Why do so many research practices still use research animals, despite the societal wish to decrease the number of research animals, the existence of public policy that aims to stimulate the development of alternative methods to animal experimentation and the sky-high potential of emerging technologies? In *Lost in Technification - Uncovering the latent clash of societal values in Dutch public policy on animal-testing alternatives*, Meggie Pijnappel offers a critical reflection on the technical promises of the established discourse coalition on animal-testing alternatives in the Netherlands. Her research focuses on the intersection of policy, research funding and research practices in translating abstract societal values on health, safety and animal welfare into concrete research programmes. This research not only shows the difficulties that the transition towards an animal-free research world entails, but it also provides a means to stimulate more sustainable policy change.
LOST IN TECHNIFICATION
Uncovering the latent clash of societal values in Dutch public policy discourse on animal-testing alternatives

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PART I
Introduction and theoretical framework
Chapter 1 - Public values at stake

Diverging expectations of animal research in the Netherlands
It seems hard to think of an issue that raises so many strong emotions and ethical concern among the public, while remaining a relatively minor issue in public policy, as animal experimentation. Public debate on animal experimentation has a long history of arguments regarding the moral and ethical justification of using animals for research purposes. The Dutch debate appeared to hit rock bottom in the mid-1990s when a series of arson attacks astounded the Netherlands (AIVD, 2004), and opponents and proponents of animal research stood diametrically opposed to each other.

In comparison, the current public debate on animal experimentation appears to be very different. It would seem that most (although not all) of the former camps have merged into a new coalition that works collectively towards what appears to be a shared normative horizon of alternatives to animal experimentation (subsequently, “animal-testing alternatives”). Devoted politicians, engaged animal protectors, lucrative multinationals and curious scientists all seem to value such alternatives to the practice of animal experimentation. We may even speak of an “industry per se” that has its own research programmes, policy interventions, organisations, vision documents and connecting technologies. The mobilising power seems to lie in the promise – or perhaps even the expectation – of a sustainable future in which animal welfare is associated with other generally shared public values, such as economic progress, scientific relevance and technology development, in a fair and equal manner.

The question remains why only a handful of people are truly committed to changing animal experimentation while almost everyone seems to have an opinion about it. Why is it so hard to make a real impact and to continue the steep decrease in research animal numbers that marked the 1980s and 1990s? Why have today’s technological possibilities not made animal experimentation superfluous yet? In other words, why does a transition – a radical, structural change of a societal (sub)system (Rotmans, 2005; Rotmans et al., 2001) – seem so difficult to achieve despite the availability of what appear to be the main components?

1.1 Animal experimentation: a persistent policy problem

Animal experimentation is a complex issue that has been studied quite intensively in the literature. Most contributions, including the “intrinsic value” of research animals (Brom, 1999; Dol, Fentener van Vlissingen, Kasanmoentalib, Visser, & Zwart, 1999; Verhoog, 1992), our duties to laboratory animals (De Vries, 2009), animal rights (Regan & Singer, 1989/1976; Regan & Singer, 1989/1976; 1 Obviously, there seem to be no real proponents of animal research. Proponents here refer to people that accept animal research under the present conditions (e.g. regard animals models relevant for their questions, or in the absence of suitable animal-free alternatives for their animal experiment).
Singer, 1975), moral frameworks in the animal biotechnology debate (Kupfer, Krijgsman, Bout, & De Cock Buning, 2007) and a philosophical inquiry into the genetically engineered mouse (Ter Gast, 2007), have come from the humanities. More recently, the social sciences have picked up the issue as well, including through studies about the “visual politics” of animals in bioscience (Brown, 2006), discursive strategies of scientists in attempt to defend their practices (Michael & Birke, 1994) and policy instruments in bioethics governance (Paula, 2008).

Yet, an understanding of animal experimentation as a policy issue is missing from the vast body of literature. This research studies animal experimentation as a public policy issue in order to stimulate the development of animal-testing alternatives as innovations amidst diverging societal values. It starts from the assumption that there is at least some societal desire to limit animal experimentation as much as possible. However, this wish for reducing research animal number connects with other wishes that are generally common in Dutch society, including for safe food products, for an understanding of the underlying biological mechanisms of sickness and disease, for healthy livestock, and for new medical treatments with fewer side effects. These wishes have a high impact on the current use of animals and come at a high cost, with over 500,000 research animals being used in the Netherlands alone (NVWA, 2014).

Animal research is a complex issue comprising many actors that perform animal experiments (e.g. universities, industries, knowledge institutes, contract companies), fund the experiments (e.g. research councils, industries, universities, academic hospitals, private companies), demand animal experiments (e.g. regulators, editors of academic journals, fellow-scientists), depend on the knowledge obtained from animal experiments (e.g. patients, consumers, fellow scientists), make a living out of animal experiments (e.g. breeders, suppliers) and are otherwise involved in the public debate (e.g. non-governmental organisations, umbrella organisations). The issue involves many sectors, including the medical sector (e.g. drug development, clinical innovations), the agro-food sector (e.g. food ingredients, dietary products), the chemical sector (e.g. food additives, house-hold products), the defence sector (e.g. effect of neurotoxins in warfare) and the academic sector (e.g. knowledge production). There is no doubt that each of those actors and sectors has a different value in relation to animal experiments. These diverging values and expectations are also visible during policy formation. Indeed, the extent to which animal experimentation is understood as a single policy issue that is worthy of attention – and whether this issue is in fact a problem – seems to depend on how the topic is perceived and framed. For example, animal experiments may be framed as a “necessary evil” (Freriks, Van der Meulen, Van den Belt, Ten Holt, & Verstappen, 2005), a “deception” (EDEV, 2014), or as “indispensable” (Nefarma, 2015). The process of framing is problematic in the sense that different frames and their underlying appreciative systems create multiple social realities and require different (policy) solutions. Expectations, beliefs and interpretation thus shape the world we (want to) live in. Indeed, diverging policy frames have been found to have a prominent role in policy controversies (Rein & Schön, 1993) and intractable conflicts (Lewicki et al., 2003).

The framing of a policy issue takes place within a nested context: “[I]ssues tend to arise in connection with governmental programs, which exist in some policy environment, which is part of some broader political and economic setting, which is located, in turn, within a historical era” (Rein & Schön, 1993, p. 154). The specific understanding of animal experimentation, the meaning of animal-testing alternatives in the light of animal experiments and public values, and the interpretations of three-R research as societally relevant therefore only make sense in a particular context (i.e. “discourse”, Hajer, 1995)). The diverging underlying appreciative systems involved in animal experimentation, the difficulty to describe the problem, the improbability of an optimal solution and the ongoing substantial political debate relate to the “wickedness” of the policy problem (Hoppe, 2011; Rittel & Webber, 1973).

4 William Russell and Rex Burch introduced the three Rs in their 1959 book, Principles of humane experimental techniques, but the term gained more attention in the scientific community after the publication of Smyth’s Alternatives to animal experiments in 1978 (Balls, 2005). As described in their 1959 book, “replacement means the substitution for conscious living higher animals of insentient material. Reduction means reduction in the numbers of animals used to obtain information of a given amount and precision. Refinement means any decrease in the incidence or severity of inhumane procedures applied to those animals which still have to be used” (Russell & Burch, 1959). The term “alternatives” was often used to summarise all methods and situations that offered an alternative to the practice of animal experimentation. The term itself has been contested, and over the years, many have tried to get rid of it. However, I use this term throughout this study, as it is still very much present in the discourse on animal research.

5 The information needed to understand the problem depends upon one’s idea of solving it. That is to say: In order to describe a wicked problem in sufficient detail, one has to develop an exhaustive inventory of all conceivable solutions ahead of time.” (Rittel & Webber, 1973, p. 160)
Chapter 1 - Public values at stake and the "societal, including the cooperation between natural and social networks and institutional barriers, which cannot be corrected by the market or current policies (Rotmans & Loorbach, 2009).

These problems appear to be too complex to solve with technological interventions alone. Indeed, numerous studies have shown that the innovations that research developed have often not been adopted, and that successful innovations were usually based on an integration of (technological and other) ideas and insights from scientists as well as users, intermediaries and other societal agents (e.g. Pinch & Bijker, 1984; Rip, 1995). Besides the technical arrangement, innovations need to include new social and organisational arrangements, such as new rules, perceptions, agreements and social relationships (Leeuwis & Aarts, 2010), which means that it will not be easy to introduce animal-testing alternatives into the present system of animal experiments, nor for these alternatives to manage the problem of animal experimentation successfully.

Such a socially embedded understanding of innovation suggests that the stimulation of animal-testing alternatives through research (i.e. “three-R research”) alone will not suffice. Recent developments regarding “responsible (research and) innovation” (Owen, Macnaghten, & Stilgoe, 2012; Stilgoe, Owen, & Macnaghten, 2013) and the “societal relevance” of research (Bouter, 2008; ErC, 2010b; Hessels & Van Lente, 2008; Spaapen, Dijstelbloem, & Wamelink, 2007), including the cooperation between natural and social scientists in the R&D process (Flipse, Van der Sanden, Radstake, De Winde, & Osseweijer, 2014), appears to have a better chance of improving the system in a sustainable manner.

1.1.1 Dutch animal research policy under pressure

The existence of various diverging and often conflicting public values on a range of topics points to the value that is pluralism in Dutch society. In this pluralism, public policy – including the one on animal research – has a tough task to manage all. Desperately searching for new ways to live up to all societal values relevant to the topic, the policy programme has seemingly put its faith in the hands of animal-testing alternatives. Public policy addresses the welfare of animals in or after experiments, too, for example, through an exploration of the possibility of prohibiting the practice of giving mice a “toe cut” as a means to identify them6, or of giving the animals up for adoption after the experiments have been concluded.

6 A toe cut is frequently used to identify mice in the same birth nest. Possible alternatives, such as the use of a marker on their coat or an ear puncture, appear less reliable, as the marker fades, and the punctures may close in time. Note that while an alternative to the toe cut is regarded as a refinement of the animal experiment (i.e. animal-testing alternatives), such an improvement will not have any effect on the numbers of animals used in the research.

Despite the public attention and the apparently societal wish to lower the number of animals used in research, the number of animals has hardly decreased over the past decade. Animal experimentation has remained a policy issue in need of further work, attention and public investments ever since the 1970s. The policy programmes have been promising improvements and changes, but to date, few of those promises have been fulfilled, and the present public policies on animal experimentation seem to have led to a deadlock.

These signals indicate that the present (policy) discourse on animal experimentation is not living up to societal concerns and values regarding animal research, and that there is incongruence between what is socially expected from animal research policy and what the dominant voices promised animal-testing alternatives would deliver. In other words, the present policy system regarding animal research, including animal-testing alternatives, is under pressure to live up the societal expectations.

The following section draws attention to the rational approach to animal research policy and exposes some of its limitations.

1.2 Questioning the rational approach of Dutch animal research policy

This section dives into the Dutch policy practice of animal research, including its monitoring and evaluation systems. It explains the rational approach to animal research policy and makes clear the limitation of such an approach for the questions in this study.

1.2.1 Evaluating success by counting animal numbers

Each year, the Dutch Food and Safety Organisation’s (NVWA) publication of a report containing the total number of registered research animals draws much attention in the Dutch media and in Parliament (Anonymous, 2014; EZ, 2014a; Proefdiervrij, 2014a; Van Kessel, 2014; Van Santen, 2014). This report is based on the registration of all the institutes that perform animal experiments in the Netherlands (i.e. “licensee”). The Animal Experimentation Act
obliges these licensees to register all the research animals used in their studies over the past year, including the species and the purpose of the experiments. The NVWA quantifies all the data in multiple categories in the annual report Zodoende [which may be translated as Thus]. For example, the 2014 report showed that 517,181 research animals were used for 526,593 animal experiments in 2013 (NVWA, 2014).

The public uproar appears to be focused on the number of research animals serving as an indicator to measure the effectiveness of animal research policy in the Netherlands. This indicator suggests that a decline in research animal numbers correlates with a successful policy, whereas an increase is tied to a failing policy. The indicator has been used for both policies regarding animal research as animal-testing alternatives (i.e. “three Rs”). The use of this indicator has mainly been criticised by the scientific community, especially in relation to the effect of animal-testing alternatives. For example, scientists have argued that the relationship between an investment in animal-testing alternatives and a decrease in animal numbers is too simple and that only scientific experts can judge the developments in this respect (Van Zijverden et al., 2013b). Yet, the number of research animals remains the main indicator for an assessment of the success of Dutch policies with regard to animal research, including the three Rs, at present.

The reliance on (quantitative) indicators fits within a rational model of policy-making, which builds on the assumption that eventually the policy alternative that maximises the decision maker’s value most is the one that gets chosen. In the case of animal research, this implies that counting animals says something relevant about that value. Before going into the limitations of such an understanding of policy-making for the present case study, the following section will briefly introduce the assumptions of such rational models.

1.2.2 A rational approach to policy: a short introduction to the literature

Rational decision-making draws on dominant policy theories that are collectively known as rational choice theories (RCTs). This rational approach to policy entails a comprehensive analysis of all policy alternatives and their consequences, after which an alternative is chosen that will maximise the decisions maker’s value (Griggs, 2007; Hill, 2005). The ideal rational model postulates the prior specification of objectives and the identification of means to reach these ends (Bekkers, 2007; Hill, 2005). Following this approach, only the best-suited policy alternative will be chosen, namely the one that maximises its outcomes (i.e. utility-maximisation). In the case of animal experimentation, this desired outcome may thus be defined as the lowest amount of research animals possible, which implies that only those policy alternatives would be chosen that are likely to minimise the dependency on animal experimentation (as measured by a decrease in animal numbers). The rational model is built on decisions to implement policy programmes that contribute to societal goals (e.g. fewer research animals) that can be evaluated later on (e.g. counting animal numbers). In a rational approach to policy, policy objectives rely on specific, measurable, attainable, relevant and time-bounded definitions (i.e. “SMART”).

The rational approach to policy-making understands the central government as a single entity with a coherent, instrumental and hierarchical “mind of its own” that can act without the approval of others (Colebatch, 2009).

The rational models of policy have garnered much criticism over the years, especially regarding the extent to which the decisions of political leaders (e.g. ministers) can actually be seen as a choice between various types of actions to reach a stated objective. For example, political decisions often seem to be derived from present situations just as much as stated objectives, goals are often vague and ambiguous, and they overlap or contradict with other policy goals. Where multiple goals are in conflict, the outcome seems likely to be a compromise that reflects the power of different interests (Colebatch, 2009, p. 47 and beyond). Moreover, others may redefine policy choices, too.

11 It is worth pointing out that the RCT literature encompasses a variety of other names, including public choice theory, social choice theory, game theory, rational actor models, positive political economy and the economic approach to politics (Borooh, 2002).

12 An important assumption in the rational policy model is that of a linear process that distinguishes several steps. These steps are i) defining goals; ii) imagining alternative means for attaining them; iii) evaluating the consequences of each course of action; iv) choosing the alternatives most likely to attain the goal; v) implementing and vi) evaluating (Stone, 1997b).

13 According to the rational choice models, rationality and power can be seen as separable, where rationality – in the form of knowledge – precedes power. In reality, however, power often ignores or designs knowledge as it chooses. As Flyvbjerg’s study on the Aalborg Project has shown, power and rationality are very much related, albeit asymmetrically. Power has a clear tendency to dominate rationality in the dynamic and overlapping relationship between the two. Whoever gets to have the most power behind its interpretation or rationale is the one who defines the new truth (Flyvbjerg, 2002).

14 The theories have evolved over time by taking into account much of the criticism levelled against the model’s previous, more polarising assumptions. This led to the insight that the policy process is in reality far

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7 A local Animal Ethics Committee (DEC) has granted permission prior to the start of these experiments for them to be carried out. Since 18 December 2014, the new Animal Experimentation Act [“Wod”] has been in force. Since then, licensees need to obtain permission from the Central Authority for Scientific Procedures on Animals [Centrale Commissie Dierproeven, CCD] before starting their projects. A research project may include one or more animal experiments.

8 In 2012, the former VWA merged with two other inspectorates into the New Food and Safety Authority, NVWA. Later, this acronym was used for the Netherlands Food and Safety Authority. Meanwhile, the NVWA continued with the publication of the yearly Zodoende reports.

9 Owing to the re-use of research animals in other experiments, the number of animal experiments is slightly higher than the number of research animals.

10 Note that a policy alternative is not the same as an animal-testing alternative, and that many policy initiatives are presented in a linear, rational manner; e.g. policy x will lead to more y, contributing to goal z.
Choosing the policy alternative that best suits the objective is therefore much more restricted in practice than the rational model assumes, especially for as wicked and persistent a problem as animal research and the Dutch polder model of consensus-based economic and social policy making. The issue involves multiple and often conflicting values that include animal welfare (e.g. the reduction of the use of research animals), improving health (e.g. prolongation of life), economic progress (e.g. market introduction of new products) and enhanced academic understanding (e.g. unravelling the relationship between genes and mechanisms of toxicity). From this perspective, policy-making seems to be a compromise reached to satisfy a powerful field of various actors, values and priorities.

Rational models for policy thus assume (and require) the definition of unambiguous policy goals and the measurability of their effects in terms of numbers. If policy outcomes cannot be measured clearly and unambiguously, the calculation of optimal choices becomes unstable. The next section will show the limitations of the rational models in understanding animal research policies by looking into the problems of counting research animals as a policy indicator.

1.2.3 The problem of evaluating from a rational approach: categorising and counting research animals

To count research animals, one needs to decide what counts as a research animal and what does not. The same goes for counting animal experiments. Should each procedure be counted as an experiment, or should the sum of procedures with one animal count as such? Whoever makes the classification has the power to decide what is counted, what is included, and what is excluded. In the words of Deborah Stone (1997b, p. 164), “there are many possible measures of any phenomenon and the choice among them depends on the purpose for measuring”. Counting thus always involves decisions about “counting as” (Stone, 1997a).

Counting research animals, animal experiments and animal-testing alternatives assumes categorisation, which also involves classification. Categorisation involves the establishment of boundaries in the form of rules or criteria that reveal whether something belongs to a particular category or not (Stone, 1997a). Counting assumes mutually exclusive categories and a classification system that is complete with consistent, unique classificatory principles in operation (Bowker & Star, 1999). However, many scholars have shown the ambiguity and multi-interpretablility of classification systems, including that of of invertebrates (Boonman-Berson, Turnhout, & Van Tatenhove, 2014), nature (Turnhout, 2009; Waterton, 2002) and biodiversity (Bowker, 2000).

Counting involves selection, too, as it allocates privileges and discrimination: Animals that fall within the boundaries of the category (e.g. vertebrates) have legal protection, while animals outside the category (e.g. most invertebrates) do not. Counting research animals therefore also implies value judgments about which animal counts more (Stone, 1997a).

Counting also implies a need for policy action (Stone, 1997a): Animal numbers are counted to support (the absence of) policies. The fact that the same numbers are used to support opposing arguments (e.g. decreasing trend since 1977, or an increasing trend in relation to the year before) supports the assumption that numbers are far beyond neutral and have different meanings in different contexts over time. Numbers thus seem to support a certain policy direction over others (i.e. they make “normative leaps” (Stone, 1997a, p. 167). The way in which the measurement is framed and understood thus seems to be more important than the actual outcome of the counting.

1.2.3.1 Ambiguous demarcation of legal categories

One may argue that the definition of what counts as a “research animal” is clearly defined in legislation on the matter. However, this legal clarity is elusive: Even the clearest definition needs interpretation and elaboration in concrete situations. In addition, categories are only temporarily fixed and always subjective to challenges. For example, Article 9.1 from the EU Directive 2010/63/EU on the protection of animals used for scientific purposes states: “Animals taken from the wild shall not be used in procedures” (my emphasis) (European Parliament & Council of Europe, 2010). A procedure is defined as:

(…) any use, invasive or non-invasive, of an animal for experimental or other scientific purposes, with known or unknown outcome, or educational purposes, which may cause the animal a level of pain, suffering, distress or lasting harm equivalent to, or higher than, that caused by the introduction of a needle in accordance with good veterinary practice. (European Parliament & Council of Europe, 2010, Art. 3.1)

Based on the definition above, it seems at least questionable to what extent the swabbing of a goose to determine the virus strains this bird carries as part of zoonosis15 research should be interpreted as a “procedure” and hence should be counted as an animal experiment, too. The inclusion or exclusion seems to be left to the evaluation of the swabbing of the goose against the “introduction of a needle in accordance with good veterinary practice” (European Parliament & Council of Europe, 2010, art. 3.1).16

[^15]: Zoonoses are infectious diseases that can be transmitted from animals to humans and vice versa.
[^16]: This example was given by a virologist at the workshop on the implementation of the European Directive.
Moreover, legal categories may have unintended side effects that diverge from the original goal of policy (e.g. improving welfare of research animals). Consider the response from the former Minister of Health, Sport and Welfare Ab Klink when he was asked to reflect on the possible inclusion of invertebrates’ embryos into the classification of research animals:

(…) embryos of invertebrates should be included in the regime. That leads to several things. Firstly, the amount of research animals will increase, as these animals will be considered research animals, too. Moreover, some animal-testing alternatives will not remain animal-testing alternatives…as they [the embryos of invertebrates] are now counted as research animals - which we want to get rid of - the amount of animal-testing alternatives decreases as a consequence. (my translation) (CDA Minister Klink in Tweede Kamer, 2009, p. 152)

Interestingly, counting research animals and animal-testing alternatives may also pose a threat to the protection of animals in the research setting. The quotation above also highlights the fragility of the boundaries of an “animal-testing alternative”, including its use as a policy indicator. After all, accepting more (life stage of) animals as research animals will decrease the number of possible animal-testing alternatives and therefore negatively affect the evaluation of related policies.

The two examples above reveal the difficulties in practice. The difficulty of deciding what belongs or “counts as” and what does not is strengthened even further by the challenges to which temporarily fixed categories always appear to be subject to: the challenge to include and the challenge to exclude (Stone, 1997a, p. 163).

1.2.3.2 Challenging the categories
Because of the temporal meaning of categories, it seems like the latter are always being challenged. Animals that fall within the category of research animals may rely on the privilege of protection. Therefore, there seems to be more “challenges to include” than “challenges to exclude” animal from the legal definition (Stone, 1997b, p. 163).

For example, as more and more scientific evidence points to the pain sensation of several invertebrates, the exclusion of invertebrates from the legal category of research animals seemed difficult to uphold. In 2005, the scientific panel on Animal Health and Welfare (AHAW) of the European Food and Safety Authority (EFSA) was asked to consider the scientific evidence for the sentience and capacity of all invertebrate species used for experimental purposes and of foetal and embryonic forms to “experience pain, suffering, distress or lasting harm” (EFSA, 2005). Based on the pain system, brain complexity and social relationships, the panel concluded that “cyclostomes, all Cephalopoda and decapod crustaceans fall into the same category of animals as those that are at present protected” (EFSA, 2005, p. 3). The advice challenged the EU directive in force at that time (i.e. Directive 86/609/EEC) to include specific types of invertebrates in the definition of research animals and count them as such. Moreover, the former EU Directive 86/609/EEC had excluded foetal or embryonic life stage from the legal category of research animals (EFSA, 2005, p. 9). To the scientific panel, this point raised questions about the grounds on which such forms were excluded. The EFSA report did not go into detail on this question. However, it recommended that “whenever there is a significant risk that a mammalian foetus, or the foetus or embryo of an oviparous animal, is for any length of time sufficiently aware that it will suffer or otherwise have poor welfare when a procedure is carried out on it within the uterus or egg, or after removal therefrom, such animals should be included in the list of protected animals” (EFSA, 2005, p. 18). In the new EU Directive 2010/63/EU, both formerly excluded categories are included.

Yet, other animals remain - at least for now - outside the legal category of research animals. These include animals that are kept or bred for research purposes but do not end up in experiments themselves. These so-called “killed-in-stock animals” fall outside the legal definition of research animals and hence do not add up to the total number of research animals in the Netherlands. This group consists of around 600 000 animals and would double the number of of research animals in the Netherlands if they were included in the count. Other “excluded” categories of animals include spiders and free-swimming tunicates. The EFSA positioned these animals in a “borderline area”, as it found evidence for sensory processing and awareness in these animals but no evidence for a pain system (EFSA, 2005). Future scientific evidence on the existence of a pain system in these species would likely mean they would be included in the legal category of research animals, too.

organised by the Nederlandse Vereniging van Proefdierkunde (NVP, the Dutch Society on Animal Experimentation Practices) on 29 October 2010.

17 Stone identifies these as challenges to include: “a real likeness where the measure finds a difference, and insists on inclusion of something the measure excludes” (Stone, 1997a, p. 164). In other words, something that is at present excluded from the measure has some similarities with something inside the measure.

18 Stone describes the second challenges as “a real difference where a measure finds a likeness, and insists on exclusion on something the measures includes” (Stone, 1997a, p. 164). This is the direct opposite of the challenge to include, as it aims to exclude that which is still inside.

19 Invertebrates were not regarded, and therefore not protected, as research animals within the former EU Directive 86/609/EEC. Some member states, however, did already include some invertebrates in their national legislation.

20 Directive 2010/63/EU defines research animals as “(a) live non-human vertebrate animals, including: (i) independently feeding larval forms; and (ii) foetal forms of mammals as from the last third of their normal development; (b) live cephalopods” (Art. 3).

21 In Dutch, this group is referred to as “in voorraad gedode dieren”.
By contrast, the legal category of research animals hardly ever seems to be challenged by groups that wish to escape the categorisation (i.e. “challenge to exclude”). As inclusion also gives protection to those animals, the voluntary exclusion of some groups (e.g. certain species) seems unlikely. Nevertheless, some species attract more protection than others. Consider, for example, the quotation from Member of Parliament Harm Evert Waalkens during a debate on the phasing out of non-human primates for research purposes:

_Ornel said that they are all animals. But just like with people: We’re all equal, only some are a bit more equal than others._ (Tweede Kamer, 2009, p.22)

He appears to argue for a further specification within the legal boundaries of the category. This example may come closest to Stone’s definition of the challenge to exclude and giving some research animals more protection than others (e.g. primates over dogs, rabbits over fish).

The examples above show even smart (legal) definitions will not guarantee that past ambiguities will be resolved. Categories can always be subject to challenges to include and to exclude, such as the ones described above. These examples also show that the practice of counting is very much subject to normative choices and public scrutiny, rather than a neutral and objective measure of policy success. As the rational account of policy denies the existence of such challenges, such an approach seems unfit to grasp the incongruence between technological promises and societal expectations on animal-testing alternatives in the Netherlands.

1.2.4 The problem of implementation from a rational approach: redefinition of values

A rational approach to policy postulates a causal relationship between policy and outcomes. This approach concentrates on the ability of single authority structures (i.e. the government) to effectively manage the implementation process. The politics of implementation is viewed in terms of the administrative process, not as a contradiction of values (e.g. Goggin, Bowman, Lester, & O’Toole, 1990).

Such an understanding of policy implementation has the intuitive appeal of all means-end theories, which seems to embody the very essence of rational action. From this theoretical perspective, “implementation problems” occur in the absence of strict policy formulation: Effective management is the key to solving the implementation problem.

In practice, however, implementation appears to be a complex process of putting policy into practice by means of a variety of mechanisms and procedures that involve a wide and diverse array of actors. It is the stage of the policy process where the underlying theories of policy decisions, the choice of policy instruments and the resources allocated during the formulation process are tested against reality (Dimitrakopoulos & Richardson, 2001). We might think of implementation as a process of learning rather than carrying out instructions (e.g. Pressman & Wildavsky, 1984). In most policies of interest, the objectives are characteristically manifold (because we want different things, not just one), conflicting (because we want different things) and vague (because that is how we can agree to proceed without having to agree also on exactly what to do) (Page, 2006, p. 211).

Policy implementation thus appears to be a bidirectional process, in which interpretation and sense-making in “the field” also reshape policy interpretations. The government is no longer understood as a singular entity with authoritative choice (Colebatch, 2009).

Viewing implementation as a process also dismisses a simple and linear implementation of public policy into research calls and research programmes, including those on animal-testing alternatives. Implementation involves the (re)definition of the relevant concepts (e.g. societally relevant research and animal-testing alternatives), as well as the prioritisation of public values. “[I]mplementation is the continuation of politics by other means,” says Eugene Bardach (1977, p. 85).

Understanding implementation as an execution of public policy in policy programmes seemingly ignores the (re)definition and (re)prioritisation of public values. Such a rational approach to policy therefore seems unhelpful to understand the incongruence that is central to this study.

1.2.5 The need for an interpretive approach

The rational model (“goal-orientated perspective” or “authoritative account”) views policy as a process of choosing goals and finding optimal measures to achieve them. From this perspective, policy embodies a theory of cause and effect: If we invest in animal-testing alternatives, then the number of animals will go down. The authoritative choice account recognises that many organisations may be involved in exercising public authority, but views them all as being part of one system that exercises the will of the government. This account assumes that the decisions at the top coincide exactly with the outcomes at the bottom (i.e. implementation). From a rational account of policy, the stable number of research animals is likely understood as a “problem of implementation”, and the argument would be that more (governmental) investment is needed, and a stricter definition of the categories would overcome the problems of “counting as” that were presented above.
However, an authoritative choice account of policy seems unable to understand the present incongruence for at least four reasons. Firstly, a rational account denies the political and ambiguous classification of categories such as research animals and animal-testing alternatives, which figuratively assumes these categories to be stable. Secondly, the rational account assumes that a quantitative measurement (e.g. the number of research animals) represents a relevant indicator to measure the effectiveness of the policy. Furthermore, this indicator assumes a causal connection between animal-testing alternatives and animal numbers. Thirdly, such an understanding ignores that organisations and researchers involved in three-R research are not so much after the animal-reducing potential of their work as they are doing their job (e.g. doing science, funding research) and the extent to which the policy programme can contribute to their own agendas (e.g. public accountability, social impact) (After Colebatch, 2009). Finally, such an approach takes the existence of animal research as a policy issue for granted. The questions of what is the issue, why and to whom it is an issue are therefore assumed to be irrelevant. Yet, within the context of societal expectations to animal research policies, these questions may well be relevant.

Like Deborah Stone and others, Frank Fischer and John Forrester described policy-making as “a constant discursive struggle [emphasis added] over the criteria of social classification, the boundaries of problem categories, the intersubjective interpretation of common experiences, the conceptual framing of problems, and the definitions of ideas that guide the ways people create the shared meaning which motivate them to act” (1993, p. 2). Such an “interpretive” approach to policy-making seems more capable of understanding the many challenges and ostensible lack of progress that this policy issue faces. In animal research, the discursive struggle continuously redefines the terms of the debate. It alters the outcome of policy not by making it more (or less) effective but by redefining what counts as effective. This research will therefore start from an interpretive account to policy-making.22

1.3 Research objective, relevance and research questions

This study starts from the premise that the apparent incongruence between societal expectations regarding animal research policies and the technological promise of the discourse coalition on animal-testing alternatives in the Netherlands hampers a sustainable transition, namely one that better reflects the societal values present in the dominant discourse23 on animal research in the Netherlands.

Building on interpretive approaches to policy that assume the discursive character of policy-making and the constant struggle over interpretation and power, this study fits within an argumentative tradition to policy analysis (e.g. Fischer & Forrester, 1993).24

This research aims to more fully understand the apparent incongruence by studying the implementation of public policy on animal research along the science-policy nexus in the Netherlands in general, and of animal-testing alternatives in particular. This research analyses how the incongruence may have evolved by analysing the framing and interpretation of the concept of animal-testing alternatives in different settings (e.g. policy discourse, research councils, and research programmes). It also studies the promises within the dominant discourse coalition25 on animal-testing alternatives amidst diverging societal values in order to work towards a more sustainable transition.

The central research question in this study is the following:

*To what extent does the present discourse coalition on animal-testing alternatives have the ability to reflect the societal concerns regarding animal experimentation in the Netherlands?*

This study takes a formative approach26 to policy evaluation, as reflected in the following three sub-questions:

1. **Analyse:** How can the present incongruence between societal expectations and technological promises from the dominant discourse coalition on animal-testing alternatives be understood from an interpretive framework of policy evaluation?

2. **Assess:** How can the mobilising power of the dominant discourse coalition on animal experimentation in the Netherlands be valued?

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22 Chapter 2 will outline the theoretical framework on which this study is based.
23 This research uses Maarten Hajer’s definition of discourse as “a specific ensemble of ideas, concepts, and
24 Whereas the rationalistic tradition of policy evaluation tries to save evaluation from the pressure, the argumentative tradition sees policy evaluation as a contribution to the informed debate amongst competing interests and therefore explicitly incorporates politics in the ex post analysis of policy performance. See also Bovens, ’t Hart, & Kuipers, 2006 for an overview of the two schools of policy evaluation.
25 This research uses Maarten Hajer’s definition of discourse coalitions as “the ensemble of a set of story lines, the actors that utter these story lines, and the practices that conform to these story lines, all organised around a discourse” (Hajer, 1995, p. 47: See also Chapter 2).
26 A formative evaluation focuses on learning and reflection, in contrast to a summative evaluation, which focuses on judgement and goal-achievement.
3. **Improve:** How can there be a sustainable change in policy that would do justice to the societal expectations regarding animal experimentation in the Netherlands?

### 1.4 Research outline

Chapter 2 outlines the theoretical framework and interpretive research approach of this study. Part II includes the empirical chapters of this study: Chapter 3 studies the shifting interpretation of animal-testing alternatives in Dutch policy discourse since the introduction of the Animal Experimentation Act in 1977. Chapter 4 analyses how societal values regarding animal research are re-interpreted in research programmes on animal-testing alternatives during policy implementation. Chapter 5 studies how scientists give meaning to the concept of animal-testing alternatives in their attempt to achieve societal relevance in research programmes. Part III includes the overall assessment and conclusions: Chapter 6 analyses the development of the discourse coalition on animal-testing alternatives and describes the discursive process that may have contributed to the current tensions within the coalition. Chapter 7 describes the means and corresponding public policy instruments that may stimulate policy change on several levels of policy reflection regarding animal experimentation in the Netherlands. Finally, Chapter 8 presents the general conclusion and discussion to this study.
Chapter 2 - Theoretical framework and approach

The previous chapter showed the limitations of a rational account of policy to analyse the present public policy on animal research in the Netherlands, by pointing to the many challenges that categorising and counting – both central to the rational account – are subject to. Instead, it was argued that an interpretive account of policy seems better capable to understand the apparent incongruence between the societal expectations regarding animal research policies and the technological promise of the discourse coalition on animal-testing alternatives in the Netherlands.

This chapter starts with an outline of the study’s theoretical framework and builds towards the research approach. Section 2.1 sketches the assumptions of an interpretive account of policy, followed by a section on interpretive policy analysis (§2.2). The chapter continues with two ordering devices of meaning, namely discourse (§2.3) and frames (§2.4). It continues with an examination of the role of promises in the shaping of societal expectations (§2.5). Section 2.6 integrates the various theoretical building blocks into a coherent framework. Finally, §2.7 outlines this study’s research approach.

2.1 An interpretive account of policy

An interpretive account of policy is based on the belief that the social world is characterised by multiple possible interpretations. From this perspective, policy is seen as a social construct of reality, a result of on-going interaction between the various parties in the debate (Bekkers, 2007). This view contrasts sharply with traditional approaches to policy analysis, which are taken under the assumption of positivist-informed science, which means they claim it is not only necessary but also possible to make objective, value-free and univocal decisions (Fischer, 2003; Yanow, 2000b). Moreover, the interpretive account acknowledges that much of the work takes place across or outside organisational boundaries, and it is much more concerned with identifying new players and negotiating with them than it is with selecting and perusing goals. It is for this reason that Colebatch (Colebatch, 2009, p. 26) talks of “policy making as negotiating” (in contrast with the authoritative choice account of policy that perceives “policy making as deciding”). From this perspective, policy making is about relationships, linkage and creating meaning. Consequently, the meaning and interpretation of policy is not something vague, or something that follows the decision-making process, but an integral part of the policy process. It is precisely for that reason that meaning can shape practices, institutions and policies and brings them into being. In the words of Henk Wagenaar, “meaning does not merely put a particular affective or evaluative gloss on things, but (...) it is somehow constitutive of political actions, governing institutions, and public policies” (2011, p. 4).17
As such, policies’ meaning is “situated” and only makes sense within a particular context (e.g. Wagenaar, 2011; Yanow & Schwartz-Shea, 2006). Dvora Yanow speaks of the “reading” of a particular context, which means capturing the meaning of a particular socio-cultural environment at a particular point in time (Yanow, 1993, 47). Data and conclusions are thus constituted by the shared expectations, beliefs, values, routines, and practices of specific cultures. This culture can be small (e.g. a particular science domain or a specific practice of an organisation) or large (e.g. Dutch society, Western societies). As Heclo (in Freeman, 2006, p. 372) formulated it, “[p]olicy is a form of collective puzzlement on society’s behalf”, asking “What is normal and what is deviant?”, and “Who are the experts?” (Heclo in Colebatch, 2009, p. 30). This dimension of policy formation is perhaps hard to see, because it is concerned with things that are often taken for granted. It seems logical for the government to be concerned with problems, and if the government is dealing with an issue, it has to be a problem. However, this “scene-setting” dimension of policy practice27 is important to recognise and study, as it informs us to some extent about “why is this a problem, or why is this a problem now but not before?” (Colebatch, 2009: See also Chapter 4). Whether or not topics become a policy issue has much to do with how they are (re)frame (Colebatch, 2009, p. 30: See also §2.4 about framing). For example, whales used to be seen as a source of oil, but hunting them is a practice that most countries, with the exception of a few, condemn today. Similarly, research animals used to be considered ethically neutral, as objects, models or laboratory instruments in the 19th century. At present, many countries have regulations in place that acknowledge the intrinsic value of research animals.28

From the angle of an interpretive account of policy, multiple meanings and interpretations are the rule rather than the exception. It is exactly the multivocality of policy that becomes the reason for and the explanation of implementation difficulties as well as successes (Yanow, 1993). Ambiguity can “unite people who might benefit from the same policy but for different reasons” (Stone, 1997b, p. 243). This leaves room for the forming of new “discourse coalitions” to link two formerly unconnected policy domains (Hajer, 2003). By contrast, the benefits of ambiguity may prove to be only temporary. If policymakers do not make their meanings explicit, multivocality is passed on to an administration agency or to others (Stone, 1997b). A lack of precise definitions at this stage postpones the phase of interpretation even further. In other words, the longer the policy journey is, the more divergent and dispersed its meaning may become.

2.2 Interpretive policy analysis

To do justice to the interpretive account of policy, one must use interpretive methods.30 But, what is “interpretive” about interpretive methods? Is it not the case that all science engages with the interpretation of data? Dvora Yanow and colleagues open the discussion in Interpretation and Methods (2006) with these questions. While the use of the concept is not exclusive, interpretive methodologists share the view of “taking language seriously”, an overarching appreciation for the centrality of meaning in human life in all its aspects and a reflexivity on scientific practices related to the production of meaning and to knowledge claims (Yanow & Schwartz-Shea, 2006). Interpretative approaches assume that prior knowledge, whether derived from a person’s education, experience, and training or some other form of personal background, plays a central role in sense making. Interpretive approaches may therefore be defined as approaches that focus on “meanings that shape actions and institutions, and the ways in which they do so” (Bevir and Rhodes in Wagenaar, 2011, p. 3), or “meanings of policy, on the values, feelings, or beliefs they express, and on the process by which those meanings are communicated to and ‘read’ by various audiences” (Yanow, 2000b, p. 14).31

27 Henk Wagenaar (p.4) points to the trite and controversial connotation of the concept “constitutive”. He argues that it is trite in the sense that its synonym, “constructed”, has become so pervasive in interpretative social sciences that it is now a symbolic marker signalling that “you speak the right language” (p.4). Furthermore, he finds the use of the concept controversial as “it glosses over a slew of philosophical and practical difficulties that are usually more hinted at than explicated”.

28 Colebatch also speaks of the “social construction account” of policy (p.29).

29 The term intrinsic value is not easily definable but generally refers to the animal’s value on its own and defies the instrumentalisation of animals. Yet, the philosophical consequences for the recognition of such a value and the practical consequences for our daily interaction are still under debate. For an interesting overview in this regard, see the edited volume Recognising the Intrinsic Value of Animals. Beyond Animal Welfare (Dol et al., 1999).

30 The conceptual bases for these ideas were developed by philosophers, phenomenologists and hermeneutic scholars from the late 19th century onwards (for an overview, see (Yanow, 2000b; Yanow & Schwartz-Shea, 2006)).

31 Interpretive should not be misunderstood as ’qualitative’, as qualitative methods may still hold positivist ontological and epistemological presuppositions. In this regard, see also (Yanow & Schwartz-Shea, 2006, p. XV). One of challenges that interpretive approaches often encounter is the claim that their methods are neither rigorous nor objective. In the edited volume with Peregrine Schwartz-Shea, Dvora Yanow refutes such critics by arguing that interpretive research cannot possibly achieve these evidentiary standards, as “these expectations often reflect substantive misunderstandings of the character of the criteria themselves, definitionally, as well as what interpretive research entails – what its own procedures are”. Another point is that these criteria have “developed over time out of positivist positions, which interpretive philosophies long ago rejected as inapplicable to human sciences” (Yanow, 2006a, p. 67).
As meaning is inherent in all aspects of policy, interpretive analyses consider a wide range of discursive resources, including not only the written language of the policy itself but also the spoken and written language of committee debates, including agencies’ manifold types of documents (annual reports, correspondence, etc.) and interviews (Yanow, 2000a). Yanow calls artefacts conveyors of meaning, including agency buildings, their furnishing and dress codes and other allegedly “external” items (Yanow, 1993, 1996, 2000a). In summary, “the ‘data’ of interpretive analysis are the words, symbolic objects, and acts of policy-relevant actors along policy texts, plus the meaning these artefacts have for them” (Yanow, 2000b, p. 27).

The interpretive approach to policy analysis is not a singular method but rather a family of approaches, including – and certainly not limited to – narrative analysis, metaphor analysis, content analysis, category analysis, frame analysis, and discourse analysis (Hajer & Laws, 2006; Wagenaar, 2011; Yanow & Schwartz-Shea, 2006). Their shared assumption is that policy formation and implementation – or more broadly, the activities and interactions of government agencies, public officials, and their publics in civil society – cannot be properly understood unless we grasp their relevant meaning (Bevir and Rhodes in Wagenaar, 2007).

From an interpretive account of policy (or the post positivist tradition in social sciences), language is thus “recognised as a medium, a system of significance through which actors not simply describe but create the world” (Hajer, 1993, p. 44). The task of the analysts is to unearth the larger configurations of ideas, practices, artefacts and doctrines that shape the texture of social reality as we recognise and experience it (Wagenaar, 2011). These configurations can be understood through the concept of discourse, where meaning is discursive meaning. The next section explores the “ordering function” (Hajer & Laws, 2006) of discourses in the policy process.

### 2.3 Ordering through discourse

The previous section showed the consequences of an interpretive account of policy as a sharp contrast to the rational models or authoritative account of policy (see also Chapter 1). I understand policy problems – such as animal research – as socially constructed. By drawing upon discourse theories, this section describes how public officials, policy analysts, researchers and stakeholders make sense of the complex and politically charged world. It will introduce the concept of discourse and related concepts, such as discourse coalitions and discourse maturation.

The concept of discourse is understood in a variety of ways and used in many different disciplines, including sociology, literature, and political science. However, an important common denominator is that discourse is broader than speech: It is not seen as synonymous with discussion or understood as a mode of talking. Given the central focus of this study on the discursive meaning of policy, I follow Maarten Hajer’s definition of a discourse as “a specific ensemble of ideas, concepts, and categorisations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities” (Hajer, 1995, p. 44).

#### 2.3.1 Closure and discourse dominance

The post-structuralist approach to discourse theory stresses the change of discourses over time, as well as their partial fixation of meaning (e.g. Howarth & Stavrakakis, 2000). A discourse always invokes a temporary closure: It fixes meaning in a particular way but does not dictate that meaning to be fixed forever. As such, there is always room for struggles over what the structure should look like and which definitions should prevail. Accordingly, discourses are structured differently over time (see also frame shifts in Chapter 3 and 4).

The concept of hegemony in discourse theories affirms the primacy of politics in the construction of discourses. In the words of Margo van den Brink, “politics is perceived in

32 The study of artefacts goes beyond the scope of this research, although one can imagine its importance: for example, the contribution of laboratory animal facilities to the dominant safety discourse as closed and non-transparent, and a strong distinction between expert and layman.

33 To be sure, and following Hajer’s example of dead trees (Hajer, 1993, p. 44), I do not see the animals in experiments as social constructs; the point is how one makes sense of those animals. In this respect, there are many realities. For example, one may see those animals as victims of modern humanity, or as relevant models of knowledge production.

34 For an overview of the emergence of discourse theories and some critiques of each of the traditions, the work of Margo van den Brink (2009, p. 22 onwards) is very helpful. She distinguishes between the first tradition in discourse theory, which is concerned with the investigation of “language in use” and the analysis of “talk and text in context”; the second tradition, which defines the concept in a broader sense and extends to a wider set of social practices and phenomena (e.g. Foucault, Fairclough); and the third tradition, which further extends the notion of discourse, so that it covers all social phenomena, both discursive and non-discursive practices and elements (e.g. Laclau, Mouffe). These three traditions of discourse theory thus show a gradual development towards a more inclusive notion of discourse.

35 Like Hajer, I follow a more discursive meaning of discourse for the purpose of this study. Nevertheless, I agree with the post-structuralist approach to discourse theory, which abandoned the distinction between the discursive and the non-discursive and argued that non-discursive phenomena, such as technology and institutions, are ultimately constructed in and through discourses (“scripts”) (e.g. Akrich, 1992) (Van den Brink, 2009, p. 25). Yet, given the scope of the research, the interpretive methods used are orientated towards discursive meaning (in policy and political debates) rather than non-discursive meaning, for example of technologies and buildings (e.g. laboratories).
Chapter 2 - Theoretical framework and approach

Firstly, they have the functional role of reducing the employing them, yet robust enough to maintain a common identity across sites” defined as “objects which are both plastic enough to adapt to local needs and constraints of the several parties (Van den Brink, 2009, p. 29).”

Maarten Hajer (2005) uses a two-step approach that seeks to determine whether or not a discourse is dominant in a particular domain. Firstly, discourse structuration occurs when a particular discourse starts to dominate the way in which people conceptualise the world. In Hajer’s own words, when “the credibility of actors in a given domain requires them to draw on the ideas, concepts, and categories of a given discourse” (, p.60). Secondly, discourse institutionalisation occurs when a given discourse solidifies into specific institutional arrangements and organisational practices, i.e. when its ideas become concrete policies. If these conditions are satisfied, a discourse can be said to be “hegemonic” (, p. 61) in a given domain: The discourse is understood - at least temporarily - as dominant.

The next section will explore the role of discourse coalitions and their role in dominating the field of discursivity and constructing a centre for partial fixation.

2.3.2 Discourse coalitions

In the struggle for discursive hegemony, discourse coalitions are formed among actors that, for various reasons, are attracted to a specific set of story lines (or discourse). The discourse coalitions approach suggests that politics is a process in which different actors from various backgrounds form specific coalitions around specific story lines. The coalitions are held together by discursive affinity: Arguments may vary in origin and come from people with widely varying backgrounds but who still have a similar way of conceptualising the world. Following the lead of Maarten Hajer (1999), I understand discourse coalitions as “the ensemble of a set of story lines, the actors that utter these story lines, and the practices that conform to these story lines, all organised around a discourse” (, p. 47). In this definition, story lines are “narratives about social reality through which elements from many different domains are combined and that provide actors with a set of symbolic references that suggest a common understanding” (Hajer, 1995, p. 62).

Essentially, story lines are political devices that engage in three roles to (temporary) discursive closure (Hajer, 1995). Firstly, they have the functional role of reducing the discursive complexity of a problem and creating possibilities for problem closure (see also §2.4 on the function of frames). Secondly, they provide some stability to the debate, once more and more actors start using them. Thirdly, story lines allow different actors to expand their own understanding of the phenomena beyond their own discourse of expertise or experiences. In other words, “a story line provides a narrative that allows the scientist, environmentalist, politician, or whoever, to illustrate where his or her work fits into the jigsaw” (Hajer, 1995, p. 63).

Story lines not only help to construct a problem; they also play an important role in the creation of a social and moral order (in other words, a solution) with ideas about responsibility or blame. These devices help to position actors as problem solvers, as top scientists, as victims, or as scaremongers within a coherent story. Story lines are thus the “discursive cement” (Hajer, 1995, p. 65) that keeps a discourse coalition together (see also §2.4.3, about the parallel functionality of frame characteristics).

Discourse coalitions differ from traditional political coalitions or alliances in the sense that story lines, rather than interests or beliefs, form the basis of the coalition.39 Story lines may, however, change the previous understanding of what the actors’ interests are. Moreover, the scope of where participating actors are located is broader than is the case with political coalitions. The discourse coalitions approach suggests searching for politics in new areas, such as science, media and nongovernmental organisations (NGOs) (Hajer, 1995).

A discourse coalition can be said to dominate a given political realm when it dominates the discursive space; that is, central actors are persuaded or forced to accept the rhetorical power of a new discourse (“discourse structuration”) when the actual policy process is implemented according to the ideas of a given discourse (“discourse institutionalisation”). Discourse coalitions are thus always subject to tensions challenging the boundaries of the coalition. When the coalition can no longer manage the tensions, it will likely disrupt the corresponding discourse as well (“discourse dislocation”) (e.g. Hajer, 1995; Van den Brink, 2009).

37 For a more elaborate account of the concept of hegemony, refer to the work of David Howarth (e.g. 2004).
38 In a sense, the idea of discursive affinity relates to the concept of boundary object. Boundary objects are defined as “objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star & Griesemer, 1989).
39 In this sense, discourse coalitions thus also differ from ‘advocacy coalitions’ in the advocacy coalition framework as developed by Sabatier and Jenkins-Smith (e.g.Sabatier, 1988; Sabatier & Jenkins-Smith, 1993). Within the political subsystem “it is assumed that actors can be aggregated into a number of advocacy coalitions composed of people from various organizations who share a set of normative and causal beliefs and who often act in concert.” (Sabatier, 1988, p. 133).
2.3.3 Discourse analysis

A key discourse-analytical assumption is that language profoundly shapes one’s view of the world and reality rather than being a neutral medium mirroring it (Van den Brink, 2009). Accordingly, it cannot be said that the truth exists out there, waiting to be discovered (i.e. a central tenet of positivism). Truths are created and maintained through social interaction and depend on the specific contexts in which they arise. The analysis of discourse fits inside the interpretative and social-constructionist tradition of the social and policy sciences.

Discourse analyses come in various shapes and sizes (e.g. Hajer & Laws, 2006; Van den Brink, 2009; Wagenaar, 2011). However, what stands out is that discourse is no longer synonymous with “discussion” but is seen as “patterns in social life, which not only guide discussions, but are institutionalised in organisational practices create meaning without necessarily orchestrating or coordinating their actions or sharing deep values. In fact, and analogous to the notion of “boundary objects” (e.g. Bowker, 2000; Star & Griesemer, 1989), this space for diverging norms, values, and agendas actually strengthens the power of a discourse coalition.

In summary, the discourse coalition approach illuminates how different actors and organisational practices create meaning without necessarily orchestrating or coordinating their actions or sharing deep values. In fact, and analogous to the notion of “boundary objects” (e.g. Bowker, 2000; Star & Griesemer, 1989), this space for diverging norms, values, and agendas actually strengthens the power of a discourse coalition.

2.4 Frames as sense-making devices

Maarten Hajer and David Law (2006) talk of frames as “an account of ordering that makes sense in the domain of policy and that describes the move from diffuse worries to actionable beliefs” (p. 256). Although frames have had different meanings in different locations, they are always referred to as sense-making devices that involve selection and salience. Frames may be understood to be an “organising principle that transforms fragmentary information into a structured and meaningful whole” (Van Gorp in Fischer, 2003, p. 144). They are also “intended to mobilize potential adherents and constituents, to garner bystander supports, and to demobilize antagonists” (Benford & Snow, 2000). Frames thus privilege some parts of reality by excluding others. As such, they determine what actors will consider “the facts” to be and how these lead to normative prescriptions for action (e.g. Fischer, 2003; Rein & Schön, 1993; Yanow, 2000b). The analysis of frames therefore helps to understand how animal-testing alternatives are understood in particular contexts.

In discursive analysis, language is seen as action (Wagenaar, 2011). The intention of the analysis is to make visible the discursive structures (i.e. belief systems, ideologies, institutions, and public policies) that envelop us. Discourse analysts may adopt a reflexive position outside the cognitive domain of policy makers, for example, with “analytic leverage on how a particular discourse (...) orders the way in which policy actors perceive reality, define problems, and choose to pursue solutions in a particular direction” (Hajer & Laws, 2006, p. 261). As an extension to Foucault’s lectures on governmentality, discourse analytic approaches have been employed to expose a particular power regime in policy domains (Hajer & Laws, 2006; Van den Brink, 2009). The next section explores the framing theory for useful and adequate practical tools for the analysis of discourse and discourse coalitions. After all, both discourse theory and framing theory provide “ordering devices” to analyse sense-making processes (Hajer & Laws, 2006, p. 252).

40 Laclau and Mouffe (1985), following Foucault, use the concept of “subject positions” for actors who participate in the struggles about the definition and shaping of society. The concept thus refers to the positioning of subjects in various discourses (Van den Brink, 2009, p. 32).
41 While the focus of this study does not allow for an elaboration on discourse analyses, the Handbook of Discourse Analysis (Schiffrin, Tannen, & Hamilton, 2001) is a good point of departure for further information in this regard.
42 In short, the concept of governmentality encourages us to think of power beyond the traditional terms of the hierarchical, top-down power of the state, so as to include forms such as social control in disciplinary institutions as well (i.e. schools, psychiatric institutions, prisons) (e.g. Burchell, Gordon, & Miller, 1991). Or, in the words of Steven Lukes (2005) “a neologism referring to the way in which modern society’s various authorities administer populations, to the way in which individuals shape their own selves, and to the way in which these processes get aligned” (p. 91).
2.4.1 Exploring the interpretive framing perspective

The metaphor of the frame in interpretive social science can be traced to the work of Erving Goffman.43 He defined frames as a principle of organisation that “governs the subjective meaning we assign to social events” (Goffman in Fischer, 2003, p. 144). Frames represent “schemata of interpretation” that enable individuals “to locate, perceive, identify, and label” occurrences in their life space and the world at large (Goffman in Benford & Snow, 2000, p. 614). At present, the interpretive and social constructionist framing perspective is used by scholars in a broad range of disciplines, including policy studies (e.g. Rein & Schön, 1993, 1996), conflict and negotiation research (e.g. Dewulf, Craps, & Dercon, 2004; Lewicki et al., 2003), social movement research (e.g. Benford & Snow, 2000), and science and technology studies (e.g. Bijker, 1995; Zwartkruis, 2013).

The notions of “interpretive frames” (Fischer, 2003) or “interactional co-constructions” (Dewulf et al., 2009) focus on the meanings assigned to social events in interaction. Such an approach differs from a more cognitive understanding (i.e. frames as “cognitive representations”(Dewulf et al., 2009)) that focuses on individuals’ sense-making processes.44 Furthermore, the interpretive account of frames denotes a more active and dynamic perspective on change, showing how the process of “framing” evolves over time, even within a single community of meaning, at the level of reality construction (Benford & Snow, 2000; Dewulf et al., 2009; Yanow, 2000a).

Building on the interpretive account of frames, this research starts with the assumption that the meaning of animal-testing alternatives is produced through the interactions between individuals. Interaction may occur directly (e.g. two or more people having a conversation) or indirectly (e.g. with the outside world as subsequent policy papers).45 This notion of frames also leaves room for the more deliberate and strategic character of framing, in which some elements receive more attention than others.46 For example, the innovative possibilities of animal-free methods are emphasised more than the ethical dimension of animal research in today’s policy papers (see also Chapter 3). This process of redefining meaning in a particular discourse is often indicated as reframing (e.g. Benford & Snow, 2000; Lewicki et al., 2003). Note that the existence of one frame does not necessarily exclude another; other frames – even ones that are competing with each other – may (and will) co-exist.

2.4.2 Role of frames and framing in policy controversies

Competing frames play a pivotal role in policy controversies (Schön & Rein, 1994), such as animal research. Such controversies occur not only because different interpretive communities (i.e. “discourse coalitions”) focus cognitively and rationally on different elements of a policy issue, but also because they value different elements differently (Yanow, 2000a). For example, one frame may place a high value on the healthy aging of humans, another on the economic valorisation of scientific results, and a third on the intrinsic value of animals. Different prioritisations of values often hamper successful integration into a new frame.

In their seminal book, Frame reflection. Towards the Resolution of Intractable Policy Controversies, Schön and Rein (1994) point to the ways in which public policies rely on “policy frames” that supply them with underlying structures of beliefs, perceptions and appreciation. They argue that the presence of multiple conflicting frames makes intractable policy controversies resistant to resolution; the different problems and solutions that are put forward are grounded in different problem-setting stories, which are rooted in different frames. Defining the problem of animal research, for example, as a lack of animal-testing alternatives demands (and justifies) an investment in such alternatives. As such, frames and framing actually change the problem. In the process of policy making, Schön and Rein show that policymakers turn to reframing as a primary strategy in situations where conflicting frames have paralysed the decision-making process.47

2.4.3 Frame analyses

The interesting part of policy controversies is not so much that framing occurs, but what, how, when and by whom it occurs. The central question for the interpretive policy analyst is “How is the policy issue being framed by the various parties to the debate?” (Yanow, 2000a, 11). In frame analysis over disputes, the researcher identifies two or more interpretive communities and the language that each of them uses to ‘frame’ the policy issue. Analysis consists of identifying the values underlying these frames, often to solve (reframe) the

43 The origin of the concept of frame is found in the fields of cognitive psychology and anthropology (e.g. Dewulf et al., 2009; Van den Brink, 2009).
44 For a discussion of the different branches in academic literature, refer to the work of Art Dewulf and colleagues (2009). They disentangled divergent approaches to framing by analysing their assumptions about the nature of frames (cognitive representations or interactional co-constructions), and what is framed (issues, identities or interaction process). The strict separation, however, is difficult to uphold in practice, as one can question whether cognitive representations are in fact ever static, because they are continuously challenged by other representations, opinions and beliefs.
45 Note that the production of the policy paper itself involves many direct interactions. However, the meaning of a particular policy issue is at least temporarily frozen upon publication (see also §2.4.3).
46 The intention here is not to prove (if that is even possible) that a particular collective is responsible for the reframing of the policy issue. This research aims for more awareness regarding the process of reframing, which elements are given more attention, and which elements are left out. This awareness may improve our understanding of the present mismatch between societal expectations and technological promises.
47 The active process of reframing, as deployed by policy makers and other actors, falls outside the central scope of this research. The work of Schön and Rein (e.g. 1994), Lewicki (e.g. 2003) and Dewulf (e.g. 2004) may be of interest in this respect.
particular dispute, (e.g. Dewulf et al., 2004; Lewicki et al., 2003; Schön & Rein, 1994; Yanow, 2007).

This study follows a somewhat different approach, as I understand documents (e.g. policy documents, programme evaluations) as ways to capture and analyse temporarily fixed meanings in interaction as well. Firstly, documents are never produced by a single person in a value vacuum. They represent the negotiated meaning at a certain moment in time within a certain context (e.g. policy formation, science funding, and science practice). Secondly, they enact time, because they are negotiated products. To some extent, documents are also a reaction to (or interaction with) the previous and future understandings that are fixed in documents. It is therefore possible to study *shifting frames* over a longer time period (see also Chapter 3 and 4).48 Following Fischer (2003), policy frames and their underlying appreciative system can be uncovered through an analysis of the various participants’ stories about policy situations. This “telling” can occur at various moments, which can all be studied by the analysts, for example, in research proposals, during parliamentary debates or the annual meetings of science programmes, in research calls, laws and regulations, etc.49

Frames are not just “out there”, waiting to be discovered by the analysts. As researchers, we re-construct frames, not least of all by our own baseline of thought in understanding the situation. This is not a problem as such, as all forms of inquiry to some extent are shaped by our baseline beliefs, values, and assumptions, and frame analysis is no exception. It does, however, make clear that in order to reconstitute frames (rather than “discover” or “find”), we need to define the building blocks, or *frame characteristics*, that collectively shape the nature of a particular frame at a certain time in a specific context. Building on Scholten’s work on the framing of the problem of immigrant integration in policy and research (Scholten, 2007, 2011), I have identified four *building blocks* that resemble the different functions of frames and can be studied separately: *issue identification, categorisation, attribution of responsibility, and causal story*.

Firstly, frames name an issue in terms of specific concepts and metaphors. *Issue identification* refers to the contextualisation of animal experimentation, including animal-testing alternatives. It focuses on the discursive surroundings of a policy issue and on its relationship with other subjects and policy issues, such as safety, (animal) ethics, and health. As such, it also reveals its blind spots, or missing links. This contextualisation determines how the policy issue and the problem are defined. Secondly, *categorisation* reveals what is counted as relevant for the particular situation. Here, it refers to the inclusion and exclusion of certain (categories of) animals and methods in both the definition of research animals and animal-testing alternatives. As shown in Chapter 1, the boundaries of such categories play a major role in determining what is deemed relevant. Animals that are used for the breeding of research animals are not considered research animals themselves and are therefore excluded from the annual count. The exclusion of these animals also determines the scope of possible policy solutions. Thirdly, framing a policy issue in a certain way attributes *responsibility* on certain actors. For example, framing the issue in terms of conservatism and safety avoidance may place the responsibility on regulators, civilians or consumers. Contextualising animal research as a problem of shortage, by contrast, may place the responsibility on funding organisations, scientists or industries to develop animal-testing alternatives. Finally, policy frames are also about combining aspects, gluing the problems, categories and actors into an intelligible, and convincing causal story. By analysing the different building blocks, or *frame characteristics*, it is possible to reconstruct the dominant policy frames at a particular time and visualise the *frame shifts* that occur within a particular discourse (e.g. policy discourse).

Frames often build on the *potential* effects of policy measurements and technologies to construct a coherent narrative. Yet, there is still very little analysis about this aspect in the framing literature. The next section explores how the ‘sociology of expectations’ subfield of science and technology studies may provide a valuable contribution here.

2.5 Expectations as guiding structures of the present

Promises and expectations play a crucial role in the public legitimisation of policies, research programmes, and technology development regarding animal research. Carefully crafted
arguments and promises build on their potential effect (e.g. the increased relevance of test outcomes, the enhanced animal welfare, and the use of animal-testing alternatives) and aim to legitimise the investment at present.

The functionality and study of such promises and expectations is core to the sociology of expectations as part of science and technology studies (STS). In short, STS has become on “interdisciplinary field that is creating an integrative understandings of the origins, dynamics, and consequences of science and technology” (Hackett, Amsterdamskaya, Lynch, & Wajcman, 2008, p. 1). The rising number of scholars and literature supports the growing interest in this dynamics of expectations and promises, including xenotransplantation (Brown & Michael, 2003), stem cells (Brown & Kraft, 2006), genetic technologies (Nelis, 2000), and visionary images of nanotechnology (Lösch, 2006). The field is also expanding beyond the borders of medicine, as indicated by studies on metaphors of the Internet (Wyatt, 2000), Dutch biogas developments (Geels & Raven, 2006), hydrogen cars (Bakker, 2011), and sustainable agro-food systems (Zwartkruis, 2013). Overall, these studies share their focus on the role of expectations in structuring futures, and expectations are therefore understood as guidance structures at the present time.

2.5.1 How expectations ‘perform’ in the present

There are expectations in all social and political actions, making it impossible to act without making assumptions about the consequences of that act, either explicitly or tacitly (Berkhout, 2006). Often, the future is presented as something we all want or fear and is clearly demarcated from the past. The past is represented as problematic, as something lacking, or something wrong, and the future is depicted as the moment or place where solutions are achieved and wrongs turned into rights. To unite the variety of individuals in one common future, multi-interpretable concepts such as ‘health’ and ‘safety’ are frequently used.

In the edited volume Contested Futures (Brown, Rappert, & Webster, 2000), Mike Michael (2000) draws explicit attention to the performativity of the representation of the future: “we must ask how are such representations of the future so constructed that they ‘perform’ in such and such way” (p.22). In order to perform, expectations serve several roles (e.g. Borup, Brown, Konrad, & Van Lente, 2006). The first and perhaps most prominent function of expectations is their guiding character. Harro van Lente succinctly summarises it as follows: “once technological promises are shared they demand action, and appear as a necessity for technologists to develop, and for others to support them” (Van Lente, 2000, p. 58).

The second function of expectations, achieved through guidance, is to provide structure to those action demanding activities (Borup et al., 2006). The represented future creates an ostensibly clear track structuring the activities that should be undertaken in order to reach that future. The third function is for expectations to attract interest of others, including colleagues (at the micro-level), related disciplines or organisations (meso-level) or society as a whole (macro-level). Expectations for animal-testing alternatives may come into play on all these levels, including the expectations raised in research programmes in reference to societal concerns on animal numbers (meso-level). The fourth function of expectations is their role in legitimising actions, projects, policies and research programmes.

The legitimising role of expectations is also perceptible in present debates around the societal relevance of research (See Hessels, 2010 for an excellent introduction). In short, scientists are increasingly asked to legitimise their research in terms of the concrete contributions to society as a whole, instead of their academic or economic relevance. The pressure for societal relevance may place scientists in difficult positions in their “struggle for relevance” (Hence the title of Hessels, 2010), while also requiring new impact indicators to measure this type of relevance (e.g. Drooge & Spaapen, 2011a; Drooge et al., 2011b). For example, the toxicogenomics programme in the Netherlands has claimed to serve both societal concerns regarding animal welfare and safety, and the (academic) understanding of the underlying mechanisms of toxic response, such as liver and renal failure (see also Chapter 5).

2.5.2 The downside of overpromising

Promises and imaginative speculation are “indispensably central to the shaping of technology” (Brown, 2003), crucial to get emerging technologies on the agenda and stimulate action. And yet, at the same time, we want to stay away from overpromising, technological failure, and disillusionment.

Expectations may also shape the socio-political landscape surrounding these technologies. In Hope against Hype - Accountability in Biopasts, Presents and Futures, Nik Brown (2003) pays attention to the downsides of expectations. The performative actions of expectations take place in competitive environments where rival expectations vie for ascendancy. In

50 The editors of the Handbook of Science and Technology Studies (Hackett et al., 2008) describe the common ground of STS as a “multifaceted interest in the changing practices of knowledge production, concerns with connections among science, technologies, and various social institutions (the state, medicine, law, industry, and economics more generally), and the urgent attention to issues of public participation, power, democracy, governance and the evaluation scientific knowledge, technology, and expertise.” (p.3)

51 Note that the function of expectations here closely relates to the gluing characteristic of frames.

52 In earlier research, Van Lente (1993) found that expectations were less specific at the meso-level than at the micro-level. Rather than point to exact percentages, expectations were expressed as, for example, “great potential” (Van Lente, 1993). At the macro-level, expectations became even more broad and diffuse.

53 Here understood as the application of genomic technologies in the field of toxicology.
their struggle to be heard, expectations must compete with each other. It is likely that only the expectations of the most strident voices become the widely shared normative anticipation of the future (Brown, 2003), even though they do not necessarily express the general societal expectation regarding the development of technology, for example, a decrease in research animal numbers.

At a particular moment in time, when the energy that was invested in order to maintain expectations no longer outweighs the benefits, the process collapses abruptly and starts all over again (Brown, 2003; Van Lente, 1993). In many cases, the present fails to measure up to the former expectations (Brown, 2003; Brown & Michael, 2003), which can have severe consequences for the reputation and credibility of professions, institutions, and industry (Brown & Michael, 2003).

2.5.3 Levels of promises and expectations

Representations of the future can be analysed on different levels. For example, Harro van Lente (1993) proposes a “promise-requirement cycle” to differentiate between different levels of expectations: “[W]hat starts as an option can be labelled as a technological promise, and may subsequently function as a requirement to be achieved, and a necessity for technologists to work on, and for others to support” (Van Lente, 2000, p. 60). An important aspect of the cycle is the niches, or protected spaces, in which any attempt to fulfil the promises is protected, and they provide the opportunity to continue the development of a technology. Such niches may be effective at the level of individual organisations (micro-level) or techno-scientific fields (meso-level), or at the societal level of generic cultural orientations (macro-level). At the micro-level, expectations actually shape the local agenda, where promises’ “will be” changes into a “should be done” in practice (Van Lente, 1993). At all levels, actors will compete and be active in “expectation work”, which means “raising, maintaining and controlling expectations” (Bakker, 2011, p. 39). More specifically, the multi-level character of expectations can be linked to their fallibility. For example, specific expectations built on a local agenda have a higher rate of fallibility than generic expectations built on societal agendas (Bakker, 2011, p. 40).

The classifications of Van Lente and Bakker focus on the specific phases of technology development and are therefore less appropriate for the study of expectations at various levels of policy arguments. The next section integrates the previous ones and shows how Fischer’s framework of analysing policy arguments (e.g. Fischer, 2003; Fischer, 2007a) may help with an analysis of expectations and frames at different levels of policy reflection. In short, his framework offers a logic of four interrelated discourses, each with its own questions and level of reflection. For example, the technical-analytical discourse focuses on the measurement of the efficiency of programme outcomes, whereas the ideological discourse is concerned with the fundamental ideals organising the accepted social order (see also §2.6.1 and Chapters 4, 5, and 7).

2.6 Putting theory to use: complementing discourse theory with framing theory and STS

The focus in this study is on how meaning is conveyed (Yanow, 1996) within and between discourse coalitions (Hajer, 1995) and the way in which questions are “framed” (Schön & Rein, 1994) and argued (Fischer, 1995, 2003) in promises and expectations (Borup et al., 2006) along the science-policy nexus of animal research. Complementing discourse theories with framing theories and science and technology studies require some work with regard to adjustment and (re-)conceptualisation.

Firstly, one of the difficulties in combining discourse theories and framing theories is their conflicting ontological and epistemological assumptions. In general, “the work on frames can be positioned on a continuum between an individualist ontology, in which ordering and sense-making is understood in terms of individual capacities, and a relational pole that describes ordering and making sense in terms of the patterns of social interaction that characterise a particular situation” (Van den Brink, 2009, p. 40). By focusing on strategic elements of frames, I follow Benford and Snow’s definition of framing processes as “deliberative, utilitarian, and goal directed: frames are developed and deployed to achieve a specific purpose – to recruit new members, to mobilize adherents, to acquire resources, and so forth” (2000, 624). In contrast to the framing account of Schön and Rein, Benford and Snow posit a certain distance between belief and frame (Hajer & Laws, 2009).
While the assumptions have considerable force, they do not come with a single interpretation, and Sergio relational ontology and on a strong form of social constructionism” (Van den Brink, 2009, p. 43). Therefore, following Van den Brink (2009), I use the framing perspective to analyse the way in which meaning is (temporarily) fixed in structures, such as policies, laws, and regulations. I use the concept of “frame shift” to highlight the change from one (policy) frame to another (see also Chapter 3 and 4).

Secondly, the notion of framing closely resembles the work on expectations with respect to the individual and the relational. Frans Berkhout (2006) argues that “collective expectations” have a specific set of functions in aligning interest and framing problems, have a common structure and take characteristic forms. Those collective visions influence the frames and interests of agents, but only insofar as they align with existing predispositions in privately held “schemata’s” and are consistent with privately interpreted experience. Future visions contain implicit (or explicit) ideological assumptions (e.g. over the way problems are framed), and these will colour their attractiveness to different audiences (idem). As a consequence, what starts as a discursive reality may end up as a technical one (Van Lente & Rip, 1998)

Thirdly, STS theories are more naturally combined with discourse theories as they are both grounded on comparable ontological and epistemological assumptions. While the focus of STS is on science and technology, both theories assume the existence of multiple socially constructed realities that are historically and culturally specific. In short, social constructivism provides three important assumptions, or “reminders” (Sismondo, 2004, p. 57) for STS: Science and technology are inherently social, active and are not themselves natural. Insights from STS in general, and from the sociology of expectations in particular, are thus a welcome theoretical addition to the discourse-theoretical approach.

In summary, a discourse is conceptualised in this research as “a specific ensemble of ideas, concepts, and categorisations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities” (Hajer, 1995, p. 44). Each discourse holds different sets of narratives, or story lines, around which different stakeholders collide to form a discourse coalition. Frames are then sense-making devices through which meaning is (temporarily) fixed within a discourse (coalition), and which may change over time (i.e. “frame shifts”). Frames are part of a larger discourse, and frame shifts may occur inside the same discourse. Frames include both a problem definition and the presumed answer to this definition. Finally, discourse coalitions may create expectations functioning on different levels of (policy) reflection.

### 2.6.1 Levels of policy reflection

To position the frames and expectations, I adopted Fischer’s framework on analysing policy arguments (e.g. Fischer, 2003; Fischer, 2007a), as well as additional work by Grin and Van de Graaf (1996a, 1996b). The framework offers a logic of four interrelated discourses, each with its own questions and level of reflection. Each of the different levels raises a different set of questions assembled in different discourses. For example, the goal of programme verification is “to produce a quantitative assessment of the degree to which a certain programme fulfils a particular objective (...) and a determination (...) of how efficiently the objective is fulfilled” (Fischer, 2003, p. 133). The framework clearly demonstrates the interrelatedness of all levels and treats each of them as equally important.

Following Grin and Van de Graaf (1996a), I argue that the object of Fischer’s first-order discourse is analogous to the object of Schön and Rein’s first-order reflection in action (1993), and what Fischer calls second-order discourse corresponds to their second-order reflection. The adopted framework thus makes a distinction between a first-order policy reflection, which assumes animal-testing alternatives as a solution to the problems associated with animal research, and a second-order reflection that positions animal experimentation in the broader societal context driving these experiments. In the second order, neither the use of animal experiments nor the development of animal-testing alternatives is taken for granted. The framework through which this research should be analysed appears below.

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58 However, Henk Wagenaar (2011) points out that Rein and Schön, in their later work, seem to become more aware of the “relativist trap”, especially in relation to frame analyses (p.40). There is no frame-independent point from where it is possible to assess frames, a point that Rein and Schön seemed to imply in their earlier work regarding frames as constructs underpinning individuals’ stable and shared belief systems.

59 “In general, it can be argued that whereas framing theories draw on an individualist ontology and on a relative weak and moderate form of social constructionism, post-structuralist discourse theory draws on a relational ontology and on a strong form of social constructionism” (Van den Brink, 2009, p. 43).

60 While the assumptions have considerable force, they do not come with a single interpretation, and Sergio Sismondo speaks of many different “social constructions, each with their own implications”.

61 Note that Fischer’s understanding of a discourse expands on Hajer’s definition of discourse (see also §2.3 and §2.6), as Fischer’s (technical-analytical or contextual) interpretation may co-exist in one of Hajer’s (political, scientific) interpretations.
Chapter 2 - Theoretical framework and approach

Table 2-1: Analysing framework of frames, promises and expectations. It is based on Fischer’s framework on analysing policy arguments and additional work from Grin and Van de Graaf, 1996a.

<table>
<thead>
<tr>
<th>Argumentation concerns</th>
<th>Questions include</th>
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<tbody>
<tr>
<td><strong>First-order reflection</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Technical-analytical discourse:</strong> programme verification</td>
<td>Evaluations of solution, objectives, end and means</td>
</tr>
<tr>
<td><strong>Contextual discourse:</strong> situational validation</td>
<td>Problem definitions and the meaning of solution</td>
</tr>
<tr>
<td><strong>Second-order reflection</strong></td>
<td></td>
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<tr>
<td><strong>Systematic discourse:</strong> societal validation</td>
<td>Empirical and normative background theories</td>
</tr>
<tr>
<td><strong>Ideological discourse:</strong> social choice</td>
<td>Normative ontological preferences</td>
</tr>
</tbody>
</table>

2.6.2 Between promises, expectations, and societal values

This research studies how policy programmes on animal research have been implemented along the science-policy nexus (e.g. research programmes on animal-testing alternatives). It is therefore important that promises and expectations be conceptualised as distinct concepts that are nonetheless related. 62 I understand their relationship as mutually exclusive but co-created through interaction: They need each other in order to mean something, and simultaneously they influence each other’s meaning. For example, the promise of an animal-free future is inadequate if nobody expects this to be genuine. Or, without an expectation of fewer animals, the promise of animal-testing alternatives would not be necessary in the first place.

In this research, a promise is thus understood as the (deliberate) discursive production of a desired future by individuals, organisations, or a discourse coalition as a whole (i.e. the sender). An expectation is defined as a future image that is the result of the produced promise (i.e. the receiver). 63 More specifically, I refer to **technological promises** as a representation of the future within the technical-analytical discourse of policy reflection. “Technical” thus refers to the level of policy reflection and not to the scientific and technical population as such (e.g. scientists, technologists). In other words, policy makers, funding organisations, industries, and scientists may all make promises on the technical-analytical level.

This technical-analytical level of policy reflection is built on the premise that social problems, such as animal research, can have technical solutions that include scientific research and technical interventions. This firm belief in technology as having the capacity to provide the answers to social, political and economic problems has been identified as a “technological fix” (Rosner, 2004). In her research regarding the discursive strategies of stem cell scientists, Sarah Parry introduces the term “scientisation” as “the way in which scientists convert social and ethical issues into scientific or technical ones” (Parry, 2009, p. 95). Elaborating on Parry’s notion, I introduce the concept of **technification** as an ongoing process of the over-representation of technical/scientific futures as solutions to social problems, including a *technology-push* approach to innovation (e.g. Coombs, Savioiti, & Walsh, 1987). In short, the core of the technology-push argument is that advances in scientific understanding determine the rate and direction of innovation (Nemet, 2009). The concept of technification thus underscores the importance of the adoption and imposition of technical/scientific methods, answers and solution to social, political and economic problems. This overall technification-process may thus entail one or more technological promises and activities (see Chapter 4 and to some extent Chapter 3). 64

Finally, I refer to **societal or public values** as wide-ranging, abstract values that are shared within the dominant societal discourse in Dutch society. These include health, nature protection, animal welfare, children’s safety, and scientific progress, among many others. With reference to the ontological normative preferences of society as a whole, societal values occur on Fischer’s level of social choice (“ideological discourse”; see also previous section). Note that the concept itself does not discriminate between or prioritise different values. Indeed, societal values may be in conflict with each other and not always easily united in a single practice, promise or expectation.

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62 This is in contrast with the majority of the literature on the sociology of expectations (e.g. Brown, 2003; Brown & Michael, 2003; Van Lente, 1993), which regards the terms as interchangeable.

63 It is not my intention to frame the receiver as passive, because the creation of an expectation may also require work; furthermore, it also shapes the production of new promises.

64 The term technification in used in this research in a sociological manner, while acknowledging its proximity to a more philosophical understanding of technology (i.e. Philosophy of Technology, e.g. Böhme, 2012; Feenberg, 1991, with its own journals, including Philosophy & Technology) (see also Chapter 7, and especially §7.5).
The classification of both promises and expectations on their level of policy reflection makes it possible to describe and capture the present incongruence between societal expectations and technological promises with respect to animal-testing alternatives in the Netherlands.

### 2.7 The study of meaning along the science-policy nexus: case selection

Central to this study is an exploration of how policy regarding animal research conveys meaning along the science-policy nexus. How does the notion of an animal-testing alternative acquire meaning when it travels to different contexts, such as a science funding organisation or a research programme? I understand the science-policy nexus as a highly interactive and shaping nexus, where meaning is conveyed, constructed, and converted in alliance with - or between - numerous actors. These include the Dutch parliament and Cabinet, the European Parliament, individual scientists, programme leaders, science coordinators, several types of industries, policy makers, ministers, NGOs, health organisations, civil servants, science programmes, umbrella organisations (e.g. for the sciences in general, for medical institutions, for particular professionals), science funding organisations, the media, science departments, and the public at large.

Three case studies were selected from which the nexus was entered: Firstly, I selected the Dutch public policy on animal research to study the changing meaning of animal-testing alternatives in the policy discourse. By studying a wider time period (1970-2012), I was able to capture the changes in the contextualisation of both the problem and solution regarding animal research (i.e. “policy frames”). Such an evolving understanding is crucial to an understanding of the present incongruence. The table below summarises this study’s approach to analysing the science-policy nexus.

Secondly, I selected the ZonMw programmes on animal-testing alternatives. Inspired by the work of Wiebe Bijker, Roland Bal and Ruud Hendriks behind the influential Health Council (Bijker, Bal, & Hendriks, 2009), I attempted to gain access to the relevant ZonMw working committee to observe their work and discussions from within (i.e. “backstage”). Unfortunately, this request was turned down.

The relevance of the ZonMw programmes, however, remained beyond dispute. An analysis of programme reports, evaluations and programme texts made it possible to study the frontstage translation process of policy and societal values into the (daily) practice of an intermediary funding organisation.

Finally, I selected the Netherlands Toxicogenomics Centre (NTC), part of the larger Netherlands Genomics Initiative (NGI) consortium. The NTC programme developed around several emerging technologies (e.g. metabolomics, proteomics, genomics) and aimed to contribute to the development of animal-testing alternatives in the field of toxicology. The proximity of the NGI research-funding organisation, the national and network-like organisation of the programme, the exploring character regarding emerging technologies and the public legitimisation of its research in terms of animal-testing alternatives made the NTC a very interesting case to study. The individual empirical chapters (3-6) will each present its theoretical framework, data selection, and method of analysis in more detail.

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65 This study focuses on the science-policy nexus; yet I acknowledge that in the sense-making process of public policy programmes on animal research (i.e. implementation) many actors are involved (e.g. industry, NGOs, patient organisations). Their understanding will occasionally be included too, but remains largely outside the scope of this research.

66 I think that such a back stage picture would have resulted in relevant and interesting research data for this research and vivid discussions regarding the future of three-R programmes. I sure hope that this research can still have this function.

67 The distinction between frontstage and backstage processes refers to Goffman’s dramaturgical perspective (1959/1990), which was also use by Hilgartner (2000) in his analysis of the National Academy of Sciences (Bijker et al., 2009). Frontstage refers to the way in which research producers and users openly present their work and work processes, which suit a more rational way of policy making. Backstage refers to the practical, yet often invisible, coordination work that needs to be done to make research evidence fit the policy perceptions and requirements (Bekker, Van Egmond, Wehrens, Putters, & Bal, 2010).
<table>
<thead>
<tr>
<th>Chapter</th>
<th>3 part II</th>
<th>4 part II</th>
<th>5 part II</th>
<th>6 part III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short title</td>
<td>Shifting discourse on animal research</td>
<td>Technification of public values</td>
<td>Conflicting public values in research practice</td>
<td>Vulnerable new discourse coalition</td>
</tr>
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<td>Position on nexus</td>
<td>public policy</td>
<td>science-policy intermediaries</td>
<td>science programmes</td>
<td>all of the previous</td>
</tr>
<tr>
<td>Main focus</td>
<td>public policy on animal research, in the Netherlands</td>
<td>science funding organisations</td>
<td>research activities within larger research programme</td>
<td>discourse</td>
</tr>
<tr>
<td>Case</td>
<td>public policy on animal research, including animal testing-alternatives, since the introduction of the draft in 1970</td>
<td>ZonMw programmes on animal-testing alternatives between 2000 and 2010</td>
<td>the Netherlands Toxicogenomics Centre, part of the larger Netherlands Genomics Initiative</td>
<td>synthesis of the previous three chapters (hence part III)</td>
</tr>
<tr>
<td>Focus of interpretive analysis</td>
<td>policy frames</td>
<td>policy frames</td>
<td>policy frames</td>
<td>discourse</td>
</tr>
<tr>
<td>Empirical data</td>
<td>documents, including laws and regulations, drafts, and reports</td>
<td>in-depth interviews, documents, including reports, evaluations, and programme texts</td>
<td>in-depth interviews, documents, including reports, evaluations, programme texts, observations of meetings, and academic literature on toxicogenomics</td>
<td>all of the previous</td>
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**Part II**

**Empirical chapters**
3

Studying policy frames
The shifting interpretation of animal-testing alternatives in Dutch policy discourse
Animal experimentation has been a major topic of public debate for decades. The diversity of players, the numerous fields of application and (end) products, and different arguments yield a very complicated debate. Policy domains overlap with each other, and decisions from one may have direct consequences for the others. In this contested debate, the search for and stimulation of animal-testing alternatives have therefore welcomed with great enthusiasm by many, including pharmaceuticals companies, animal welfare NGOs, members of parliament and knowledge institutes.

However, the question remains how animal-testing alternatives have become an answer to the problems of animal research, and what the requirements were to reach this goal. For one, the interpretation of animal-testing alternatives has changed quite radically since the publication of the draft of the Animal Experimentation Act in 1970. In 1970, such alternatives where understood as methods to replace previous animal experiments:

(...)

animal experiments are a necessary evil. They cannot be missed as yet, but there are many reasons not to use animal experiments when these experiments can be replaced by different experiments that do not use animals.

(...)

Such replacement methods, including the use of tissue and cell cultures, already exist and continue to be developed. (my translation) (Tweede Kamer, 1970b, p. 8. Emphasis added)

Four decades later, the scope of animal-testing alternatives has expanded greatly. Methods aiming to understand the underlying mechanisms of disease or toxicological pathways and can replace, reduce, refine or avoid animal experiments are now also being regarded as animal-testing alternatives.

The search for animal-testing alternatives is the search for underlying mechanisms and an understanding of complex processes. The new direction in scientific research is not the observation of effects in research animals but an understanding of why these effects occur. (....) The replacement of animal experimentation is not about specific research that aims to replace one test with another. It is about deploying recent scientific insights in such a way that they will eventually lead to the abolition of, or at least significant reductions in, animal experiments (my translation) (VWS, 2011b, p. 5&6)

This chapter analyses how the interpretation of “alternatives” in the context of animal experimentation has evolved in public policy discourse in the Netherlands since the draft of
Chapter 3 - Studying policy frames

Thus refers to the textualisation of animal experimentation, a process that adapts from Scholten's work on the problem framing of immigrant integration in policy and research (Scholten, 2007, 2011). Firstly, frames label (or name) an issue in terms of specific concepts and metaphors. Issue naming refers to the textualisation of animal experimentation, including animal-testing alternatives, and it determines how the policy issue is defined. Secondly, categorisation refers to the classification of research animals and animal-testing alternatives. Thirdly, policy definitions attribute responsibility to particular actors to solve the policy problem. Finally, policy frames are also about combining aspects and gluing the problems, categories and actors into an intelligible and convincing causal story that helps to explain and understand a particular issue.

As policy frames are understood as temporarily fixed meanings, we may say that the frames interrupt, or punctuate, Dutch policy discourse. Therefore, I call the collective of these interruptions frame punctuations. A frame shift occurs when the inferred policy frame changes drastically over time. Such shifts can only be made visible if specific frames are studied in a particular order over time.

### 3.1 Policy frames, frame shifts and frame characteristics

This chapter draws primarily on framing literature to capture the understanding of animal-testing alternatives in Dutch policy discourse. Framing theory generally states that individuals make sense of their world through frameworks of interpretation, “which select raw experiential data, thereby making it meaningful” (Brandwein, 2006, p. 231). The interpretive strand of framing theory starts from the premise that interpretation and meaning are created through interaction (Dewulf et al., 2009; Wagenaar, 2011; Yanow, 2000a). Naturally, the creation of meaning in interaction is also influenced by the “baseline categories of thought” (Brandwein, 2006, p. 231), such as taken-for-granted values and beliefs.

It is hard to talk about the political discourse, considering the many interpretations that may co-exist alongside each other. As meaning is co-created in interaction with various actors, including ministers, members of Parliament, and societal organisations, the specific understanding of animal-testing alternatives is rather context- and time-specific. However, it is possible to study policy frames as temporarily fixed meanings in a particular discourse. Such policy frames may help to identify the problem policy or legitimise policy actions (Benford & Snow, 2000; Rein & Schön, 1996: See also Chapter 2).

In this chapter, a policy frame is understood as the inferred understanding of animal research between 1970 and 2012. The policy frames are constructed from frame characteristics that can be identified in public policy documents: issue naming, categorisation, attribution of responsibility, and causal story. These characteristics are adapted from Scholten’s work on the problem framing of immigrant integration in policy and research (Scholten, 2007, 2011). Firstly, frames label (or name) an issue in terms of specific concepts and metaphors. Issue naming refers to the textualisation of animal experimentation, including animal-testing alternatives, and it determines how the policy issue is defined. Secondly, categorisation refers to the classification of research animals and animal-testing alternatives. Thirdly, policy definitions attribute responsibility to particular actors to solve the policy problem. Finally, policy frames are also about combining aspects and gluing the problems, categories and actors into an intelligible and convincing causal story that helps to explain and understand a particular issue.

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### 3.1.1 Frame analysis

The frame analysis is based on Dutch policy documents between 1970, when the proposal of the Act was sent to Parliament, and 2012. The search engines of the Dutch government were used to retrieve the relevant documents from this period, including ministerial letters, memoranda, reports from the Standing Committee, and minutes from parliamentary debates. Based on several interviews with key players and publications on this topic (e.g. Dol et al., 1999; Smid, 1989; Smit, 1989; Swart, Groothuis, Horbach, & Van der Valk, 2006; Swart, Jonker, & Tramper, 2000; Swart, Wolters, & Van der Valk, 2004), I identified a

68 In the Netherlands, this Act is known as the Wet op de dierproeven (Wod).

69 Scholten studied the relation between the research-policy nexus and the framing of immigrant integration in policy and research. He distinguished several facets of how problem situations are understood in problem framing: the use of specific language to name the problem situation (terminology), the definition of groups or categories that are involved (social classification), a causal story to explain the problem (causal story), and a normative perspective for suggesting what could and should be done about it (normative perspective) (Scholten, 2007, p. 27).

70 The search engine Statengeneraalidigitaal.nl was used to search for Dutch policy documents in the period from 1970 until 1995, and Zoek.officielebekendmakingen.nl was used to search for documents from 1995 to 2012, the end of the designated time period. The Dutch political system is divided into the Cabinet (the prime minister, the other ministers, and the state secretaries), the House of Representatives (150 chosen representatives from the various political parties), and the Senate (75 indirectly chosen representatives). If the ministers agree on a draft bill, it is submitted for advice to the Council of State. The bill and accompanying advice are first examined by a Standing Committee of the House of Representatives, in which all political parties are represented.
number of crucial episodes to filter the massive amount of data: The introduction of the Experiments on Animal Act in 1977, the first policy on animal experimentation in 1984, the legal anchoring of the three Rs within the revision of the Act in 1996, and more recently the paradigm shift in scientific thinking in the Cabinet’s Vision of 2008 and Action Plan of 2011. Collectively, the documents dating to within one episode reveal the creation of meaning in interaction. The documents were scanned for topics related to animal-testing alternatives, including responsibility and the stimulation of research regarding alternatives. The content of the selected documents was manually labelled according to the following four framing characteristics: issue naming, categorisation, attribution of responsibility, and causal story. Together, these characteristics constitute several different policy frames.

### 3.2 Frame punctuations in Dutch policy discourse

This section describes the different policy frames as inferred from the frame characteristics issue naming, categorisation, attribution of responsibility and causal story between 1970 and 2012. To contextualise the first shift, the following subsection opens with a short description of the period prior to 1970.

#### 3.2.1 Absence of legislation

At the beginning of the 20th century, the maltreatment of animals developed as a separate policy issue in the Netherlands (e.g. Bordes, 2005; F. Brom, 1997; Brom, 1999). Yet, research animals were treated differently than other animals because of their perceived significance for the benefit of mankind. Their different status became even more apparent when research animals were excluded from the draft of the Animal Health and Welfare Act ['Wet op de dierenbescherming'] in 1955 (Bordes, 2010; Tweede Kamer, 1955).

Members of Parliament kept the topic of animal research on the political agenda after this AHWA draft, but protests from the scientific community prevented the Dutch government from taking action for a long time: the draft of a law regulating animal research was not sent to Parliament until 1970 (Brom, 1999; Tweede Kamer, 1970b; Van den Bos, 2006).

#### 3.2.2 “Regulating animal research”

The first frame shift occurred with the establishment of the Animal Experimentation Act in 1977.71 In 1970, a proposal for the Act was sent to the Standing Committee of the House of Representatives (Tweede Kamer, 1970a). Although it took around seven years before political consensus was reached, animal experiments eventually did become subject to special legislation in the Netherlands.74 This section pieces together the dominant policy frame as inferred from the 1970 bill (Tweede Kamer, 1970a), the explanatory memorandum (Tweede Kamer, 1970b), and the content of the published act in 1977 (Stb., 1977).

#### 3.2.2.1 Issue naming: rules and regulations

The Act was introduced to regulate animal experimentation and thus protect research animals.

\[
\text{\ldots it is desirable, keeping in mind the protection of the animal, to provide rules for performing experiments on animals. (my translation) (Stb., 1977)}
\]

The new rules had some serious implications in practice. For example, a licensing system was introduced, and only licensed institutions (e.g. universities, hospitals, and pharmaceutical industries) were allowed to perform animal experiments. The licensees carried out their experiments and had to report back regularly. Animals were to be obtained from authorised breeders, and the Act introduced a certification system for both caretakers and feeders of the animals. The existing national veterinary inspection had to enforce the law. It is clear that the practice of animal experimentation significantly changed thanks to the introduction of the Act.

The introduction of the Act also marked a general change in attitude towards animal experiments. The draft’s memorandum clearly stated that non-animal models were favoured over animal models.

\[
\text{\ldots animal experiments are a necessary evil. They cannot be missed as yet, but there are many reasons not to use animal experiments when these experiments can be replaced by different experiments that do not use animals. (my translation) (Tweede Kamer, 1970b, p. 8. Emphasis added)}
\]

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72 The recommendation of the 1970 State Committee to introduce a licensing system led to vigorous opposition from medical scientists, who viewed the recommendation as a criticism of their work. Moreover, they argued that such regulations would send research to other countries (Tweede Kamer, 1970b).

73 The Act (Wod) is a lex specialis with respect to the Animal Health and Welfare Act (AHWA), which is a lex generalis. If a situation is described in Wod, the AHWA does not come into force. If there is a discrepancy between the AHWA and Wod, Wod takes precedence. If the situation is not described in Wod, the AHWA comes into force (For a discussion on this topic: Tweede Kamer, 1995a, p.5031).

74 Most of the articles went into effect in September 1980 (Stb., 1980).
However, the draft itself stated nothing about such “non-animal experiments”. Under pressure from the Standing Committee and Parliament, Article 10 was amended (Tweede Kamer, 1975a, 1975b) as follows:

*It is forbidden to perform an animal experiment for a goal that, according to the view generally held by experts, can be achieved in a way other than by means of an animal experiment.* (my translation) (Stb., 1977. Emphasis added)

The promising words of the memorandum were thus put into action, and Dutch law prohibited an animal experiment from being performed if a non-animal method was available.

3.2.2.2 Categorisation: the non-animal method and ranking of animals

The 1977 Act only applied to living vertebrates and did not protect invertebrates used for research purposes (Article 1). In other words, invertebrates escaped the obligatory registration of research animals. Moreover, the Act ranked animals according to their status: So-called “lower” research animals were preferred over “higher” research animals.

(...) in designing the experiment, one should determine the species for which the experiment is the least harmful; therefore the “lowest” animal should be chosen. (my translation) (Tweede Kamer, 1970b, p. 9)

To reinforce this ranking, some higher-class research animals gained a special status. Research on horses, monkeys, dogs, and cats was prohibited, unless the same results could not be obtained with another, lower animal (Stb., 1977, Art. 10.2).

The memorandum thus created a strict outer boundary between a research animal and a non-research animal, and an inner boundary between horses, monkeys, dogs, cats, and other research animals. Thus, the context determined whether or not a specific animal species was favoured or not. For example, a lobster was preferred over a rat in scientific experiments, as the lobster was not regarded a (legal) research animal. However, the use of rats was preferred over dogs, as the latter were considered relatively “higher” animals.

The Act forbade the use of research animals when an “other-than-animal-method” was available (Stb., 1977). The memorandum elaborated on such “replacement methods” as “tissue and cell cultures” (Tweede Kamer, 1970b, p. 8). Such methods aimed to replace the common practice of animal research on whole and living research animals.

3.2.2.3 Attributing responsibility: the individual researcher

While the Act was introduced to protect the welfare of the research animals through the regulation of the practice of animal experimentation, it was never intended to prohibit animal research entirely. The law was based on the idea of proportionality, in that animal experimentation was accepted for the benefit of mankind. The consequent suffering of animals was considered “reasonable” in this respect (Brom, 1999).

*The point of departure of the designed licensing system is that animal experiments are legal if the experiments focus on specific benefits for humans and animals, namely health and food.* (my translation) (Tweede Kamer, 1970b, p. 7)

These benefits were specified in a few goals, such as “toxicological and pharmacological research” or “answers to scientific questions” (Article 1), which meant that, within the broadly defined legal restrictions, researchers were still able to perform their experiments. Moreover, the legal registration of experiments was never intended to place administrative burdens on researchers (Tweede Kamer, 1970b, p. 7). The members of the political party K.V.P. summarised the notion of instituting some form of animal protection - but not at any cost - as follows:

(...) the draft is considered a good compromise, in which the interests of the research animal are generally protected, and where the animal research is not unnecessarily hindered (...). (my translation) (Tweede Kamer, 1970c, p. 1)

Just as they were before the introduction of the Act, the individual researchers remained responsible for judging the necessity of the experiment. As long as the animal experiments were defined within the legal restrictions, their performance was authorised.

The researchers were also responsible for the decision whether or not to use “other” or “replacement non-animal” models for their experiments. In the memorandum, the Dutch government had already highlighted the importance of these replacement models, but it was only after Parliamentary pressure that this was also legally paraphrased in the accepted act of 1977. However, the Act’s reference to the “view generally held by experts” did not contain a legal check system with such experts. Pressure from within the scientific community would have to prevent misinformed decisions by individual researchers. Ultimately, however, the decision to perform animal experiments or to use “replacements” or “other-than-animal methods” was left up to the researcher (Tweede Kamer, 1970b).
Likewise, the researcher was once again responsible for the actual development replacement models, too. Around the mid-1970s, however, this mindset changed slightly, and the Dutch government financed small-scale projects that could encourage the use of replacement methods, such as an information centre and research on the use of cell cultures (Tweede Kamer, 1975a, p. 10). Nevertheless, the researchers were more or less the only ones responsible for the development and use of replacement models.

3.2.2.4 Causal story: regulation and unstructured development of replacement models

The main function of the Act was to regulate and control animal experimentation after decades of non-regulation. It had to prevent a repetition of past excesses in the laboratories and improve the average research animal's welfare in the Netherlands. Public concerns regarding the use of horses, monkeys, cats, and dogs in experiments were reflected in the Act’s preferences for the use of the “lowest” possible animal.

Within this frame, the use of replacement models was thought to increase the net animal welfare in experimental practices, as these animals were to be replaced by non-animal models. Researchers themselves were believed to be capable of deciding whether or not to perform an animal experiment and whether relevant replacement models were available. The development of such models was thus left to the researchers, without further interference or aid from the government.

3.2.3 "Stimulating the three Rs"

The second shift occurred with the explicit formulation of a policy on animal experimentation. During the parliamentary debate on the budget of the Ministry of Welfare, Public Health and Culture in 1984, several members of Parliament raised questions about the Dutch policy on animal experimentation. In reaction, State Secretary of the Ministry of Welfare, Public Health and Culture Van der Reijden promised a policy document on animal experimentation. In June 1984, the first policy document on animal experimentation was produced in the Netherlands (Tweede Kamer, 1984). This subsection is based on this first policy document, as well as the subsequent Parliamentary debate in June 1985 (Tweede Kamer, 1985a), and an additional document from September 1985 (Van der Reijden, 1985).

3.2.3.1 Issue naming: trade-off between animal welfare and human health

Within this policy frame, animal experimentation was increasingly presented as a conflict between public health and animal welfare.

> Per definition, animal experiments imply a reduction in the animal's welfare. Therefore, everything needs to be done to protect its welfare as much as possible. (my translation) (Tweede Kamer, 1984, p. 9)

Public health and animal welfare were thus inconsistent with each other. Animal research was viewed as necessary to improve the public health, but since the particular experiments harmed the welfare of animals, public health and animal welfare could not be reconciled. In other words, animal experimentation became presented as a trade-off between improving public health and protecting animal welfare.

With the focus on this trade-off, the notion of “reasonableness” gained traction and frequently appeared in policy documents (e.g., Van der Reijden, 1985). The contexts in which animal experimentation was performed became more relevant, as did the financial aspect of the research. This notion of “reasonableness” was also applied in the context of alternatives to the practice of animal experiments. During the parliamentary discussions, important questions were raised about such alternatives. The written response of the Secretary of State Joop van der Reijden was firm but ambiguous:

> When a high degree of accuracy is required, scientific reliability should be leading the way. Saving some animals at a high cost may also be objectionable. (...) We should not – to borrow another term from the Act – lose sight of reasonableness. Hence, it is not possible to lay down any general rules on this issue, but decisions have to be taken in context. (my translation) (Van der Reijden, 1985, p. 6)

3.2.3.2 Categorisation: the three Rs

With regard to alternatives to animal experiments, the concept of “the three Rs” gained political momentum during this period.76

> In fact, this term encloses more than just the replacement of animal experiments. Methods that lead to the reduction of animals per experiment,
or the refinement of research such that the experiments can be performed in
better animal circumstances, should also be included. In this respect, reference
is often made to the three Rs (Reduction, Replacement and Refinement) of
Russell and Burch, the authors who first defined the term alternatives. (my

The definition of “alternatives” was thus broadened with the inclusion of the three-R
concept. Besides the “cell and tissue cultures” (Tweede Kamer, 1984, p. 6: i.e. “replacement-
alternatives”), new methods and situations, such as reducing the number of animals per
experiments by “improving the experimental design”, “performing pre-studies with slaughter
material” (Tweede Kamer, 1984, p. 7: i.e. “reduction alternatives”), and “improving housing
conditions” (Tweede Kamer, 1984, p. 15: “refinement alternatives”) fell under the umbrella
of the ‘new alternatives’ (i.e. “second-generation alternatives”).

The introduction of the three Rs did not make it easier to qualify alternatives. Often,
the quality of alternatives was measured according to the absolute decrease in research
animals on an annual basis (E.g. Tweede Kamer, 1984, p. 6; Van der Reijden, 1985, p. 14).
At other times, however, the relative decrease in animals per experiment was taken as a
criterion (E.g. Tweede Kamer, 1984, p. 7 (“reduction”). In the latter case, the total number
of research animals was not particularly important. Such an understanding could lead to
different expectations about the results or the use of such animal-testing alternatives.77

3.2.3.3 Attributing responsibility: co-responsibility of researchers and government
The Dutch government obviously struggled with the balance of safeguarding animal
welfare and protecting public health at the same time. The problem of reducing animal
research was illustrated as follows and supported by a report on animal experimentation
for cosmetic products:78

(...) there is no room for animal experiments to test the cosmetic action of
certain substances and products. On the other hand, the commission points
out that governmental policy (...) should be aimed at the protection of its
consumers, and therefore it is not proper to expose the user of cosmetic
products to unknown side effects. (...) With this example, it is clear that

77 The use of fewer animals per experiment does not necessarily lead to an overall reduction in research
animals, as the number of experiment may have increased. For that reason, the qualifying adverb “potentially”
is used in this statement. See also Chapter 5 for a shifting understanding in this respect.
78 This report was written by the Commissie van advies voor de dierproeven [‘Committee for Advice on Animal
Experimentation’] as based on Article 18 of the Act. The committee was mandated to give advice - both upon
request and its own initiative - to the minister.

the last word on the acceptability of animal experimentation has not been
uttered. (my translation) (Tweede Kamer, 1984, p. 9)

It thus became more important to assess the experiment’s relevance. The Dutch government
acknowledged the need for general “ethical criteria” and the possible desirability of an
“animal ethics committee” (Tweede Kamer, 1984, p. 11).79

Although these discussions indicated a shift towards more delegated responsibility, the
researcher remained responsible for the assessment of relevance within this frame. The
government saw the Act, with its licensing system, housing requirements and caretaking,
as one of the instruments to achieve animal protection. The researchers themselves were
expected to be “responsible” scientists when making the decision whether or not to use
research animals.

3.2.3.4 Causal story: Stimulating animal-testing alternatives
In the light of the struggle between animal welfare and benefits for mankind, it became
important to search for alternative ways to gain scientific knowledge. Animal-testing
alternatives were presented as a way to resolve this struggle. The

The most effective way to reduce the number of animal experiments is the
development and application of alternatives. (my translation) (Tweede
Kamer, 1984, p. 12)

However, it also became clear that alternatives had their limitations, both functionally and
reasonably, with regard to financial investment. Animal-testing alternatives would have
a hard time imitating the “complexity of an intact functional body”, and the government
warned of “exaggerated promises” (Tweede Kamer, 1984, p. 15).

Nevertheless, the firm belief in animal-testing alternatives underscored the importance of
the development of such methods.

The application of newly developed alternatives saves thousands of research
animals per year. The results thus far were mainly side effects – albeit welcome
side effects - of other research. To achieve more, it is necessary to actively stimulate
the research on alternatives (and) aim to reduce the use of research animals by
30% in the coming five years. (my translation) (Van der Reijden, 1985, p. 14)

79 At the stage when these documents appeared, the issue of “animal ethics committees” was under advisory
at the Commission for Advice on Animal Experimentation.
To this end, the Secretary of State of Welfare, Public health and Culture Joop van der Reijden allocated J70 000 (= €30 000) for an “inventorying literature study” (p.15) on existing alternatives within vaccine research, which were meant to replace and reduce animal research in the field of vaccine production. Other ministries invested in animal-testing alternatives as well: For example, the Ministry of Education and Science earmarked f450 000 (= €200 000) for the development of audio-visual equipment to be used for educational purposes; the Ministry of Public Housing, Spatial Planning and the Environment allocated a total of f350 000 (= €160 000) for the development of in vitro teratogenic tests80; and the Ministry of Transport, Public Works and Water Management invested approximately f100 000 (= €45 000) to reduce the number of fish used to monitor the contamination of surface water (Van der Reijden, 1985, p. 4-6). The government also welcomed research focused on the ethical and societal backgrounds of animal experimentation (Tweede Kamer, 1984, p. 15).

Based on the premise that an investment in animal-testing alternatives would causally lead to a decrease in research animal numbers, the policy rationale followed that of a linear “technology-push” (e.g. Coombs et al., 1987) model to innovation: A linear model according to which innovation is a sequence of stages starting from scientific research (Saad, 2000: See also Chapter 4, especially § 4.4.2).

3.2.4 “Growing public discontent”

The third shift occurred around the revision of the 1977 Act. In January 1992, State Secretary of Welfare, Public Health and Culture Hans Simons proposed a change to the Act (Tweede Kamer, 1992a). On-going discussions over the ethical judgment of animal experiments were said to be the main reason for the proposed change (Tweede Kamer, 1992b). In addition, policy developments in Europe also required an updated version of the national act. In 1985, the Council of Europe had finished its draft of the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes (Council of Europe, 1985). Meanwhile, the European Economic Community (EEC) had also proposed uniform European legislation. In November 1986, the EEC adopted Directive 86/609/EEC to protect animals in experiments (Council of Europe, 1986). From that moment on, member states of the EEC had three years to incorporate the directives into their national legislation.81 Finally, the origins of research animals were subject to on-going debates, and the Dutch government wanted to regulate this part as well.

This section is based on the first proposal of the new act (Tweede Kamer, 1992a), the memorandum from 1992 (Tweede Kamer, 1992b), the final report of the Standing Committee of 1993 (Tweede Kamer, 1993) and the response of the minister of Welfare, Public Health and Culture (d’Ancona, 1993), the updated proposal of 1994 (Tweede Kamer, 1994), and the transcript of the Parliamentary debate in 1995 (Tweede Kamer, 1995a).

3.2.4.1 Issue naming: Increased public awareness and policy change

The trade-off between public health and animal welfare was challenged by the introduction of the concept of “intrinsic value” in the revised draft of the Act. Already in 1981, the Dutch government acknowledged that animals had an intrinsic value and that this value was an explicit point of departure in animal protection legislation (Tweede Kamer, 1981). The Dutch government, however, did not find it necessary to include the term in the Act itself.

*The law itself is an expression of the recognition of the intrinsic value of animals. (…) Inclusion of the term intrinsic value (…) results to my opinion in a tautology that does not add something essential to the law. (my translation)*

d’Ancona, 1993

Neither the Standing Committee nor the members of Parliament agreed with this line of reasoning, and in the end, Section 1a of the Act read as follows:

Any right accorded by or pursuant to this Act shall be exercised in recognition of the intrinsic value of the animal life. (my translation) (Stb., 1996, art. 1a)

The explicit recognition of the intrinsic value of (research) animals marked an important discursive departure from the original trade-off. Animal welfare shifted from an understanding of pain and discomfort to a larger notion of animal integrity. Human benefits were no longer sufficient to outweigh the animal’s suffering in the research practice.82

80 Teratology is the study of abnormalities of physiological development and studies various stages of life, including birth and puberty. In vitro literally means, in glass, and is used to indicate experiments that are performed outside the human/animal body in a test tube or other glass material.

81 The State Secretary of Welfare, Public Health and Culture at that time, Hans Simons, explained that the delay of incorporating the directive into the Wod took more time than had been anticipated, because of the late advice of the Advisory Committee and possible interference from other regulations.

82 Many scholars have studied the concept and (policy) implications of the intrinsic value, especially in relation to the genetic modification of (research) animals. Refer to the work of Frans Brom on animal welfare and intrinsic value in relation to public policy (e.g. 1999; 1999; 1997), as well as Ellen ter Gast’s (2007) work on a philosophical inquiry concerning genetically engineered animals, and Rob de Vries’ (2008) work on the concept of intrinsic value and animal integrity in relation to our duties to laboratory animals. Additionally, the genetic modification of animals was (and is) subject to specific regulations, including the 1997 resolution on biotechnology on animals (‘Besluit biotechnologie bij Dieren’). It goes beyond the scope of this chapter to describe the development on this matter, as the development and debate exceed the research practice alone. Nevertheless, it is important to ‘read’ the frame shifts as part of a larger discourse on animal welfare, animal integrity, and intrinsic value in the Netherlands. In line with the interactional interpretation of frames, this development once more highlights that frames do not rise from a vacuum but are indeed relational.
Furthermore, Dutch society increasingly challenged the original trade-off by condemning some animal experiments, including the LC/LD50 tests\(^8\), and animal testing for cosmetic products. While not part of the 1992 draft, both types of testing were eventually banned in the Netherlands from 1996 onwards. LC/LD50 tests were forbidden, unless no alternative was available (Stb., 1996, art. 10.2 and 10.3); experiments for cosmetic (end) products were also prohibited (Stb., 1996, art. 10.2 and 10.3). We see that, while the original trade-off was largely maintained, little cracks started to appear as a result of public pressure.

3.2.4.2 Categorisation: alternative methods as one-on-one surrogates

The changing legal definition of research animals and animal experimentation implied that some former alternatives might not be excluded in the future (i.e. living invertebrates). Under pressure from the public, there was a shift in the definitions of both an “animal experiment” and a “research animal”. For example, actions leading to the birth of an animal that could suffer were included in the definition of an animal experiment in the revised act (Stb., 1996, Article 1, Section 1e; Tweede Kamer, 1992b, p. 7 & 10). Moreover, the special status of horses, monkeys, cats, and dogs was regarded superfluous, since expansion of Article 10 already covered this topic (Tweede Kamer, 1992b, p. 12). Finally, the possibility that (some) invertebrates could suffer was a topic of parliamentary debate and notified in the revised act:

(...) vertebrate, or a living invertebrate of a species indicated by a council order. (my translation) (Stb., 1996, art. 1.1)

By contrast, the legal anchoring of the three Rs made room for new types of alternatives:

It is forbidden to perform an animal experiment, which can (...) also be achieved with something other than an animal experiment, or an animal experiment that uses fewer animals or with less discomfort than the original experiment. (my translation) (Stb., 1996, article 10.1. Emphasis added)

Furthermore, the criteria for the “good alternative” were specified in that an alternative should completely replace the old model and that it should generate the exact same results as the original animal model (Stb., 1996).

First of all, I note that only a method that produces the exact same results as the method it replaces can be called an alternative method. (my translation) (Eerste Kamer, 1995)

Alternative methods within this policy frame were thus regarded as a one-on-one replacement of the animal model (i.e. “first-generation animal-testing alternatives”; See also Chapter 4, especially §4.3). This understanding of animal-testing alternatives was reflected in the financed projects by the Platform Alternatives for Animal Testing: pig ears from slaughter houses to measure skin penetration, the growing of human tumours in bovine eyes to replace the naked mouse model, and the use of eyes from slaughter houses to replace the eye irritation test with rabbits (Simons, 1993, p. 27).

3.2.4.3 Attributing responsibility: animal ethics committees weigh the relevance

Along with the shift from the voluntarily to the legally mandated establishment of animal ethics committees (hereafter: AECs), the responsibility shifted from the individual to an institution; responsibility thus became delegated. Many institutions had already installed these committees voluntarily, following the Advisory Commission for Animal Experimentation in 1985. The original idea behind the AECs was self-regulation; the moral values had to be internalised by the researcher performing the experiments (Brom, 1999; Tweede Kamer, 1992b). However, this form of self-regulation raised questions over the years.

In the past few years, the opinion has emerged that it is not sufficient to have the assessment made solely by the one performing the animal experiment. (my translation) (Tweede Kamer, 1992b, p. 3)

In 1996, Article 10 was expanded to state that it is forbidden to perform an animal experiment without consulting with an AEC (Stb., 1996, art. 18a). While the change in the text was small, the impact on the responsibility of the researcher was significant. As the judgment of an AEC (or Advisory Commission for Animal Experimentation, the CCD) was decisive, the final responsibility shifted away from the individual researcher towards the committees.

In the context of using animal-testing alternatives, however, the researchers remained primarily responsible.

(...) illusion that some people can supervise the entire area of alternatives (...). The Article 14 official, considering his or her task, is expected to have sufficient knowledge of alternatives for the experiments that are performed at the relevant institution. (...) – with regard to the possible application of alternatives – the researchers in particular are informed of the possibilities. (my translation) (d’Ancona, 1993, p. 13).

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83 The abbreviation LD50/LC50 stands for the Lethal Dose or Lethal Concentration of a compound at which 50% of the research animals die.
Thus while the responsibility shifted towards the AECs, the researchers were still seen as a crucial link to the knowledge on alternatives that were available for their tests. With the growing importance of expertise of alternatives, animal experimentation slowly shifted from an ethical to a cognitive problem.

3.2.4.4 Causal story: increased technology push of alternatives
The upcoming technology-push approach from the previous frame was strengthened further. The stimulation of animal-testing alternatives was still seen as an important way to reduce the number of research animals, and as such, the research animal numbers increasingly became positioned as a strong and reliable policy indicator (See also §1.2 on categorising and counting research animals).

An important aspect of the existing policy is the stimulation of so-called alternatives for animal experiments. (...) If the question is raised whether this policy was successful, reference can be made to the course of the annual animal usage. Since the beginning of registration in 1978, this number has decreased by 32.4%. (...) The conclusion, therefore, is that the current policy should be continued in a forceful manner. (my translation) (Tweede Kamer, 1992b, p. 2)

Despite the overall consensus on the importance of stimulating animal-testing alternatives, the question remained how much money was to be invested. Following the proposal of the Dutch NGO Proefdiervrij, some MPs asked the minister of Health, Welfare and Sports Erica Terpstra to allocate 2% of the total budget to animal research on alternatives.84

(...) the current imbalance between the budgets for alternatives and for animal experiments bears no relation to the importance we attached to them. (my translation) (Green Party MP Marijke Vos, Tweede Kamer, 1995a, p. 5035)

Let’s be realistic. The jump from the existing budget and the 2% is big. I don’t want to create illusions. I don’t think you should directly count on the 2%. (my translation) (Minister of Health, Welfare and Sports Erica Terpstra, Tweede Kamer, 1995a, p. 5035)

While two amendments on increasing the budget were rejected by Parliament, a more general one requesting the government to set aside “substantial financial means” to stimulate the development of alternatives managed to pass (Tweede Kamer, 1995b). It seems the conflicting underlying values needed to be resolved in order to proceed along the promising route of stimulating animal-testing alternatives in the Netherlands; the policy issue became de-sensitised.

3.2.5 “Integrating science, innovation, and animal welfare”
Twenty-five years after its passage, the Act was evaluated in a process that led to the “Necessary Evil” report (Freriks et al., 2005). The authors were fairly critical about certain aspects of the Act, especially the absence of the “animal’s voice” and the lack of a framework for ethical judgment for the AECs. The report led to much commotion in the field of animal experimentation. In reaction, the Dutch government started a bottom-up process by which Dutch organisations were asked for their responses to the evaluation (Tweede Kamer, 2007). The debate followed the three central themes of the report: openness and publicity, ethical test, and inspection. Meanwhile, animal welfare increasingly gathered political momentum. In 2006, the Party for the Animals (PvdD) won two seats in Dutch Parliament.85

In October 2007, both the minister of Health, Welfare and Sport Ab Klink and the minister of Agriculture, Nature and Food Quality Gerda Verburg wrote a letter to Parliament that included the findings of the bottom-up process and the ministers’ respective policy intentions.86 In short, AECs had to make their annual reports publicly available, and the licensees had to be more open about the animal experiments they perform. The obligatory ethical tests for animal experimentation and biotechnological treatments with animals were also merged into one test. Furthermore, the national umbrella organisation NVDEC was asked to harmonise and structure the expertise of AEC members, the inspection instruments were be strengthened, and the legal status of Art. 14 officials would be evaluated (Tweede Kamer, 2007). Finally, an “interdepartmental vision on animal-testing alternatives” (p.5) was promised. In June 2008, this document was sent to Parliament (Klink, 2008). Another document, containing the policy intentions, followed in 2011 (VWS, 2011a, 2011b).

This subsection is based on the 2008 document “Cabinet’s vision on animal-testing alternatives” (Klink, 2008), the 2011 “Action Plan Animal Experimentation and alternatives, 2011-2021” (VWS, 2011b), and its accompanying Ministerial Letter (VWS, 2011a).

84 According to Green Party MP Marijke Vos, 2% was the equivalent of approximately f10 million (~ €4.5 million).
85 The Party for the Animals was established in October 2002. The elections in 2003 did not result in enough votes for a parliamentary seat. However, in the 2006 elections, the PvdD received 1.8% of all votes, leading to two of the 150 seats in Parliament. Sources: www.parlement.com: Tweede Kamer – verkiezingen Tweede Kamer 1918-2010 and www.partijvoordedieren.nl: de partij – organisatie. Both websites retrieved on 5 August 2012.
86 The minister of Public Health, Welfare and Sport [‘Volksgezondheid, Welzijn en Sport’] used to be the spokesmen on the policy dossier animal experimentation, including animal-testing alternatives. The minister of Agriculture, Nature and Food Quality [‘Landbouw, Natuur en Voedselkwaliteit, LNV’] was spokesmen for the Animal Health and Welfare Act and biotechnology on animals. Since 2013, all aspects are the responsibility of the State Secretary for Economic Affairs.
3.2.5.1 Issue naming: from problem to solutions

This frame marked the start of changing drivers behind animal-testing alternatives. Scientific and economic rationales started to gain ground at the expense of ethical and animal welfare concerns. As formulated in the Cabinet’s vision, balancing animal experimentation was also about:

(...) the desire of continuing innovative scientific developments, strengthening of the economic position and preservation of consumer safety. (my translation) (Klink, 2008, p. 6)

The relation between animal experimentations, safety and risk avoidance behavior also became more evident in this frame. At first, this relation was presented as problematic: The risk-averse behavior of society as a whole, and especially of regulators, was said to align difficulty with innovation and improvement.

The conservative method (with animal research) still seems to function well as basis for conservative decisions, especially in situations where safety and risk avoidance show a rising trend (like permitting the addition of chemical substances to our food and medicine). However, in a society striving for progress and renewal, there is little sympathy for too much risk avoidance: those who never cross the street hardly risk the chance of being hit by a car, but they will never reach the other side of the street, either. (my translation) (VWS, 2011b,p.5)

It seemed that animal experimentation’s trade-off between animal welfare and public health was replaced by one between innovation and risk avoidance: one at the expense of the other. Interestingly, the three Rs became the solution to this ostensibly new trade-off.

Replacing animal research does not mean performing research that will replace one test by another. It is about using emerging technologies in such a way that it eventually leads to the abolishment of, or at least a sharp decrease in, animal experiments. (my translation) (VWS, 2011b, p. 6)

The three Rs lead to more insights and a better predictive value for humans, are ethically acceptable and eventually cost-saving, as well. (my translation) (VWS, 2011b, p. 6)

Animal-testing alternatives - at that time generally associated with the three Rs in political discourse - thus became bigger than a solution to the animal welfare problems of animal research alone. In this policy frame, the three Rs were positioned as a means to overcome the social (or ethical), scientific and economic problems associated with animal research: in other words, a win-win situation. Supported by the term “paradigm shift” (VWS, 2011b, p. 6), a new way of thinking was introduced: To search and use the method that would yield the best possible results for mankind.87 The three-R alternatives were presented as crucial links in the transition towards this new way of thinking in science. Overall, this policy frame marked a shift towards solutions through innovation rather than problems through animal experimentation.

3.2.5.2 Categorisation: no new pieces, but a new puzzle

This new issue naming also had its repercussion on the category of animal-testing alternatives itself. As alternatives were no longer regarded as replacing the former test, the criteria moved towards a chain approach.

(...) alternatives will not replace animal experiments one by one: the vision for the future is not that new pieces from the old puzzle replace the old pieces, but that there be a completely new puzzle, one that is possibly also three-dimensional. (my translation) (VWS, 2011b, p.6)

By means of this shift, the boundaries of what was regarded as an alternative also changed. Methods that lowered animal experimentation’s dependence during the early phase of development also became animal-testing alternatives: kinetics, gene technology, genomics, and systematic reviews88 (VWS, 2011b, p. 7, 9, 14 &25 respectively). Interestingly, much of these “new alternatives” focused on the possibilities to detect certain toxicological effects prior to animal experiments (“screening”; see also Chapter 5 on toxicogenomics).

In terms of categorisation, alternatives were no longer viewed as one-to-one surrogates for the former animal model but as part of a new trajectory. Methods that could avoid animal research, as well as methods that focused on screening, also became part of the category. A significant number of the animal-testing alternatives thus focused on the understanding

87 While the term “paradigm shift” is obviously borrowed from Thomas Kuhn’s seminal book The Structure of Scientific Revolutions, the use of the term here has a more directly link to the National Academy’s report from 2007, “Toxicity Testing in the 21st century: A Vision and a Strategy”.
88 Systematic reviews (SRs) were already offered as an example in the 2008 Cabinet’s vision on animal-testing alternatives. This method is somewhat different than the other examples, as SRs are part of the phase prior to the decision of performing animal research at all. In short, SRs could help to find the best species for a particular research question, or it could find that previous animal experiments have already yielded the required data and that additional animal research would be useless. For more on this point, see the important work of Ritskes-Hoitinga and colleagues (e.g. 2014).
to underlying mechanisms of disease, toxic (side) effects and overall response (i.e. “third-generations alternatives”)

3.2.5.3 Attributing responsibility: chain responsibility

The Dutch Cabinet was convinced that “the development of three-R alternatives provides more possibilities to meet the changing social, scientific and economic developments in society” (my translation) (VWS, 2008, p. 4). The 2011 action plan listed the (planned) activities regarding animal-testing alternatives by numerous organisations, both public and private. The (potential) governmental cooperation with industries became more evident in this frame as well.

Wherever possible, and when there are overlapping stakes, cooperation with industry will be sought to reach a bundling of the powers. (my translation) (VWS, 2011b, p. 10)

The cooperation with industries fit well within the larger plan to incorporate the entire chain into the development of animal-testing alternatives.

To create success, it is of crucial importance to involve the entire chain (...) in the development. When this does not happen, the chances are big that an obstacle will appear inside the chain. (my translation) (VWS, 2011b, p. 4)

In this policy frame, the responsibility regarding animal-testing alternatives shifted from the government’s stimulation of development and the AECs’ evaluation of the availability of alternatives within a specific domain, to include the entire chain: from producer to user. The development, use, and success of animal-testing alternatives thus became a shared responsibility among all stakeholders.

3.2.5.4 Causal story: increased coordination of the three Rs

Within this policy frame, the issue is defined differently than in earlier frames. The three Rs remained the main solution to the problems associated with animal research, but it was thought that more coordination was needed to overcome the “fragmented character” of what at the time was the leading policy.

The current policy on the three-R alternatives comes up short because of its fragmented character and minimal effective support. There is insufficient transfer of knowledge and information between the different research parts and research institutions. Therefore, knowledge often remains in one spot, or research is duplicated (my translation) (Tweede Kamer, 2008a #393, p. 10)

A change in structure was announced to create more coordination on the three-R initiatives in the Netherlands. These changes included the establishment of the Netherlands Knowledge Centre on Alternatives to Animal Use [‘Nationale Kenniscentrum Alternatieven voor dierproeven (NKCA)’], the creation of an Interdepartmental Steering and Working Group on animal-testing alternatives, and a Societal Sounding Board [‘Maatschappelijke klankbordgroep’], which supported the expertise from a societal and business perspective (Klink, 2008, p. 12). The 2011 Action Plan contained an overview of the numerous public and private initiatives that “could help to reduce the number of animal experiments” (p. 10).

In addition to more coordination on overall activities, the Dutch Cabinet also wanted to increase the use of the three-R alternatives. Therefore, the minister of Health, Welfare and Sports allocated additional funding for “validation, acceptance and implementation” (VWS, 2011a). This step reflected the increased orientation towards “chains” (VWS, 2011b, p. 4. See also Chapter 4).

3.3 Shifting interpretations

The previous section described four policy frames that were found in Dutch policy discourse between 1970 and 2011. This section uses the previous one to identify crucial shifts in the positioning and interpretation of animal-testing alternatives, thus providing an answer to the question how animal-testing alternatives became the leading solution to the problems associated with animal research.

It shows that what counts as a research animal has changed over the years and affected the category of animal-testing alternatives. Whereas the term “alternatives” was originally used for testing methods that did not use animals, it now also covers technologies and methods that do use animals, as well as methods that aim to screen new substances for their therapeutic or toxic characteristics. With this expanding meaning, the positioning of alternatives became broader as well. Animal-testing alternatives moved from a single policy issue of animal welfare to a bridge between various policy issues, including public health, animal welfare, innovation, and economic progress (win-win situation). Moreover,

89 Animal-testing alternatives are thought to follow a fixed pattern of development (proof of principle) ➔ (pre-)validation (reliability and relevance is established) ➔ (regulatory) acceptance (formal acceptance by regulatory authorities). Often, a final stage of implementation is added to emphasise the use of the alternative. See also https://eur-ecvam.jrc.ec.europa.eu/validation-regulatory-acceptance (accessed on 28 November 2014), and the work on barriers to regulatory acceptance, for example (Ahr et al., 2008; Schiffelers et al., 2007; Schiffelers, 2016 (expected)).
the responsibility for animal research in general and the development of animal-testing alternatives gradually became part of bigger chain(s) in which an increasing number of stakeholders were responsible for the situation.

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### 3.3.1 Changing interpretation of research animals

The category of research animals has changed steadily over the past few decades. This change is also of importance for the notion of animal-testing alternatives, as non-research animals are also understood as animal-testing alternatives. The changing category of research animals thus directly affects the category of animal-testing alternatives.

Over the years of regulation, vertebrates’ offspring produced during experiments were included in the category of research animals and received protection under the Act as well. With the revision of the EU Directive, mammalian foetuses, cyclostomes (i.e. lampreys and hagfishes), live cephalopods (e.g. octopuses, squids, and cuttlefish) and independently feeding larvae will soon be protected under the Act as well (European Parliament & Council of Europe, 2010, Art. 3).^90^ Other animals, by contrast, have lost their special status within the category. Horses, cats, and dogs, lost the special status they enjoyed during the early years of the Act and have become equal to the other research animals within the group.

In the end, some animals received additional protection by being banned completely from testing. For example, some non-human primates were banned under the Act in 1996, giving them the highest form of protection in the Netherlands. It is clear that the definition of research animals has been dynamic; some animals have become research animals, and some research animals ascended while others descended the hierarchical ladder.

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### 3.3.2 Expanding definition of animal-testing alternatives

Besides the changing definition of a research animal, the interpretation of animal-testing alternatives in Dutch policy documents also shifted over the years. At first, alternatives were interpreted as methods “other than by means of an animal experiment” (Stb., 1977: i.e. “first-generation alternatives”. See also §3.2.2.1). This understanding became broader with the introduction of the three Rs in the 1980s. Methods that used fewer animals (reduction), were more animal-friendly (refinement) or did not use animals at all (replacement) were all regarded as alternatives to animal experiments (i.e. “second-generation alternatives”). More recently, methods or technologies that – in combination with others – function at some point along the experimental chain are also regarded as animal-testing alternatives (i.e. “third-generation alternatives”).

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^90^ National authorities have to adopt their laws to meet the goals of EU directives, but are free to decide how to do so. As stated in Article 61 of the 2012 Directive: “Member States shall adopt and publish, by 10 November 2012, the laws, regulations and administrative provisions necessary to comply with this Directive.” After months of debate, the revision passed the Dutch Upper Chamber in November 2014.
The criteria for what was considered a good alternative changed with the shift in understanding of alternatives. In the early years, only those methods that acted as one-on-one surrogates for the original animal models were classified as animal-testing alternatives. The third-generation alternatives also encompass methods that - together with other methods – either replace, reduce, refine or avoid animal experiments.

The expanding understanding of animal-testing alternatives was also visible during their development (i.e. “three-R research”). In the earlier years, the development of a three-R alternative started with the animal model that was to be replaced (“second-generation three-R research”). Over the years, not only the animal model but also the scientific approach was questioned. The human relevance or knowledge question turned into the starting point for an alternative’s development. These “third-generation alternatives” were aimed at an understanding of the underlying mechanisms of disease and toxicological pathways (see also Chapter 5) rather than to observe the physiological changes of the “first- and second generation alternatives”. Animal-testing alternatives became more and more associated with understanding the mechanisms of disease and (toxic) response.

### 3.3.3 From trade-off dilemma to glorious win-win situation with three Rs

Also of interest for animal-testing alternatives is their positioning in the political debate. Around the introduction of the Act in 1977, animal experimentation was framed as a trade-off between public health and animal welfare. Stimulating public health would inevitably harm the welfare of research animals, but without harming the welfare of research animals, progress in public health was unattainable. The introduction of the concept of animal-testing alternatives made it possible to overcome this zero-sum game by ostensibly satisfying both societal values.

Recently, scientific and economic motives were also attached to the concept of animal-testing alternatives, as the latter became regarded as cheaper and more relevant than animal experiments. Animal-testing alternatives could stimulate innovation on various levels in various domains, and the so-called industry of animal-testing alternatives would support economic growth. Alternatives thus became important artefacts serving to bridge and combine different contexts, both within and outside the scientific discourse. Like other “boundary objects” (Star & Griesemer, 1989; see also Chapter 2), the concept was able to connect different contexts and arguments into one common future (“robust”) without specifying its exact understanding in each of these contexts (“flexibility”).

The function of alternatives was thus no longer limited to decreasing the number of animals but seen as a crucial element to achieve the “paradigm shift”. The policy issue of animal experimentation was successfully reframed from a trade-off dilemma to a glorious win-win situation through the introduction of the concept of animal-testing alternatives.

### 3.3.4 Increased shared responsibilities

Along with the changing positioning of animal-testing alternatives, the view also changed regarding who was responsible for developing such alternatives. At first, the problem of animal research and animal-testing alternatives was rather technically and cognitively orientated. As a response, the granting of subsidies to develop animal-testing alternatives was seen as the solution to overcome this problem.

The focus on technical solutions for the policy problem of animal experimentation changed slightly over the years. People realised that the use of alternatives was not only a matter of availability but also of convincing the (in)direct users of animal experiments, such as regulators, scientists, and industries. The policy intentions in policy documents shifted from a technology push to a co-creation approach to alternatives, in which end-users were increasingly involved in the development of alternatives. Public-private partnerships were established with the help of the Dutch government to stimulate the development of animal-testing alternatives in specific scientific domains (See also Chapter 4 and 5), and the development and implementation of animal-testing alternatives have become an issue of shared responsibility over the past few years.

### 3.4 Conclusion

This chapter showed how the issues of animal experimentation and animal-testing alternatives have been presented in Dutch policy discourse since the introduction of the Act in 1977. By describing four policy frames, I was able to identify crucial shifts in the understanding of the two issues. These shifts may be helpful to understand the incongruence between societal expectations regarding animal research and technological promises around animal-testing alternatives in the Netherlands.

The issue of animal experimentation became framed as a technical problem, a journey that paved the way for technical solutions. Animal-testing alternatives provided a perfect answer to the technically made problem of animal research; it was assumed that such alternatives would lower the dependency of animal experiments and thus directly lower the number of research animals. In other words, the policy aimed to stimulate the development of animal-testing alternatives with the assumption that availability would stimulate use as
The policy discourse on animal experimentation was long dominated by the problematic trade-off between animal welfare and public health. Gradually, the idea of animal-testing alternatives managed to eliminate this trade-off by creating an attractive win-win situation for animal welfare, human benefits, scientific innovations, and economic growth. Thus, the concept was able to bridge different social worlds, including their different expectations, values, and norms. Animal-testing alternatives created a situation in which actors with diverging values and expectations could work together and have the same goal, namely to work towards alternatives.

To produce the win-win discourse, it was crucial that the concept of animal-testing alternatives not be defined too narrowly. Over the years, the inclusion of new criteria broadened the category of alternatives. The arrival of the three Rs in Dutch policy discourse in the 1980s, for example, also expanded its boundaries towards refinement and reduction alternatives. In more recent years, alternatives no longer had to replace a complete animal model but could also be part of an integrated testing system.

However, along with the development of this new understanding of animal-testing alternatives (or “second- and third-generation alternatives”), the individual contributions of such alternatives in reducing animal numbers became less visible. Furthermore, because the third-generation alternatives do not necessarily replace the animal model, their overall effect on animal numbers remains to be seen. Finally, the more fundamental questions driving animal research likely will not be solved with a narrow focus on animal-testing alternatives. It may well be possible that the newly established win-win situation in Dutch policy discourse has only a temporarily effect and contributes to the growing gap between societal expectation and political promises.

Questions remain as to how actors along the science-policy nexus work with the shifts as presented in this chapter, how they translate the various and diverging societal values into their daily practice, how they function as intermediaries between the concrete and the expected, and which choices they make within the process to re-shape the understanding of animal-testing alternatives in other discourses. The following chapter examines how the research council ZonMw re-interpreted the understanding of animal-testing alternatives during policy implementation.
In recent years, the stimulation of three-R alternatives became an important policy instrument to reduce animal experiments in the Netherlands and elsewhere (e.g. Horizon 2020 calls for new approaches to improve predictive human safety and EURL-ECVAM, 2015a). In 2008, the Dutch Cabinet presented its policy on animal-testing alternatives (Klink, 2008), of which the development of three-R alternatives was the main component. The expectation was that the knowledge resulting from the Netherlands Organisation for Health Research and Development’s (hereafter: the Dutch acronym “ZonMw”) and other research programmes would reduce the number of research animals and experiments in the long run.

This policy is primarily aimed at the stimulation of animal-testing alternatives. The starting point is the three Rs: replacement, reduction, and refinement. The ultimate goal is to reduce the number of animal experiments and is therefore also based on societal and economic arguments. (…) The Cabinet supports the development of Three Rs alternatives in both regulatory and fundamental research. In this respect, the ZonMw programme <<Dierproeven Begrensd>> is the only funding source available to all research organisations in the Netherlands. (my translation) (Klink, 2008).

The Cabinet’s vision clearly presents the development of animal-testing alternatives as the promised technical solution to the societal and economic arguments against animal research (see also the changing policy frames in Chapter 3). However, the policy seems ambiguous as to how it should be implemented and does not clarify what counts as good and relevant animal-testing alternatives.

This chapter examines how the research council ZonMw translated the governments’ policy on animal research including animal-testing alternatives into research programmes and calls. Research councils such as ZonMw are positioned along the science-policy nexus, and as such need to live up to the (scientific) policy promises to society, while at the same time making policy ambitions feasible for divergent scientific practices. They depend on scientists for knowledge development, just as scientists depend on them for research funding.

92 This chapter went through a peer review by the director of the Netherlands Organisation for Health Research and Development (ZonMw), Henk Smid. The analysis and conclusion are my sole responsibility.
93 Three-R alternatives stand for the replacement, reduction, and refinement of animal experiments (Russell & Burch, 1959).
94 In English, this programme may be translated as “Limiting animal experimentation”.
95 Because of a structural shortage in research budgets, this relationship may not be as equal as presented.
Moreover, research councils operate in a particular “scene-setting vacuum” (Colebatch, 2009) that is not always recognised as such. This dimension entails the societal and time-specific values that influence the scope of policy in general, such as values about the position of science and the level of progress wanted.

This chapter describes how ZonMW implemented policies on animal research in its research programmes between 2000 and 2011. By making underlying assumptions explicit, this chapter shows the choices made during implementation. It also provides insight into the mechanisms that influence the relationship between societal values and technological promises about animal-testing alternatives. The research question addressed in this chapter is the following: How was the public policy on animal research implemented in ZonMW’s research programmes on animal-testing alternatives between 2000 and 2011?

The next section outlines the theoretical framework of this chapter. Section 4.2 describes how the interpretation of animal research as a policy issue gradually shifted, followed by a section on the shifting interpretation of three-R research in ZonMW’s research programmes on animal-testing alternatives (§4.3). Section 4.4 continues with a description of the factors that may have contributed to this shifting interpretation. Finally, section 4.5 provides an overview of the possible implications of these shifts.

### 4.1 Frames, policy reflection and technification

This chapter draws on the literature on ‘framing’ to study how the intermediary organisation ZonMW implements animal research policies in its programmes on animal-testing alternatives within the governance infrastructure for research policy. The implementation of policy programmes is understood as a process and achievement of collective action (i.e. “structured account” Colebatch, 2009). It is the stage of the policy process where the underlying theories of policy decisions, the choice of policy instruments and the resources allocated during the formulation process are tested against reality (Dewulf et al., 2009; Dimitrakopoulos & Richardson, 2001: See also Section 1.2.4; Wagenaar, 2011; Yanow, 2000a). The framing theory starts from the premise that interpretation and meaning are created in interaction. The theory thus suggests that the concept of animal-testing alternatives is shaped in interaction during the implementation process and may be captured in various frames.

Frames determine what the actors will consider ‘the facts’ to be and how these lead to normative prescriptions for action. A different frame will also change the social construction of the problem and which facts then may be considered relevant. In other words, frames are not just different perspectives on the ‘same problem’; with a different frame the problem itself has changed (Fischer, 2003; Rein & Schön, 1993). Frames are considered “sense-making devices” (Hajer & Laws, 2006) that are part of a larger discourse, which is defined as: “a specific ensemble of ideas, concepts, and categorisations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities” (Hajer, 1995, p. 44). Here, the framing literature intersects with Colebatch’s social construction account of policy making (i.e. “scene-setting dimension”), meaning that widely shared understandings and values about a specific problem and appropriate actions set the scene for a specific discourse (Colebatch, 2009, p. 29 onwards). This dimension determines to a large extent the policy frames (and therefore the policy solutions) that are viable, and those that are not. It is for this reason that Colebatch (2009) talks of this dimension as “policy making as collective puzzling” (p. 29). Yet, it is often difficult to discern this dimension, because it is concerned with taken-for-granted aspects or matters, usually tacit and exempt from conscious attention and reflection. Frames only make sense against the background of a dominant social discourse within a particular period (See also Chapter 2, especially §2.6 about the theoretical relationship between frames and discourses).

The position of a frame provides insight into the level of (policy) reflection. For example, frames can operate on a technical-analytical level with a preoccupation with research results. Or they may function on a more general and societal level and deal with fundamental questions regarding, for example, animal research and health. This chapter uses Fischer’s framework on analysing policy arguments (e.g. Fischer, 2003; Fischer, 2007a) and Grin and Van de Graaf’s additional work on this (Grin & Van de Graaf, 1996a, 1996b) to position the research programmes’ frames during implementation (see also §2.6.1). Frank Fischer differentiates between a first-order policy discourse (e.g. focusing on the specific actions of a policy initiative) and a second-order discourse (e.g. concerned with the societal context of the policy initiative).
First-order discourse comprises the level of programme verification (i.e. technical-analytical discourse), which focuses on the programme’s content, and its stated objectives, and situational validation (i.e. contextual discourse) that is concerned with the extent to which particular programme objectives are relevant to the particular situation. This level includes the problem definition and how the programme contributes to the solution. Second-order discourse, societal vindication (i.e. systemic discourse), gives insight into the empirical and normative theories of a programme. Finally, the level of social choice (i.e. ideological discourse) deals with ideological and values questions (Fischer, 1995, 2003; Fischer, 2007a). The object of Fischer’s first-order and a second-order discourse correspond with Schön and Rein’s (1994) “first-order” and “second-order reflection” in action (Grín & Van de Graaf, 1996a).

This chapter uses an integrated framework based on both Fischer’s level of policy evaluation and Schön and Rein’s order of policy reflection, to distinguish between the different levels in the debate on animal research in the Netherlands. The first-order policy reflection, views animal-testing alternatives as a (technical) solution to the problems of animal research, whereas the second-order reflection positions animal experimentation in a broader societal context driving these experiments. Within the second order, neither the use of animal experiments nor the development of animal-testing alternatives is taken for granted.

### 4.1.1 Frame analysis

The frame analysis in this study is primarily carried out on the documents from ZonMw’s research programmes on animal-testing alternatives between 2000 and 2011, including programme texts, evaluations, assignment letters, and annual reports (see Table 4.1 for the individual resources). These documents are considered a product of the negotiated implementation of public policy in research programmes and are understood as the temporal fixation of meaning in interaction between multiple players involved (i.e. the organisation itself, programme committee, researchers, and civil servants). In addition, five semi-structured interviews were conducted with actors involved in the programme, including ZonMw employees, and former and current members of the programme committee. The qualitative data of the interviews was used to validate the findings of the frame analysis and explanatory mechanisms.

For the purpose of this study, a frame is understood as the inferred understanding of animal research and animal-testing alternatives by ZonMw’s research programmes and calls. Such frames can be constructed from frame characteristics subtracted from documents in which the meaning is temporarily fixed (e.g. programme texts, and research calls). These characteristics include: issue naming, categorisation, attribution of responsibility, and causal story (See also Chapter 2, especially §2.4.3). Issue naming refers to the textualisation of animal experimentation, including animal-testing alternatives, and determines how the issue is defined. Categorisation refers to the classification of research animals and animal-testing alternatives to answer the question as to what can be considered a good alternative. Attribution of responsibility focuses on the role of particular players in solving the policy issue. Causal story refers to the combining of aspects, and gluing of the problems, categories, and actors into an intelligible and convincing narrative about how an issue can be explained and should be understood. Consequently, shifts within each of the separate characteristics over time provide insight into the changing implementation of public policies into research programmes on animal-testing alternatives (i.e. frame shift).

### 4.2 Policy development: the construction of a technical policy problem

This paragraph focuses on the formation of animal research policies over the past three decades, as it is vital for the understanding of the implementation process into ZonMw’s research programmes on animal-testing alternatives. After all, research councils do not operate in a societal vacuum but function in the light of a continuously changing “contract” (e.g. Gibbons, 1994; Hessels, Van Lente, & Smits, 2009) between science and society (e.g. Van der Meulen, 2003). The present section describes the construction of animal research as a technical policy problem as part of the “scene-setting” dimension of policy development.

In the 1970s, animal research entered the political arena as a controversial topic. While opponents of animal research focused on the pain and distress involved in the experiments carried out in the field, proponents touted the many (medical) successes thanks to those experiments. The policy topic was framed as a trade-off between human health and the use of research animals. The introduction of the term “animal-testing alternatives” reframed the former trade-off. Gradually, the policy frame in the Netherlands shifted towards being one in which animal-testing alternatives were presented as the solution to the problems associated with animal research (see also Chapter 3). The quote below from former

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101 Because this chapter focuses primarily on the implementation of animal research policy into research programmes, the individual scientific projects within the programmes will only be addressed in passing.

102 This committee is involved in the writing of the research programme, the description of the research calls, and the selection of research projects. It comprises a changing group of experts from industry, the sciences (e.g. natural sciences, ethics), patient organisations, health organisations, and animal welfare organisations.

103 Consequently, other policy frames (including problem definitions and corresponding actions) slowly disappeared from policy discourse as well. Imagine for example the framing of animal experiments as a crime (legal frame; punishment for offenders), as morally unjust (animal protection frame; full protection for all...
Minister of Health, Welfare and Sport Hans Hoogervorst in a policy letter on animal research emphasis the orientation towards animal-testing alternatives as a policy solution:

One of the most constructive tools to restrain the number of animal experiments (...) is the development and application of research methods using no or fewer animal experiments, or lowering the suffering of research animals. (my translation) (Hoogervorst, 2005)

The shifting orientation towards animal-testing alternatives can be understood as a technological answer to a societal problem (i.e. “technological fix” (Rosner, 2004)). Based on Sarah Parry’s notion of “scientisation” for scientists’ discursive reframing process to obtain cognitive authority by converting ethical and social issues into scientific and technical ones (2009), I introduce the concept of technification to emphasise the process (i.e. a collection of activities) that keeps the level of policy reflection at the first-order. The technification process may include (deliberative) discursive strategies of scientists, policy makers and others in order to gain cognitive authority and tacit choices against the background of the larger societal discourse of that moment.104

During policy development, the issue of animal research seemed thus reframed in terms of an animal-testing alternatives’ dearth: More animal-testing alternatives were to be developed in order to restrain and lower the number of research animals. In other words, animal research became a technical policy problem.

The next section describes the frame shifts in ZonMw’s research programmes on animal-testing alternatives upon implementation of policy programmes on animal research.

4.3 Frame shifts in ZonMw’s programmes on animal-testing alternatives

The first ZON-programme on animal-testing alternatives marked the start of a new era that – for the first time since the establishment of the Platform Animal-testing alternatives (PAD) in 1987 – would seek to promote animal-testing alternatives.105 The policy goal of this programme was the “inventory, stimulation, initiation and coordination of the development and application of animal-testing alternatives” (VWS, 1999, p. 3). The policy programme seemed committed to the idea of supporting the development of animal-testing alternatives. Yet, the questions how to translate the political discourse on animal research and animal-testing alternatives into a research programme, with whom, and what to prioritise, were all questions yet to be answered during implementation at research council ZonMw.106

These (tacit) questions included the interpretation of the specific fields and aspects that had to be addressed within the programme (i.e. “issue identification”), what was counted as an animal-testing alternative and what was not (i.e. “categorisation”), who was held responsible for which aspect of the innovation chain (i.e. “attributing responsibility”), and how the programme rationale was glued together in a coherent story on how to contribute to the societal expectation of reducing research animal numbers (i.e. “causal story”). What seemed an apparent straightforward goal in the policy programme required many more decisions upon implementation.

This section starts with a brief introduction to research council ZonMw and its programmes on animal-testing alternatives, after which it continues with a description of the frame shifts in ZonMw’s understanding of animal-testing alternatives upon implementation.

4.3.1 Research council ZonMw

ZonMw has an important position in the governance infrastructure for research policy, especially on healthcare research. It mediates between research and policy (i.e. “boundary organization” e.g. Guston, 2001) to enhance evidence-based policies and practice in the field of healthcare (Bekker et al., 2010). As stated on its own website, ZonMw “funds health research and stimulates the use of knowledge developed to help improve health and health care in the Netherlands” (ZonMw, 2015b). The research councils has four programme frameworks: Science and Innovation, Prevention, Care and Welfare, and Quality and Health care efficiency (my translation) (ZonMw, 2014). Although ZonMw has some ‘open’ programmes in which innovative research in funded, most of its programmes are thematic and formulated in close cooperation with the Ministry of Health, Welfare and Sports.107

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104 I follow Parry (2009) in her use of the concept in relation to the construction of particular frames rather than analysing the role of scientists as advisors to policy (e.g. Jasonoff, 1990; Weingart, 1999). Technification may also attract new players (i.e. the formation of a new “discourse coalition”) Hajer, 1995: see also §2.3.2)

105 The evaluation of the Platform in 1995 concluded that the Platform had been mainly oriented towards the financing and stimulation of research. Other tasks, such as the coordination of research, the inventory of alternatives and advising researchers, were evaluated as less successful. A suggestion was made to appoint one central financing source and contract multiannual projects. The recommendations of the evaluation and a reorganisation at the Ministry of Health eventually led to the minister’s request of creating a new programme on animal-testing alternatives at ZON (‘Dutch Health Research’) (ZON, 2000). In 2001, ZON merged with the NWO department of Medical Sciences into ZonMw.

106 ZonMw’s sense-making process is understood as the interplay between multiple players and organisations (see also §4.1.1).

107 And with the Ministry of Economic Affairs for the programmes on animal-testing alternatives.
The programmes include research on dementia (“Memorable”), aging societies (“Ambient Assisted Living”), youth care (“Strengthening performance practices youth health care”), and animal-testing alternatives (“More knowledge with fewer animals”).\footnote{An overview of all programmes can be found on ZonMw’s website: www.zonmw.nl.} The total programme costs cover around 150 million euros per year (ZonMw, 2015e).

Each programme has a programme committee which is responsible for drafting the programme text, the evaluation of proposals and the monitoring of the projects among other things (ZonMw, 2015d, p. 17).\footnote{The programme committee is installed by the board of ZonMw, which remains ultimately responsible. The committee may decide to outsource certain tasks, such as the programme evaluation.} Policymakers and practitioners participate in ZonMw’s programme committees in order to improve the links between research and policy (e.g. Bekker et al., 2010) The committee evaluates the proposals on their relevance and on their overall \textit{(scientific) quality} as based on the call’s criteria. The final decision whether a submitter will be granted the subsidy is based on the proposal, the referents’ evaluation on the (scientific) quality of the proposal, and the possible submitter’s rebuttal (ZonMw, 2015d).

The projects are monitored and evaluated regularly, and may include submitter’s progress reports, project leader’s meetings, site visits and end reports. The programmes are usually evaluated twice: one during the scope of the programme (i.e. mid-term self-evaluation) and once at the end of the programme (i.e. external end-evaluation) (ZonMw, 2015a, 2015d).

4.3.1.1 ZonMw’s research programmes on animal-testing alternatives
Since 2000, ZonMw has initiated four large programmes and one smaller programme on animal-testing alternatives (ZonMw, 2011e).\footnote{The MKMD programme will be prolonged until 2018.} ZonMw is also involved in other initiatives stimulating the research on animal-testing alternatives, including their membership of the European consensus platform for alternatives (Ecopa, 2015). Beside the research programmes, the programme secretaries, programme coordinators, board members and director of ZonMw are actively engaged in many initiatives concerning animal research and animal-testing alternatives.

<table>
<thead>
<tr>
<th>Programme</th>
<th>Period</th>
<th>Budget</th>
<th>Relevant documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPB I</td>
<td>2000 – 2004</td>
<td>€2,700,000\footnote{1}</td>
<td>(Hackenitz, 2004; ZON, 2000)</td>
</tr>
<tr>
<td>DPB III</td>
<td>2009 – 2012</td>
<td>€2,200,000\footnote{3}</td>
<td>(ZonMw, 2008a, 2011b, 2011f, 2012a)</td>
</tr>
<tr>
<td>DPB-III</td>
<td></td>
<td></td>
<td>(ZonMw, 2011e)</td>
</tr>
<tr>
<td>ASAT</td>
<td>2010</td>
<td>€900,000</td>
<td>(ZonMw, 2011b, 2011e, 2011f)</td>
</tr>
<tr>
<td>MKMD</td>
<td>2011 – 2014</td>
<td>€5,450,000</td>
<td>(ZonMw, 2011c, 2011d, 2015c)</td>
</tr>
</tbody>
</table>

\footnote{1} The total financial heritage from PAD was €6.675.805 of which M€2.7 was freely available.\footnote{2} Including an additional budget of €200.000 for the scientific and social trend analyses.\footnote{3} The 2011 output report noted €2.500.000.

The programme committee of ZonMw’s programmes on animal-testing alternatives consists of experts from various fields, with the majority coming from the natural sciences (e.g. full professor in molecular biology, toxicology, immunology, nuclear medicine etc.) and a variable number of experts from industries (e.g. NOTOX B.V. in the MKMD programme), NGOs (e.g. Proefdiervrij in all programmes), regulators (e.g. MEB in the MKMD programme), ethicists (e.g. Ethics Institute in DPB III), and patient organisations (e.g. Reumapatiëntenbond [‘Bond for patients with rheumatic diseases’] in the MKMD programme).\footnote{The members of the programme committee hold seats in their individual capacity.} Given the responsibilities of the committee, the composition plays a pivotal role in the sense-making process during implementation.

4.3.2 Issue naming: from animal welfare to human relevance
The first programme on animal-testing alternatives (i.e. DPBI) positioned the issue of animal research in a historical context and supported this frame with numerous facts and figures, such as an overview of the regulatory requirements for drugs and chemicals, and the decrease in the number of research animals. The search for animal-testing alternatives was firstly motivated by a recognition of research animals’ intrinsic value and the care that needs to be taken of such animals. In addition, scientific (e.g. the extrapolation difficulties between animals and humans) and economic (e.g. cheaper screening methods) arguments were also used to support the search for animal-testing alternatives.

\textit{First of all, animal-testing alternatives are aimed at improving the animals’ welfare, which is an ethical consideration. In this respect, scientific research is a tool to search for possibilities to reduce the burden on the animals. (my translation) (Hackenitz, 2004, p. 46)}
Over the course of the programmes carried out over the years, animal-testing alternatives became associated with delivering results that are more relevant to human. The latest MKMD\textsuperscript{112} programme internalised this consensus “for the growing awareness that (a model for the human) is becoming the standard model for the human biology, rather than the animal model” (ZonMw, 2011c). The Module Animal-Free Techniques speaks of a “mind shift” from the execution of traditional animal research to the build-up of integrated knowledge of the human system (“human model”) (ZonMw, 2011d). The integration of knowledge from different disciplines, a central tenet of system biology, thus became increasingly important. Overall, the issue’s focus shifted from seeing to the welfare of animals in experiments to developing models, which were likely to generate more relevant knowledge about the human situation (i.e. the programme’s promise).

4.3.3 Categorisation: from the three-Rs to avoiding the animal altogether

Over the years, the type of research considered relevant to the development of animal-testing alternatives has shifted as well. The earlier ZonMw-programmes focused on research that started with the default animal model and aimed to replace, reduce, or refine the animal research associated with this model. I call these “second-generation animal-testing alternatives”, as opposed to the animal-testing alternatives of the previous PAD programme(s) (i.e. “first-generation animal-testing alternatives”\textsuperscript{113}) and alternatives in the later ZonMw programmes that appear to focus more towards an understanding of underlying biological mechanisms and processes of health, disease and toxic responses (i.e. “third-generation animal-testing alternatives”) (See also §3.3.2).

In the first programme, animal-testing alternatives were understood as “methods that use no, or at least fewer, research animals, as well as methods that aim to improve the welfare of animals in experiments” (ZON, 2000). This three-R definition had already been embedded in scientific discourse since the publication of Russell and Burch’s book, The principles of humane experimental technique, in 1959 (Russell & Burch, 1959: See also Chapter 3). This scientific discourse on animal-testing alternatives thus set the boundaries of what the first ZonMw programme considered a good alternative. The research was strictly distinguished from more fundamental research aimed at understanding underlying biological mechanisms of disease.

\textsuperscript{112} The programme’s name, “More Knowledge with Fewer Animals”, already suggests that the position of the knowledge that is developed plays a pivotal role.

\textsuperscript{113} The PAD programme(s) focussed on “first-generation animal-testing alternatives”, including pig ears from slaughter houses to measure skin penetration, the growing of human tumours in bovine eyes to replace the eye irritation test with rabbits (See also §3.2.4.2). First-generation animal-testing alternatives thus only covered the replacement of animal models, whereas the second-generation animal-testing alternatives also covered the refinement and reduction of animal models (i.e. the 3Rs).

Research on alternatives seemed to be a goal in itself rather than a side product of knowledge development. Indeed, the programme evaluators warned for scientists who “hitchhiked” on the DPB budget. They understood such hitchhikers as scientists doing “fundamental research which can also be explained as a possible base for an animal-testing alternative, but which is not the main incentive” (my translation) (Hackenitz, 2004, p. 36). Fundamental research that could possibly lead to animal-testing alternatives in the long run did not, at least form the evaluators perspective, appear to be relevant for the DPB programme. A shift towards a broader interpretation of animal-testing alternatives became visible in the DPB II programme. By welcoming new research strategies, such as “functional genomics and proteomics” (ZonMw, 2005, p. 17) the door was opened to a broader understanding of alternatives.

The current state of science offers the possibility to pay attention to research strategies that do not depart from standard animal models. These new strategies should be aimed at avoiding animal research in the future. (…) The Programme Committee does not consider it to be self-evident that such alternative models will again be animal models. Projects that focus on fundamental aspects of working mechanisms in non-intact animal models will therefore be given priority. (my translation) (ZonMw, 2005, p. 17. Emphasis added)

Animal-testing alternatives were thus no longer exclusively interpreted as methods for replacing, reducing, or refining the animal experiment, but also as methods that aimed to avoid the use of animal models altogether.\textsuperscript{114} The study of more fundamental aspects of underlying biological mechanisms, and research leading to “more relevant extrapolation of animal experimental data for human effects” were warmly welcomed within DPB II (ZonMw, 2005, p. 17). It seemed no longer a prerequisite to start from an existing animal model to be considered relevant for the programme: Methods and research strategies that worked around animals and were able to avoid animal experiments in the future also fell into this new understanding of animal-testing alternatives.

\textsuperscript{114} The Dutch word vermijden (to avoid) is used and fits with the Dutch translation of the three Rs, which translates as the three Vs: vervanging (replacement), verminderen (reduction) and verfijning (refinement).
The broadening of the alternatives interpretation has continued over the years. The MKMD programme considered multidisciplinary and interdisciplinary initiatives the “foundation for the three-R alternatives” (ZonMw, 2011d) and classified more fundamental research on underlying mechanisms as animal-testing alternatives, too. These what I call “third-generation alternatives” focus on the human situation and support knowledge development (i.e. fundamental insights into biological mechanisms, and model development) that produce relevant information while simultaneously aiming to overcome animal research. Overall, the interpretation of (research on) animal-testing alternatives seemed to have shifted from research directly focused on the animal model (“second-generation”) to research that may deliver more relevant information for the human situation (“third-generation”).

4.3.4 Attributing responsibility: from scientists to co-responsibility

Over the course of the ZonMW programmes, the perceived role of researchers, regulators (e.g. Medicines Evaluation Board, European Chemical Agency), and private partners (e.g. pharmaceutical industry) in the development, application, and use of animal-testing alternatives have changed. At the start this responsibility seemed almost exclusively attributed to scientists and gradually shifted towards increased co-responsibility of all partners in the chain.

Since the start of the programmes in 2000, attention was paid to implementation and communication. According to ZonMw, implementation can be described as:

[A] process-orientated and systematic introduction of an innovation and/or change with proven value, with the purpose of a structural position in the (professional) acting and functioning of organisations, or in the structure of health care. (my translation) (ZON, 2000, p. 25)

In the first programmes on animal-testing alternatives, the implementation of results was primarily seen as the project leaders’ responsibility. Asked to pay attention to the “possibilities and critical factors” concerning the (future) implementation of their results in their proposal, project leaders seemed regarded as crucial pivots in the implementation process (ZON, 2000, p. 26; ZonMw, 2005). Yet, the evaluation of the DPB I programme revealed a “large gap between obtaining knowledge with respect to animal-testing alternatives and their application” (Hackenitz, 2004, p. 52). The relation between knowledge development and the application of animal-testing alternatives was apparently not self-evident.

The subsequent programmes attempted to bridge this gap by involving stakeholders in the set up or development of the research proposals and the implementation process. For example, DPB III required stakeholder involvement in the project proposals and a users’ committee was established around each (group of) funded project(s) to create “early interaction between researchers and potential users” (ZonMw, 2008a). This users committee aligned with the programme’s understanding of implementation as:

[A] collective responsibility of ZonMw (the Programme Committee), project leaders of ZonMw projects, national and international authorities, industry and academia. (my translation) (ZonMw, 2005, p. 23)

During the operation of the programmes, the cooperation of partners in the development of animal-testing alternatives gained support. Against the backdrop of a range of initiatives to stimulate the cooperation between academia and industry in the Netherlands (e.g. Dutch top sector policy), and public private partnerships such as the Centre for Image Sciences, and the FitFoodFun-Factor, MKMD required chain involvement (e.g. contact with regulators) and cooperation between the relevant stakeholders. This programme’s Life Sciences and Health module even explicitly required the co-financing of the private partners in the research consortium (ZonMw, 2012b). Cooperation along the entire chain in such public private partnerships (i.e. PPPs) seemed understood as an important way forward in the stimulation of animal-testing alternatives.

4.3.5 Causal story: from raising awareness to improving human relevance

The overall rationale behind the research programmes on animal testing remained more or less stable over the course of the programmes: The development and implementation of animal-testing alternatives would diminish the dependency on animal research and thus lower the number of research animals. Yet, the causal story to legitimise a specific approach appeared to have shifted from raising three-R awareness via increasing the use of animal-testing alternatives (i.e. three-R implementation), to building a stronger business case, especially in relation to human relevance.

115 This policy has faced some criticism, also because the selection excludes certain sectors of the Dutch economy, and the possibilities for innovative starters are minimal (e.g. WRR, 2013).
116 The UMC Centre for Images Sciences is a cooperation between UMC Utrecht, Philips and Elekta to improve diagnostics and treatment of disease with imaging techniques; FitFoodFun-Factor is a cooperation between the Heart Foundation, the Netherlands Nutrition Centre and Lidl Netherlands to stimulate healthy food and move for primary school students.
117 Partners could either contribute in kind (i.e. via personnel or specific substances), in cash (i.e. financial contributions) or through a combination of both. The module was part of the Top Sector Life Sciences and Health (LSH) and therefore had additional requirements.
118 The introduction of animal-testing alternatives is frequently cited as a bottom-up approach from the actual development of three-R methods within universities or industrial R&D labs, to their validation (testing the reliability and relevance) and implementation (the regulatory acceptance of methods) (Van den Briel & Oppenhuizen, 2011). In policy sciences, however, implementation covers the entire process from the initial policy intentions to the use of three-R alternatives (as the focus of this study). I therefore use the term three-R implementation in the context of this chapter (See also Schiffeler et al., 2007, p. 288 on her use of the term “regulatory use”).
In DPB I, the problem was primarily framed as a lack of three-R awareness within the scientific community. The choice to fund multiple smaller projects, instead of fewer larger projects, fit with this perspective.

*When you have less funding available, it is important to divide it among the community.* (my translation) (Interview member programme committee, 2012)

The fact that animal research was performed within many areas of the biomedical sciences, as well as in the environmental sciences and for the purpose of education, determined the broad programmatic scope of the programme. Ranging from “education” and “model development” to “regulatory research”, “specific wishes” and “dissemination” (ZON, 2000), the programme covered most areas. Those who evaluated the programme agreed with this argument against the backdrop of societal support.

*Specifying the programme might be effective in terms of science, but it works against the broader ethical awareness and causes an erosion of societal support. (...) An expansion of the field of interest is a way to create wide support and maintain the change in mentality.* (my translation) (Hackenitz, 2004, p. 37)

The following DPB II, and especially the DPB III programme, marked a significant shift in the rationale on which the programmes were built. The problem was no longer framed as a lack of three-R awareness within the scientific community but as a three-R implementation problem. The DPB III programme focused on getting the animal-testing alternatives of the previous DPB programmes in the next phase of the “knowledge value chain” (ZonMw, 2008a). This knowledge chain comprised three subsequent phases, running linearly from “fundamental innovative and strategic research”, “applied research” and “trial-validation and implementation” (idem). Stimulation of all phases was considered to be most successful in achieving the programme’s goals.

The approach to stimulate animal-testing alternatives seemed to shift in the 2011 MKMD programme. While the infrastructure on the “knowledge value chain” continued, the (often) problematic extrapolation of animal models to the human situation strengthened the focus on human(s) (models). Based on the 2009 Trend Analyses and the 2010 Programmatic Study, four research areas were classified as “potential” (ZonMw, 2011c): human diseases, development of drugs for human use, risk assessment of potential harmful substances, and quality control of drugs, including vaccines and sera. The programme’s text enumerated many scientific focus points, including the (further) development and utilisation of technologies and techniques (e.g. system biology, -omics, imaging) for both human and animal models, translational research, the development of biological products with 3R-methods, the (further) development and utilisation of stem cell research and other tissue culture techniques, and the development of integrated testing strategies and predictive (computer) models (ZonMw, 2011c, p. 9). The functionality of three-R models (including animal-free techniques) appeared to be considered pivotal in understanding the human knowledge questions.

### 4.3.6 Strengthened technification of solution to animal research

The previous subsections described the gradual changes in ZonMw programmes’ approach in the development and implementation of animal-testing alternatives. Animal-testing alternatives have increasingly become framed as possibilities to improve the human relevance of research (“issue naming”). Along with the shifting position of such alternatives, the interpretation of what could be considered relevant research also changed. While the “second-generation alternatives” started to replace, reduce, or refine the traditional animal model, “third-generation alternatives” started from the relevant research question (“categorisation”). Knowledge development and three-R implementation became framed as a shared responsibility of all stakeholders involved in the chain of animal research (“attributing responsibility”). The overall rationale behind the research programmes shifted from improving research animal’s welfare to building a business case for improved human relevance (“causal story”).

Since all the individual frame characteristics seemed to lean towards a technical solution for the issue of animal research, it may be conclude that the implementation of animal research policy at ZonMw further technified the policy issue (i.e. “discourse structuration” Hajer, 1995. See also §2.3.1).

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119 These wishes were further divided into ecotoxicology, defence-related research, and a system monitoring the ratio between the use of alternatives and the number of research animals.

120 For more information, see: (For more information, see De Cock Buning et al., 2009a, 2009b; Deleu & Van Boxel, 2010, 2011; Hendriksen & Komduur, 2009).

121 The list also more system-approach focus areas, such as “3R-promoting funding criteria” and “periodically evaluation of regulatory compulsory tests” (ZonMw, 2011c).
4.4 Factors driving the technification process

The previous section showed that the implementation of animal research policies in research programmes strengthened the technification of the policy issue. It is important to gain insight in the factors that contributed to this technification process. This section therefore will describe some relevant factors that made a further technification possible upon policy implementation, including the delegation of some crucial (technical) choices, the technology-push argument of innovation, and the evaluation’s first-order level of reflection. These processes pertain to the present study, but the list of factors is not and should not be considered exhaustive.

4.4.1 The delegation of choices to a research council

The first factor strengthening the technification process was the delegation of (technical) choices to a research council. Positioned between policy and science, research councils find themselves in the difficult position of having to manoeuvre between the abstract societal demands of policy and the science awarding systems.\(^\text{122}\)

The delegation of policy implementation fits with public science funding organisations’ traditional role of having to “mediate a broader contractual relation between the state and science that can be considered a principal-agent relation” (Van der Meulen, 2003, p. 399).\(^\text{123}\)

In this account of research councils, the government provides resources, authority, and monitoring to a funding organisation in order to reach the goals that the government cannot reach alone. In this case, the research council simply executes the political choices that have already been made on the policy level.\(^\text{124}\) Such an account seemed based on the assumption that no further choices are necessary or that at least no significant societal values need to be reconsidered and suits a more rational way of policy making (see also §1.2.2).

However, many (political) choices still have to be made during policy implementation, a fact that challenges the notion of a strict boundary between the scientific and the political (e.g. Weingart, 1999).

\(^\text{122}\) In Chapter 5, further attention will be devoted to these science awarding systems (e.g. publications and citation index) that make it more challenging to live up to the promise of animal-testing alternatives.

\(^\text{123}\) In science policy studies, these relationships are often explained with the principal-agent theory. The basic idea is that the “principal” hands over resources to the “agent” in order to reach goals that the principal cannot reach alone (Gulbrandsen, 2005). The role of intermediary organisations, such as research councils, has complicated these bilateral relationships. Here, a research council can simultaneously be both agent (in relation to the government) and principal (in relation to scientists).

\(^\text{124}\) For example, the formality of assignment letters keeps the idea of such a principal-agent relationship in place and contributes to the appearance of a policy-science dichotomy between the principal (government) and the agent (research council).

This quote from a ZonMw employee involved in the programmes on animal-testing alternatives appears to suggest that the programme committee play a pivotal role in the implementation of policy programmes into research programmes. As most members of this committee have a natural scientific background (i.e. PhD, associate professor of full professor in molecular biology, toxicology, immunology, nuclear medicine etc.), it seems likely that a scientific and technical solution to the societal problem of animal research prevails over a non-scientific solution (e.g. economical, ethical). The scientific and technical orientation also paves the road for scientific development (i.e. emerging technologies) that may changes the interpretation of animal-testing alternatives (see also §4.3.3 on categorisation) and reinforces the technification of the policy issue.

Moreover, the way in which funding was allocated seemed to have strengthened the technification process as well. The gross amount of funding was allocated via bottom-up calls for research, through which scientists could send their proposals within the boundaries of the programme and under the provision that certain other conditions were met, for example, co-funding in the LSH call within the MKMD programme. The availability of proposals appeared to determine the programmes’ understanding of animal-testing alternatives and the eventual orientation of the programmes.

Overall, the organisation of the research council and the structure of the research funding partition seemed to have intensified the technification of the policy issue. Many choices were still to be made during implementation, and the proximity of the programme committee appeared to play a pivotal role in the programmes’ shifting understanding of animal-testing alternatives and its focus and orientation.

4.4.2 Science and technology-push argument of innovation

The second factor that contributed to further technification was the programmes’ understanding of fundamental knowledge development regarding the innovation process on which the programmes were built.
The ZonMw programmes aimed to stimulate the use of animal-testing alternatives in the various practices that used animal experiments, such as the academia and the regulatory practice. Animal-testing alternatives appeared to be understood as innovations: Methods that could improve the current system of animal experimentation. The ZonMw programmes on animal-testing alternatives were built on the assumption that all research types (e.g. fundamental or applied science) were equally important in this innovation’s implementation process. The knowledge value chain was understood as one-directional and linear: from fundamental research, via strategic research, applied research, development-projects/pre-implementation to implementation projects (ZonMw, 2011e, p. 14).

In all phases of the knowledge value chain, progress can be made towards a useful application in a next phase. That next phase can be, but is not necessarily, the phase of use or implementation. (my translation) (ZonMw, 2011e, p. 14)

(K)nowledge development is very valuable, because without new insight, innovation falters. (my translation) (ZonMw, 2008b, p. 6)

In DPB III, we have laid the accent on implementation research. That doesn’t mean fundamental research is not important anymore, but we have done that [in earlier DPB programmes]; you want to finance the entire chain of scientific research, also the end phase. (my translation) (Interview programme secretary et al., 2013)

Fundamental research was understood as the “starting point” of new innovations such as animal-testing alternatives (Interview programme secretary et al., 2013). The attributed importance of fundamental research was reflected in the available funding for type 1 projects (i.e. “development”) in DPB III (ZonMw, 2008b) and the high number (around half) of DPB projects that were fundamental research projects (ZonMw, 2011e, p. 14).

This pivotal role of fundamental research in the innovation process of animal-testing alternatives appeared built on a “technology-push” model (e.g. Coombs et al., 1987; Di Stefano, Gambardella, & Verona, 2012; Nemet, 2009) to innovation: A linear model according to which innovation is a sequence of stages starting from scientific research (Saad, 2000). 125

The core of this science and technology-push argument is that advances in scientific understanding determine the rate and direction of innovation. (…) These arguments envisioned a progression of knowledge from basic science to applied research to product development to commercial products. (Nemet, 2009, p. 701)

The original technology-push argument has been criticised primarily for ignoring the prices and other economic conditions that affect innovations’ profitability. In addition, its emphasis on a unidirectional progression during the innovation process was incompatible with work that highlighted feedback, interactions, and networks (Freeman, 1994; Nelson & Winter, 1977). By contrast, the “demand-pull” argument, which was developed later on, argued that demand – and not scientific understanding – drives the rate and direction of innovation. 126

Based on these insights from Science and Technology Studies and Innovation Studies, the question remains to what extent knowledge development, as produced within the ZonMw programmes on animal-testing alternatives, has been the driver of recent innovations. This is an important question to answer in order to evaluate whether the programmes have lived up to the societal expectation of reducing the number of research animals. By the same token, it would provide insight into whether, as the demand-pull argument suggests, the programme may better focus on the demands of “users” (Nahuis, Moors, & Smits, 2012; Von Hippel, 1976) of animal research (e.g. scientists in industry, academia) to promote a more sustainable transition (See also Chapter 7, especially §7.2.1). 127

By introducing new projects requirements, the 2011 MKMD programme appeared to move beyond the technology-push argument. Cooperation between relevant stakeholders and “chain involvement” can be seen as an effort to bridge and improve the process of implementation and the actual use of the innovations. Many scholars have recognised and studied the role of users in the innovation process (Boon, 2008; Di Stefano et al., 2012; Von Hippel, 1976). This understanding now also enters the realm of animal-testing alternatives (e.g. Nooijen, Ploeg, Zuijdama, Roelofs, & Komduur, 2014; Vandebriel & Opperhuizen, 2011e, p. 14).

125 Rod Coombs and co-authors showed that the work and ideas of two economists, Schumpeter and Schmookler, have become very influential in shaping studies of innovation and technical change. They argued that the “technology push” hypothesis of the origin of innovations find a natural place in Schumpeter’s ideas (Coombs et al., 1987, p. 94 onwards).

126 Later work offers a less deterministic version of the science technology-push argument, while it continued to emphasise the role of science and technology. The concept became more multi-dimensional and acknowledged some of the nuances of the innovation process that the strictly linear model ignored. Furthermore, the demand-pull argument received criticism for different reasons, including the definition of “demand”, the failure to account for discontinuous change, and the argument’s assumptions regarding firms’ capacities to identify “unrevealed needs” (For an overview Nemet, 2009, p. 701).

127 The linear idea that innovations are developed by scientists, disseminated through intermediaries and then put into practice by users has been criticised by many (e.g. Leeuwis & Aarts, 2010 for an overview).
2011). Yet, the 2011 MKMD programme still started from the (scientific) knowledge question rather than stakeholder needs: The demand-pull argument seems still a long way down the road in ZonMw programmes on animal-testing alternatives.

Overall, the ZonMw programmes’ technology-push approach in the stimulation of animal-testing alternatives emphasised the importance of scientific developments and appeared to have strengthened the technification of the policy issue. There seems to be a movement towards a greater (societal) demand pull of animal-testing alternatives within the research programmes, but this trajectory is still in its infancy.

4.4.3 First-order evaluation of programmes

Finally, the third factor that contributed to the technification of the policy issue was the technical level on which ZonMw’s programmes on animal-testing alternatives were evaluated.

The main thrusts of the evaluations were to assess whether the programmes’ goals were achieved in terms of their three-R contribution (i.e. result-evaluation), and whether the selection procedure was carried out correctly (i.e. process evaluation). As stated in the DPB III programme text,

\[
\text{The goal of the evaluation is to assess whether the application of developed and validated animal-testing alternatives within the programme has contributed to the reduction, refinement, and/or replacement of animal experiments. (my translation) (ZonMw, 2005, p. 29)}
\]

In practice, the evaluations faced great difficulties in answering this question. How does one measure whether the application of validated animal-testing alternatives has “contributed to the three-Rs”? In order to evaluate the “degree of success”:

[T]he committee considered whether a project potentially and clearly contributes to the reduction of animal research and animal suffering. This qualification is thus an indicator for the programme’s achievements (...). (my translation) (Hackenitz, 2004, p. 27)

The success in terms of animal reduction seemed hard to operationalise, especially as the impact appeared only to be visible in the long run (Hackenitz, 2004, p. 26).

The number of research animals that can be reduced with these applicable three-R models is hard to estimate and not easily quantified. (my translation) (ZonMw, 2011e, p. 4).

To overcome the problem of counting research animals, the evaluations involved an assessment of the project’s own goals and some general research criteria. This type of evaluation resulted in extensive reviews of the projects (titles), the number of applicants per research call, and the quality of referents’ reports, among others. For example, the 2011 evaluation provided a large overview of the projects’ percentages in terms of their three-R category (p.12), their area of interest (p.13), their position in the knowledge chain (p.14), and their success based on the original project’s objective (p. 18) (ZonMw, 2011e).

The programmes’ evaluations seemed to address questions with regard to their effectiveness in terms of their own goals, which aligns with the level of programme verification in Fischer’s framework of policy evaluation (Fischer, 1995; Fischer, 2007b). Concerned with the measurements of the efficiency of programme outcomes, the task of this phase is to produce a quantitative assessment of the effectiveness of programmes and the extent to which the programme is more efficient than the alternative means available (see also Chapter 2). In other words, the evaluation of the ZonMw programmes on animal-testing alternatives seemed to remain at the first-order level of policy reflection (Grin & Van de Graaf, 1996a, 1996b; Schön & Rein, 1994). Programme verification’s level of reflection hampers an evaluation of more fundamental issues, including the funding and developing of animal-testing alternatives as policy objective in itself (“situational validation”; first-order reflection), the infrastructure that requires animal experimentation (“societal vindication”; second-order reflection), and the boundaries of innovations (“social choice”; second-order reflection) (See also Chapter 7).

Overall, the first-order level of the programmes’ evaluations appeared to contribute to a further technification of the policy issue, as more fundamental issues driving animal research were hardly touched on.

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128 For example, the 2011 RIVM study concluded that the chain of development, validation, and implementation of animal-testing alternatives is not at all a streamlined whole but consists of various separate organisations that do not cooperate in a structural manner: “There is no need for a validated alternative method without the possibility of implementing it within the regulatory domain. On the other hand, it is not possible to deliver reliable in vitro methods on demand (…)” (Vandebriel & Opperhuizen, 2011, p. 7).

129 The programmes were evaluated in 2004 (end-evaluation DPB I), 2007 (mid-term evaluation of DPB II), and 2011 (evaluation of all DPB programmes, including the mid-term and end-evaluation of DPB III) (Hackenitz, 2004; ZonMw, 2007, 2011e).

130 The list of evaluation criteria was developed in consultation with the Ministry of Health, Welfare and Sports which assigned the programmes (ZonMw, 2005, p. 30).
4.5 Conclusion

This chapter described how the public policy for animal research was implemented in research programmes and calls on animal-testing alternatives. It showed that during policy development, the increased focus on animal-testing alternatives as a technical solution for the social problem of animal experiments reframed the issue as a technical policy problem.

The technification process seemed reinforced by a more strict (frontstage) distinction between research and policy as part the current emphasis on the instrumental use of research in policy (i.e. evidence-based policies and practices, e.g. Bekker et al., 2010). Animal research policy was re-interpreted within the programme committees as part of the dominant discourse on animal research in the Netherlands (i.e. “science-setting dimension Colebatch, 2009. See also §2.1). The programmes’ understanding of animal-testing alternatives was thus a negotiated and temporary fixed understanding of Dutch policy on animal research. A frame analysis of the ZonMw programmes on animal-testing alternatives showed that animal-testing alternatives became gradually framed as possibilities to improve the relevance of research for humans (“issue naming”), ways to generate more knowledge of underlying systems (“categorisation”), and a multi-stakeholder responsibility (“attributing responsibility”). The rationale behind the research programmes shifted from improving research animals’ welfare in the earlier programmes to building a business case for improved human relevance (“causal story”). All shifts supported the belief of animal-testing alternatives as technical solution for the social problem of animal research: The delegation of policy implementation to ZonMw research council further technified the policy issue.

Technification helps to smoothen out the implementation process as it renders the most intractable policy issues feasible. Framing issues as technical problems (for example, the shortage of animal-testing alternatives) creates manageable technical solutions in which science takes the lead. As “research councils’ raison d’être is the difficulty of bridging the gap between government policy and scientific performance” (Van der Meulen, 2003, p. 325), the delegation of at least some part of the implementation process - that is the part that involves scientific knowledge development - to research councils such as ZonMw seems valid.

Yet, as the policy issue on animal research was already understood as the development of animal-testing alternatives during policy development, the responsibility for the success of the overall policy programme was also delegated to the research council. Research councils are not equipped to take on such a responsibility, regardless of whether this is even desirable. Nonetheless, the success of the Dutch policy on animal-testing alternatives depended predominantly on the success of the research programme(s): The policy investments in animal-testing alternatives were expect to pay off in decreasing animal numbers in the Netherlands.

Delegating the process of finding a solution to the societal issue of animal research to a research council is problematic, because increased technification also implies a (temporary) depolarisation of the policy issue and hampers a second-order policy reflection. The focus on the development of animal-testing alternatives made the policy issue all about the shortage of such alternatives, rather than, for example, an ethical evaluation of the use of (research) animals. The frame shifts that accompanied the research programmes further strengthened the technification of the issue: Research animals were framed as models to be reduced, replaced, or refined. Moreover, the programme evaluation remained at the first-order level of policy reflection, and as such it ignored, lacked, and missed other, non-technological fixes for the policy issue of animal research. Other socio-political factors limiting the use of alternatives, such as regulatory inertia, editorial power, and the lack of knowledge exchange between countries, research fields, and institutions appeared hardly addressed (see also Chapter 7). This not only leads to inadequate argumentation supporting the development of alternatives to animal testing but also to continuing controversy rife with misunderstandings and policy failure. As a result of the delegation of success, the depolarisation and lack of policy reflection remain largely invisible at the policy level, and by extension for society at large.

These insights place the new evidence-based policy model in the Netherlands in a different perspective as well. The instrumental and linear view of the relationship between research and policy overlooks the unstructured and ambiguous nature of many policy problems, including animal experimentation, and potentially threatens the delicate balance that is needed to produce usable knowledge for doable problems (e.g. Bekker et al., 2010).

Technification makes policy implementation easier, as it helps to translate (divergent) societal values into workable activities and practices, such as research calls and scientific research. However, the underlying diverging societal values and expectations still exist, even though they have (temporarily) been set aside. Scientific research alone cannot sufficiently meet the societal expectations regarding research, including the ones regarding animal-testing.

131 The position and function of research councils along the science-policy nexus is a topic of ongoing (scientific) debate (Gulbrandsen, 2005; Gulbrandsen et al., 2011; Hessels, 2010).
132 Weingart (1999) study on scientific expertise and political accountability argues that the fact that many issues put on the political agenda are a product of perception through science, is one evidence of the “scientification of politics”.

alternatives. Technification thus takes the sting out of the debate, but the latter could later make a return with a vengeance.\textsuperscript{133} Following Marleen Bekkers and colleagues (2010), it seems that productive research-policy relations need both the frontstage legitimatisation and backstage processes that support the co-production of research and policy.

We can conclude that the strict separation between research and policy in delegating policy implementation to ZonMw did not justify the persistence of the policy issue of animal research. The strong orientation towards science side-lined other actors and strengthened the technification of the issue. As such, the emphasis on evidence-based policies (based on the rational view) may have contributed to the incongruence between societal expectations and (technical) promises regarding animal research and animal-testing alternatives. Without guidance and specification, national promises of policy change have a hard time living up to the expectations of other actors in the field.\textsuperscript{134}

\textsuperscript{133} Chapter 7 also discusses the drawbacks of this “technological fix”.

\textsuperscript{134} A stricter definition of animal-testing alternatives on the central level of authority (for instance, Parliament) is not likely to avoid the gap between societal expectations on a high abstract level and the execution of policy (implementation problems), because “making policy is likely to involve participants in different organizations, and these may be (outside) the line of hierarchical authority stakeholders” (Colebatch, 2009, p. 26). Instead, we need an interactive account of policy making, which stimulates mutual learning between scientists, policy makers, users, and the society at large.
Academic researchers are increasingly promising societal benefits in order to secure the necessary resources to carry out their work. However, to achieve societal relevance in research programmes is a rather complex endeavour. Scientists often struggle to locate the societal relevance of their research, situated between the dominant bibliometric assessments of science (e.g. impact factors, track records) and funders’ requirements for the valorisation of science (i.e. the value beyond the scientific domain). This struggle may lead to tensions in the research programmes and raise questions about the extent to which the present system and corresponding indicators can truly advance societal benefits. This chapter studies how the Netherlands Toxicogenomics Centre attempts to live up to the societal expectations regarding animal-testing alternatives against the backdrop of the changing nature of research funding.

The nature of research funding has changed dramatically over the past few decades, including the government’s expenditure on R&D and innovation and the changing “contract” between science and society (e.g. Hessels, 2010; Martin, 2003). A recent study from the Rathenau Institute showed that despite R&D expenditure increasing several times over, government support for R&D and innovation will drop in the 2013-2019 period (Van Steen, 2015). The Rathenau Institute forecasts that unless additional investments are made, the Dutch government will be providing less direct (e.g. institutional funding) and indirect (e.g. tax incentives) financial support for R&D and innovation in a relative sense, and the support will not keep pace with economic growth. Yet, the quest for research growth – more specifically, the quest for societally relevant research, which lives up to the demands and questions of future generations, such as food security, sustainable agriculture, climate change and health – seems to be relentless.

The increasing emphasis on the societal relevance of research seems to require a different organisation of science as well. Already, it is generally assumed that the interactions between universities, industry and public organisations have intensified over the last decades (e.g. Etzkowitz & Leydesdorff, 2000). For example, intermediary funding organisations demand the establishment of so-called public-private partnerships within research programmes. In such partnerships, public institutions, such as universities and hospitals, are expected to co-
create knowledge along with private institutions, such as spin-off companies, multinationals or NGOs. Based on a strong belief in creating both scientific and economic gains of research ("valorisation"), such public-private partnerships are at the foundation of present and future Dutch research policies (e.g. OCW, 2014).

Within this changing science-society contract, producing or promising societal benefits for academic research plays a vital role in the “credibility cycle” of science (Hessels, 2010; Latour & Woolgar, 1986). Such promises could catalyse credibility conversions, especially from recognition to money (i.e. the acquisition of research funding). For example, genomic research built on the promise to revolutionise our understanding of the human body and provide new avenues for medical treatment and biotechnology. As such, this emerging technology was able to secure major investments for research in this direction (e.g. the prestigious Human Genome Project (HGP)) (Collins, Green, Guttmacher, & Guyer, 2003; Zwart, 2008, 2013).

The Netherlands Toxicogenomics Centre (NTC) also built on this idea of revolutionising the world by applying “omics techniques” in the toxicological research of biochemical hazards. In doing so, the NTC claimed it was producing more relevant knowledge about the human body and its underlying mechanisms while using fewer research animals than was the case in traditional toxicological research. Its societal promise is emphasized in documents produced by the programme, as evidenced in the following extract:

The science and practice of safety assessment for drugs, chemicals, cosmetic and food is entering a period of revolutionary change today. This emerging era of safety assessment will enable better-informed, science-based decision making about the risks of substances to human and environmental health. At the same time, these next-generation safety assessments hold the promise to do so faster, more economically, and by using far fewer animals than current safety assessment methods. (NTC, 2007, p. 4. Emphasis added)

With a total budget of over 53 million euros (NTC, 2007), the NTC can be considered a research consortium of great magnitude by Dutch standards (and clearly of a different order than ZonMw’s programmes on animal-testing alternatives in Chapter 4). It publically legitimises its existence by pointing to important societal values, such as the safety and welfare of research animals. The question remains how a large research programme incorporates such public values into its daily practice, and which tensions scientists experience when striving for their work to have societal relevance. For example, the practical application of knowledge (e.g. animal-testing alternatives) may create societal benefits, but is hardly recognised as a rewarding scientific endeavour. The research question addressed in this chapter is: What sorts of tensions may be developed when large research consortia, such as the NTC, strive for their research to have societal relevance?

The following section will outline this chapter’s theoretical framework and method. Subsequently, section 5.2 will provide a short introduction to toxicology and toxicogenomics in order to understand the general purpose of the NTC research programme. The three sections that follow will each examine a tension on a different level: on the public level with the public legitimisation of emerging technologies (§5.3); on the level of science assessment with the economic valorisation of research (§5.4); and on the level of science funding with societal benefits as spin-offs from mainstream research (§5.5). Finally, section 5.6 concludes the chapter with a look at the implications of these tensions for achieving societally relevant research, especially with regard to the development of animal-testing alternatives.

5.1 Promises, performance assessment, and societal relevance

The increasing demand for societally relevant research has intensified the role of promises, especially in relation to society at large and intermediary research organisations. Promises play an important role in science: They can guide and provide structure to research activities, attract the interest of others and cultivate resources (e.g. Borup et al., 2006: See also Chapter 2). As such, activities and promises regarding technological developments and scientific research form a vital part of the “credibility cycle” of science (Hessels, 2010; Latour & Woolgar, 1986). Producing or promising societal benefits may thus catalyse some of the conversions, especially from recognition to money.

Promises may also legitimise research by providing both the problem (e.g. animal research in toxicological research) and the possible solution (e.g. development of animal-testing alternatives). As such, promises may develop into requirements to be achieved and into a necessity for technologists to work on (i.e. “promise-requirement cycle”) (Van Lente, 1993, 2000).

137 In this research, a promise is understood as the (deliberate) discursive production of a desired future by individuals, organisations or a discourse coalition as a whole (‘the sender’). An expectation is defined as a created future image as a result of the produced promise (‘the receiver’). See also §2.6.2.

138 The credibility cycle explains how struggles for reputation influence the daily work of individual scientists. The model depicts the research process as a repetitive cycle in which conversions take place between money, staff and equipment, data, arguments, articles, recognition etc. (Hessels, 2010).

139 This function of promises aligns with that of frames (see also Chapter 2).
Paradoxically, the societal relevance of research may also be in conflict with scientists’ credibility in practice, resulting in various types of tensions: From the more abstract relationship with society at large to the practice of doing research. Such tensions develop during the execution of research programmes and can therefore be seen as unanticipated consequences (after Merton, 1936).

A first type of tension may develop on the public level of the research programme. A promissory discourse (“promisomics”) runs the risk of becoming inflated and may entail a loss of credibility for science (Chadwick & Zwart, 2013). Such overpromising may form a first type of tension within research consortia, especially when societal benefits are deployed to legitimise disputed research and technologies.

A second type of tension may develop on the level of science assessment. While performance assessment were initially undertaken as a means to enhance the societal accountability of scientists (Van der Meulen & Rip, 2000), such assessments have gradually fuelled the “publish or perish norm” in science (e.g. Weingart, 2005). Bibliometric tools (e.g. science citation index and analysis of impact factors) have added a quantitative dimension to the conversion from articles to recognition (Hessels, 2010). In other words, scientific publications risk becoming an end in themselves rather than a means of communicating scientific findings.

The concept of “valorisation” has gained importance over the past decade as a way to emphasise the value of scientific knowledge beyond the scientific domain - and thus to provide an answer to the problems of the more traditional bibliometric tools. Often defined as “the process of creating value from knowledge by making knowledge suitable and/or available for economic and/or societal use and translation that knowledge into competitive products, services, processes and entrepreneurial activity” (National Valorisation Commission in Drooge et al., 2013), the concept incorporates the economic as well as (other) societal values of research. However, it has largely become narrowly understood in terms of universities’ economic contributions through patenting, licensing, spin-off formation and technology transfer (e.g. AWT, 2007; Drooge et al., 2011b, 2013). The emphasis on the economic valorisation and (quantitative) performance assessment of research programmes may therefore contribute to a second type of tension in research programmes striving for societal relevance.

Finally, a third tension – and related to the previous one - may develop on the level of research execution: especially when more basic research activities lead to more prestigious publications than application-oriented projects (Hessels, 2010) and scientists’ interests and curiosity diverge from the societal claim of research programmes. At the daily research practice, the (claimed) societal relevance of the research may move to the background and run the risk of becoming a side product of the programme rather than top priority. This poses a third tension for large research programmes: How to balance the societal relevance of research in the daily practice, especially when the programme entails diverging societal values such as safety, animal welfare and medical progress?

Such tensions or unanticipated consequence reflect the changing ideas about the role of science in our society, including the position of research councils, the programming of relevant research, and the development of relevant indicators for science evaluation. Barend van der Meulen (2003) has shown how the changing contract between science and society challenged divisions of the Norwegian Research Council to develop new policy instruments and to reconsider their position in relation to science, policy and society. Moreover, the term responsible research and innovation (RRI) has gained increasingly policy relevance over the last years, in particular within the European Commission’s Science in Society programmes as part of the EU Horizon 2020 initiative (e.g. EC, 2013a, 2013b) but also in Dutch research organisations (NWO, 2013, 2015). RRI seem to house three distinct features: the emphasis on the democratic governance of the purpose (e.g. socially and desirable ends), the responsiveness (e.g. anticipate on unintended impacts and ethically reflect on underlying purposes) and the responsibility (e.g. new responsibilities for policy makers and research funders) of research and innovation (Owen et al., 2012). RRI holds the promise of a transformation from science in society to “science for society, with society” (Laroche, 2011 in Owen et al., 2012). Finally, various (Dutch) scholars and institutions are attempting to develop relevant indicators for the evaluation of science (e.g. De Jong, Van Arensbergen, Daemen, Van der Meulen, & Van den Besselaar, 2011; Drooge & Spaapen, 2011a; Drooge et al., 2011b; Eric, 2010b; VSNU, 2013). For example, Leonie Drooge and colleagues developed a “4D valorisation model” whose four dimensions (actors, aggregation level, discipline and stage) create unique “valorisation maps” for various situations (2011b).

These developments show that the contract between science and society is ever developing. An improved understanding of the unintended consequences that occur within large research consortia in their quest for societal relevance may help to reflect on the functioning of research programming, including the role of research funders, and may further the development of relevant indicators as well as.

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140 In 1978, the journal Scientometrics was launched as a new medium to stimulate the development of the quantitative study of science, or scientometrics.

141 See also (Benneworth & Jongbloed, 2010) for an introduction on valorisation, including the realities that underpin the more limited view of valorisation as universities’ economic contributions and the consequences for the arts and humanities.
Chapter 5 - Societal relevance in research programmes

5.1 Interpretive analysis of a research consortium

This chapter’s interpretive analysis focuses on the NTC’s understanding of animal-testing alternatives as part of the societal relevance of its research activities. The analysis is built on various documents, including public policy documents regarding genomics investment in the Netherlands, and the policy documents (e.g. business plan, mid-term reports) of both the NTC and the NGI. These documents are considered a temporal fixation of negotiated meaning in interaction (e.g. on animal-testing alternatives) between the multiple players involved (see also Chapter 2 and 4). In addition, two NTC annual meetings were observed (in January 2011 and 2012) for a perspective on the progress being made.

I conducted nine semi-constructed interviews to gain more insight into the work of the NTC programme, the (experienced) role of promises in the funding process and the kind of tensions that evolved during the development and execution of the programme. In total, six work package leaders of the 5 work packages (indicated as WP leaders NTC 1-6 in the text), one Ph.D. student, one senior researcher, one former employee of the NTC and one senior researcher involved in the execution of the resolution were interviewed. In addition to the official interviews, I spoke to many people who are part of the consortia during the annual meetings and postgraduate courses on toxicological risk assessment (October 2009) and toxicogenomics (February 2010). Through these courses, I obtained a more detailed and technical understanding of genomics as a developing technology, including its potentials and limitations and the process of risk assessment. The empirical data were analysed for the various levels of tensions as outlined in the previous section: public, science assessment and research execution.

The next section will provide a short introduction to risk assessment, toxicology as a scientific discipline and the promises of toxicogenomics.

5.2 A short introduction into risk assessment, toxicology and toxicogenomics

In everyday life, we rely on the safety of the food products we consume, the medicines we take, the chemicals we inhale, the surgeries we undergo, the household products we clean with and the cosmetic products we apply to our skin. Such products, medical devices and chemical substances need to be tested and verified as safe before they are placed on the market.

Risk assessments are performed to gain more insight into the type of risk such products may carry. For instance, the assessments calculate the amount of food additives that can be consumed safely on a daily basis, or the time someone can work safely while exposed to certain chemicals. The assessment involves the identification of the hazard (the adverse effect of the compound), the characterisation of the hazard (a dose-response curve) and an assessment of the exposure. The goal of assessments may be to determine the acceptable daily intake (ADI) of substances that can be ingested daily throughout life without appreciable health risks (WHO, 1987) or otherwise.

Some of these risk assessments involve animal studies. For example, the ADI is determined by dividing the No Observed Adverse Effect Level (NOAEL) in research animals by the safety factor. This factor needs to compensate for any intraspecies (between sensitive humans and population as a whole) and interspecies (between the animal model and the human population as a whole) differences. The value depends on the adequacy of the safety database and whether the critical effect has been studied in humans. In general, however, a safety factor of 100 is maintained (a factor of 10 for both intra- and interspecies differences), which results in an ADI that is 100 times lower than the NOAEL in research animals. The safety evaluations of substances are conducted within the legislative frameworks of many different internationally operating organisations, including the OECD (chemical substances) and ICH (pharmaceuticals for human use).

Toxicology is the scientific discipline concerned with determining adverse effects, the dose at which something is hazardous, and the biological mechanisms underlying the effect: It is “the study of adverse effect of chemicals on living organisms” (Eaton & Klaassen, 2003, p. 7). Traditionally, toxicology is dominated by studies on the ‘phenomenological level’ (in vivo) in animal studies, such as the effect on organ weight, tumours development and death (Shostak, 2005). Toxicological studies are classified according to their point of interest or end point, such as reproductive toxicity (i.e. effect on reproductive system and offspring), carcinogenicity (i.e. cancer development) and genotoxicity (i.e. DNA damage). In 2013, 49 335 (9.4%) toxicological studies were reported in the Netherlands (NVWA, 2014, p.18). The majority of these studies reported studies to determine the reproductive toxicity of compounds (18 910), followed by teratogenic research (9 884) and sub-acute toxicological research (7 216).

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142 This introduction departs from a rather narrow definition of risks and does not do justice to the vast number of relevant studies, literature and disciplines. For example, it ignores the social dimension of risk acceptance (e.g. Beck, 1992) as well as the negotiated risk of similar events across different countries (i.e. risk assessment as “boundary work” in Halfman, 2003, 2005).

143 Note that this number of research animals does not cover the animals used within, or just at the boundaries, of the NTC programme. These animals fall primarily in the category of “answering scientific questions”. Moreover, toxicological research primarily involves the “safety assessment of substances”, which is stated as a separate goal in the Act on Animal Research (Article 1).
Of these 49,335 reported toxicological studies, most involved rats (36,849), followed by mice (45,182) and fish (41,690) on a large scale (NVWA, 2014, p. 43, Table 6). Toxicological research primarily involves the safety assessment of substances (total of 38,532 studies in 2013), including substances produced by or intended for industrial use (26,092), potential environmentally toxic substances (3,861) and food additives for human consumption (2,968) (NVWA, 2014, p. 37, Table 38).

Over the years, animal models have become the “golden standard” in risk assessments as well as drug development; the majority of the scientific community still regards the value of the animal experiments as self-evident. Disasters such as the sedative drug Thalidomide tragedy in the late 1950s have only intensified the use of research animals as “models” for humans. Over time, new animal studies have been added to the regulatory system and created a “patchwork” system (e.g., Hartung, 2009a, 2009b). The use of animals in the safety assessments of substances is increasingly a topic of debate, especially since the relevance of animal models for certain assessments have been questioned, and EU regulations leave room for the use of alternatives to animal testing (e.g., Heringa, De Wit-Vos, Bos, & Hakkert, 2015; Kooijman, 2013; Schifflers et al., 2014; Schifflers et al., 2007; Schifflers, 2016 (expected); Vandebriel & Opperhuizen, 2011; Vonk et al., 2015).

Advances in biotechnology have changed the science of toxicology over the past few decades, even though many of its work have remained well above the molecular level for a long time (Shostak, 2005). The development of a number of technologies that profile changes in genes (and gene products) supports the hypothesis of the potential role that individual genes, proteins or metabolites play in biological processes (Aardema & MacGregor, 2002; Pennie, Woodyatt, Aldridge, & Orphanides, 2001). Genetic and molecular toxicology promised “a more comprehensive view of toxicity than has been possible previously, since toxicity generally involves (...) a cascade of gene interactions” (Aardema & MacGregor, 2002, p. 14). In other words, such developments in molecular toxicology promised to open up the “black-box” of more traditional, phenomenological, animal-based toxicology.

The molecularisation of toxicology continued with the emergence of toxicogenomics. It was introduced in 1999 as “a new sub-discipline derived from a combination of the fields of toxicology and genomics (...) concerned with the identification of potential human and environmental toxicants, and their putative mechanisms of action, through the use of genomics resources” (Nuwaysir, Bittner, Trent, Barrett, & Afshari, 1999, p. 153). Toxicogenomics focuses on toxicant-induced gene expression profiles, which can be used as a “highly sensitive and informative marker for toxicity” (ibidem). The basic principle is that chemical compounds induce (small) changes in gene expression and that such changes can be monitored in thousands of genes simultaneously by using what are called microarrays. Subsequently, common sets of changes in gene expression unique to that class of toxicants are determined, leading to a class-specific “toxicant signature”. The assumption is that a comparison of gene expression profiles induced by unknown agents with the established signatures can position the unknown agent within a particular class and provide valuable (toxicological) information about the substance (e.g., Aardema & MacGregor, 2002; Nuwaysir et al., 1999; Sarrif, Delft, Gant, Kleinjans, & Vliet, 2005).

While analysing gene expression levels still dominates toxicogenomics studies, developments in ascendant fields have made it possible to study other cellular levels, too. At present, toxicogenomics encompasses the broad range of studies of the cellular products controlled by the genome, such as proteins (‘proteomics’) and metabolites (‘metabolomics’). Together with transcriptomics (transcription levels) and genomics (gene expression level), these technologies are commonly referred to as “omics technologies” (e.g., Aardema & MacGregor, 2002). Collectively, they represent a sort of toolkit that focuses on the component most relevant to the research question at hand.

Thus, whereas analysis of gene expression had the ability to predict adverse toxicity (genetic toxicology), toxicogenomics promised a great capacity to further the mechanistic understanding of toxicant action (Aardema & MacGregor, 2002). It was expected that, by using the collective of approaches within toxicogenomics, a better understanding of the underlying mechanism would improve the efficiency of safety and risks assessments of drugs and chemicals (Hamadeh, Amin, Paulus, & Afshari, 2002). In 2002, Raffaella Corvi from the European Centre for the Validation of Alternative Methods (ECVAM) wrote a short overview of ECVAM’s research areas in which toxicogenomics would initially be applied, including the monitoring of cells during in vitro cultures and the identification of new molecular endpoints for use in in vitro toxicity testing. Interestingly, Corvi did not mention the toxicogenomics potential to reduce animal numbers in risk assessments apart from mentioning the overall necessity of research into alternative methods to animal experimentation and testing with regard to the EU’s Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (See also §5.5).

The demarcation of genomics as a new discipline, and of toxicogenomics in particular, was also important in terms of allocating new funding opportunities and investments. As Sara
Shostak notes in her paper on the emergence of toxicogenomics in the United States, “(...) the inclusion of ‘omics’ made clear that this was a genomic, molecularised science. Moreover, itself a neologism, ‘toxicogenomics’ signalled that this was a new science, worthy of new resources” (Shostak, 2005, p. 374). In the Netherlands, the potential of toxicogenomics was formally recognised with the establishment of the Netherlands Toxicogenomics Centre (NTC), part of the larger Netherlands Genomics Initiative (NGI), in 2004.

The general hypothesis of this research is that at the higher organisational level, it is the toxic perturbation of a rather limited set of integrative biological pathways that induces certain human diseases such as generative diseases, organ failure and immune disorders, and that this enables the synergetic study of comparative mechanisms of toxicity across these biological pathways.

(NTC, 2007, p. 21)

The next section describes how the understanding of animal-testing alternatives as a “business case” created a first tension on the public level.

5.3 Tension on the public level: animal-testing alternatives as 'business case'

A first tension developed on the public level of both research consortia. Here, the societal relevance of genomics was used to legitimise the public investments in (at least in some respects) a disputed technology. The emphasis on the societal relevance of scientific developments was thus deployed to distract attention from other, unwanted, side effects.

The overall mission of the NTC was “The Tactical Advancement of Applied Systems Toxicology” (NTC, 2007). According to the business plan, the key steps towards this ambition were focusing on systems toxicology model creation, fostering consortium-level collaboration with external partners, strongly emphasising the applied nature of research and in particular aligning research goals with the specific needs of governmental safety assessment imperatives. This last step made an explicit connection with animal-testing alternatives, albeit at some distance in the future:

NTC’s focus will be on the “applied mechanistic research” to generate genomic-based insights and ultimately system toxicity models that will enable improved predictive toxicology for humans, the developments of new chemical safety assays to Replace, Reduce, and Refine animal models, and develop high throughput in vitro tests for use in meeting regulatory needs.

(NTC, 2007, p. 8. Emphasis added)

The NTC built a strong case by integrating the societal and economic opportunities in one research programme. Drawing on some powerful European imperatives for the improved safety assessment of chemicals and cosmetics (e.g. REACH and the seventh amendment to the Cosmetic European Directive), the NTC articulated the need for its “applied systems toxicology paradigm”. In addition to this science-orientated case, the NTC created a powerful financial case. As forecasted by the Cambridge Heathtech Associates, the “economic magnitude” of this global market was expected to increase from 70 million euros to more than 200 million euros during the scope of the programme. It was estimated that an NTC-derived business enterprise would be able to capture around 15% (equalling about 30 million euros) on an annual basis (NTC, 2007). The development of new safety arrays was thus reframed as 3R-models (i.e. the replacement, reduction and refinement of animal model) with impressive economic potential to create or save money in the safety assessments of pharmaceuticals, industrial chemicals, cosmetics and foods. As such, animal-testing alternatives were reframed as a powerful “business case”.

This reframing of animal-testing alternatives’ development attracted different actors and mobilised support from unexpected corners, such as research institutes and chemical industries. The interest in animal-testing alternatives’ development was thus no longer exclusively reserved for the relatively few animal welfare-driven researchers and other animal lovers, but attracted the attention of actors that were primarily interested in the human relevance and the economic potentials of such methods (See also chapters 3 and 4). With the inclusion of toxicogenomics in the discourse of animal-testing alternatives, the scope of interested actors expanded greatly.

The question remains where this ‘economical turn’ in the reframing of animal-testing alternatives in the light of genomic research came from. After all, the potential of the “genomic era” (e.g. Guttmacher & Collins, 2003) was also expected to put pressure on the number of research animals, given the importance of the animal model in applied and fundamental areas of biomedical research (e.g. COGEM, CBD, & Gezondheidsraad, 2010).

5.3.1 Mobilising societal support for contested technologies

The relation between genomics and animal research was part of the Parliamentary debate on biotechnology in 2001. On the one hand, the political parties viewed genomics as a promising, emerging field worth investing in. Yet, on the other hand, some also feared that genomics research would lead to an increase in the number of animals similar to what had happened with the introduction of genetic modification in the 1990s. Education, Culture

146 The emphasis on “applied” and “paradigm” is an action of labelling and reframing, similar to Shostak’s observation of genomics as a demarcated discipline.
and Science Minister Loek Hermans acknowledged a general increase in animal research due to genomics but also stressed that the search for animal-testing alternatives would eventually lower the use of research animals.

In general, genomics leads to an increase in experiments. There will be additional funding for the search for alternatives. That will cause a certain pressure on the use of research animals. However, when alternatives are found, and the developments in this area continue, the use of research animals will diminish greatly. If there is no need for research animals, they won’t be used. With study we hope to reduce the use of research animals as much as possible in term. (my translation) (Minister Hermans in Tweede Kamer, 2002a)

The search for animal-testing alternatives was thus used discursively to compensate for the increase in overall animal research as a result of genomic research. With societal concerns about genetic modification fresh in her memory, Erica Terpstra, a fellow party member of the minister, argued that the development of animal-testing alternatives could also help to gain social acceptance for biotechnology and genomics.

Biotechnological research demands much more research animals, but biotechnology can also have enormous potential for the development of animal-testing alternatives. I believe that the societal acceptance of biotechnology and genomics can only be increased by this. (my translation) (VVD politician and chair of the temporal committee on biotechnology Erica Terpstra in Tweede Kamer, 2002a. Emphasis added)

In February 2002, a resolution that earmarked 900 000 euros of the genomic budget for the stimulation of animal-testing alternatives was unanimously accepted by the House of Representatives (Tweede Kamer, 2002b, 2002c). The potential of both biotechnology and genomics in the light of animal-testing alternatives, and the additional available funding in this respect, was thus deployed to legitimise the tremendous amount of public costs to stimulate these technologies. Animal-testing alternatives were successfully mobilised to gain societal support for potentially disputed emerging technologies.

5.3.2 Inclusion of (toxico)genomics in the 3R-discourse

The implementation of the resolution was mandated to the then newly established ‘Nationaal Regie-orgaan Genomics’ ['National Coordinator Genomics'], as the precursor to the Netherlands Genomics Initiative (NGI). A former employee clarified that the ambiguity of the resolution left the interpretation up to the NGI.147

It was quite a multi-interpretable resolution that was accepted. The only thing explicitly mentioned was that 900 000 euros were to be spent on animal-testing alternatives. However, whether this was to be used for the reduction of animals within overall genomics research or genomics could lead to technological endpoints, which could reduce the overall use of research animals... well, that was left completely up to the NGI. (my translation) (Interview former employee NGI, 2011)

According to this former employee, ZonMw was one of the first organisations to contact NGI about the allocated money. They suggested adding the money to the already existing ZonMw programme DPB (See also Chapter 4). As NGI “wanted to spend the money more programmatically and not subsidise some small projects”, they refused this route. Besides, NGI regarded themselves as being best equipped for technology development, as they had “had the money, the instruments, the knowledge and the network to make different kinds of connections”. However, they lacked the expertise on animal-testing alternatives (my translation) (Interview former employee NGI, 2011).

In January 2013, the National Centre Alternatives to Animal Testing (NCA) presented its findings as requested by the NGI (NCA, 2003). The NCA advised to pay “structural attention to the animal use with respect to genomics” and “to stimulate three-R research within the genomic field” (my translation) (NCA, 2003, p. 2). They also advised to prioritise three-R research as part of the toxicogenomics developments with a “focus on the development and optimisation of in vitro models”. Moreover, the NCA concluded that “the implementation of genomics technologies could hold considerable promise for the 3Rs”, but that there was still “a long way to go before genomics technologies are converted to 3R output” (Head of NCA Professor Hendriksen in Thole, 2004/2005, p. 11).148

In the end, NGI decided - against the advice of the NCA - to tackle the route of how genomic research could live up to the expectation of developing animal-testing alternatives. With its characteristic “business approach”, the NGI was convinced that animal-testing alternatives were able “to make money” and to “position the Netherlands internationally”. Besides, as the former employee explained,

147 For the sake of clarity, I refer to both organisations as NGI in this chapter.
148 This report was published by the Netherlands Genomics Initiative as a follow-up to the International conference “Genomics & Alternatives to Animal Use”, held 2-4 June 2004 in Maastricht, the Netherlands.
5.3.3 Creation of the societal promise

In sum, the promise of developing animal-testing alternatives was already deployed at an early stage of technology development to legitimise the investment in overall genomic research on the policy level. The question was not so much whether genomics research would increase the use of research animals, but rather where and by how many. As the animal model is deeply embedded in a complex system of many actors, (perceived) regulations and strong convictions, it seems highly unlikely that emerging technologies spontaneously create animal-testing alternatives and diminish the dependency on the animal model (see also Chapter 1 and the need for “chain involvement” to stimulate the implementation of animal-testing alternatives in Chapter 3 and 4). The parties’ concerns with regard to genomic developments and its pressure on animal research thus seemed reasonable and grounded. However, based on the ambiguous resolution with a small amount of funding allocated to meet this fear, it seems fair to assume that the resolution and the promise of developing animal-testing alternatives were deployed as political leverage to those critical of genomics investments, especially with regard to animal research.

The original point of concern moved to the background and became obscured from public scrutiny during the implementation of the resolution. Focused on the “business model” of research, the NGI was not as interested in diminishing animal experimentation within overall genomic research as it was in attracting private partners to research developments in the Netherlands. Lacking any political guidance on how to proceed with the resolution, the NGI did what it thought was best and what it knew how to do: It created political momentum for the further development of toxicogenomics as an emerging technology.

We may thus conclude that the societal relevance was deployed to legitimise the genomic investments, which resulted in a first tension on the public level between the societal expectations (e.g. regarding a reduction of research animals) and the technological promises of both consortia in this regard.

5.4 Tension over science assessment: valorisation of research

A second tension developed on the level of science assessment. Here the economic valorisation of the programme seemed to take precedence over the societal valorisation, resulting in a tension to achieve the programme’s claimed societal relevance in terms of animal-testing alternatives.

The establishment of the NGI network was built on developing ideas about the relevance of science in science policy. As it has evolved over the past decades, science has increasingly become understood as the interplay between various types of actors, notably organised into public-private partnerships (see also §5.1 and Chapter 2). On paper, all the actors in the partnership work together towards a defined goal. Private partners, such as industries, SMEs and NGOs can either contribute by sending in personnel and in-house knowledge (‘in-kind’), financial contributions (‘in-cash’), or both. The assumption of such partnerships is that more relevant knowledge is developed, in terms of benefits to the society at large, instead of scientific progress per se. The credo is that society has to benefit from science, not vice versa. Yet, how this relevance should be understood differs greatly from one actor to the next.

The societal value of the NTC’s programme was unmistakably presented in its 2011 progress report:

NTC’s major societal goal is to strive for developing and finding regulatory acceptance of ‘omics-based alternatives to current animal models for chemical safety testing, with a focus on seeking replacements based on in vitro cellular systems. All WPs have set roads in place for that. (NTC, 2011, p. 63)

The progress report described valorisation as the “socioeconomic impact of the work” (p.3) and clearly demarcated it from the consortium’s overall advances in toxicogenomics research. Following the division of the NGI, the NTC showed the economic value of its programme by means of primarily quantitative indicators, such as the number of filed patents, the number of reviewed invention disclosures and an overview of the screened abstracts and posters for possible intellectual property (NTC, 2011, p. 58-63).

149 I distinguish between “societal valorisation” and “economic valorisation” in order to make a distinction between a broad definition of valorisation and the often-used narrow definition of valorisation (e.g. in terms of patents and spin-offs). I am aware that such a distinction is problematic as well, as it suggests that economic value is demarcated from overall societal value, as in fact it is a selective part of it.
In line with the NTC’s major societal goal, the largest part of the section on societal valorisation covered the programme’s contribution in terms of “replacements and alternatives for animal testing” (p.63-69). An extensive overview was to show the “state of affairs” regarding the development of ‘omics-based alternatives into current animal models for chemical safety. From the descriptions, it remained unclear, however, in which phase these ‘omics-based 3R-alternatives were in relation to their use. Furthermore, apart from the organisation of a workshop on genomics in cancer risk assessments and the awarding of a ZonMw Pearl, it was not stated what the NTC did in order to get its knowledge (and models) with regard to ‘omics-based alternatives beyond the programme’s boundaries (i.e. societal valorisation). An exception was their orientation towards the European Centre for the Validation of Alternative Methods (ECVAM). The report stated that one protocol was sent to ECVAM in November 2010 and promised that more would follow. ECVAM is the central organisation for the scientific validation of methods that reduce, refine or replace the use of animals for safety testing and efficacy/potency testing of chemicals, biologicals and vaccines (EURL-ECVAM, 2015b).

Thus, even though the scientific output of the programme seemed to be outstanding and convincing, it was unclear what this progress meant in terms of the societal expectation of reducing animal research for safety evaluations and regulatory acceptance (i.e. societal valorisation). To understand NGI’s interpretation of the societal relevance of their research, it seems vital to look into NGI’s – as the main funder of the NTC – understanding of societal relevance.

5.4.1 NGI’s understanding of valorisation

The NGI required a fundamentally different mind-set from their researchers than did other, more traditional, government-based subsidies of scientific research (e.g. ZonMw, see also Chapter 4). Built on a business model of science, the NGI emphasised the importance of the

150 ECVAM is now known as the European Union Reference Laboratory for Alternatives to Animal Testing (EURL-ECVAM). Scientific validation of EURL-ECVAM is only demanded upon official regulatory acceptance, such as the uptake in the European Pharmacopoeia – which defines requirements for the qualitative and quantitative composition of medicines, the test to be carried out on medicines and substances and materials used in their production – or in the legal frameworks of biocides (Regulation (EC) No 528/2012), detergents (Regulation (EC) No 648/2004), veterinary medicinal products (Directive 2001/82/EC, supplemented with changes in Directive 2004/28/EC and Directive 2009/9/EC), among others. Note, however, that validation does not equal the acceptance and use of such methods (e.g. Kooijman, 2013; Schifflers et al., 2007; Schifflers, 2016 (expected)). Non-EURL-ECVAM alternative methods may thus already be used for screening, or other purposes, as long as this poses no direct legal consequences. For example, chemical industries may already use non-validated alternatives for the screening of potential candidates. Recently, the RIVM published a report stating that nine out of the 10 studied EU legal frameworks for the safety assessment of chemical substances pose no legal barriers for the use of alternatives in animal testing (Heeringa et al., 2015). Moreover, a second RIVM report showed that existing pharmaceutical legislation does not impose any legal constraints on the use of alternatives to animal testing, but also concluded that such legislation does not actively encourage the use of these alternatives either (Vonk et al., 2015).

return on investments besides the overall scientific output of the consortium. It proposed an “incubator model”, in which new public-private partnerships were to be created, financially stimulated during a certain period and subsequently embedded in the Dutch life sciences and technology infrastructure.

In 2011, the Review Committee of NGI’s second phase (2008-2013) concluded that “overall, the Review Committee’s view is that output is higher and has more impact than originally planned and has thereby exceeded expectations” (Technopolis Group, 2011, p. 5).

The Dutch genomics community has made a remarkable awareness shift towards understanding the value of valorisation and intellectual property, while industry has shown growing engagement by increased participation in the various programmes. The success factors for this development are the reinforced valorisation effect of NGI in (almost) every centre, including the targeted valorisation budget. (…) The realisation of the economic targets set for each NGI centre (such as patents, spin-offs, new public and private projects) is very well on track. (Technopolis Group, 2011, 5 and 10. Emphasis added)

The societal valorisation of the overall NGI programme seemed more difficult to measure and evaluate, as indicated by the absence of indicators in the report. It was foremost understood as “communication towards society” (p. 12) and the work of the Centre for Society and Genomics (CSG). As measured by the numbers of non-scientific publications and presentations, public debates, educational activities, clinical applications, new products and advisory reports, the NGI concluded that “the diverse and numerous social valorisation activities contribute to a greater understanding of genomics and its relevance” (NGI, 2011). Apparently, societal valorisation was primarily understood as a way to explain genomics to the general public. In science communication literature, such linear models are known as the “deficit model” or the “Public Understanding of Science (PUS) model” (e.g. Durant, 1993; Van der Auweraert, 2008; Van Rijswoud, 2014). These dominant models in science communications are built on the assumption that improved science literacy of the public, as based on scientific facts and possibilities, informs the public and reduces the public’s resistance towards science.

The NGI’s narrow understanding of societal valorisation hampered a more thorough evaluation of the relevance of the NTC research with regard to the societal promise of developing animal-testing alternatives. Tailor-made indicators to measure the progress in this respect were generally missing in the progress reports, with the exception of the NTC’s own mention of the ECVAM report filing. Based on this indicator, however, it should
have been concluded that the societal promise of developing ‘omics-based alternatives for regulatory acceptance lagged behind expectations.\textsuperscript{151}

\subsection{5.4.2 Problems during the daily research practice}

The NGI’s emphasis on economic valorisation also created tensions in the daily practice of researchers, especially with regard to the reward system of science and the societal promise of developing animal-testing alternatives.

The NGI requirements contributed to a simplified image of science, in which researchers deliver the project’s results before moving on to the next. One of the work package leaders felt that the appearance of a strict separation between different research activities was destructive and created problems with intellectual property (IP) of research.

\textit{The making of the reporter cell lines started 10, 11 years ago with transcriptomics. It all just took far longer than we had anticipated beforehand. (…) It is impossible to think, now I’m working for the NTC, and half an hour later, now I’m working for STW, that is not how it works, of course. It is a continuous process. (…) That is the difficulty of dividing intellectual property among projects and funders, because who owns which IP? It’s all public funding. Why all the fuss? (my translation) (Interview work package leader NTC 1, 2012)}

Besides, the funders’ and society’s demands are not always perceived as rewarding from a scientific perspective. For example, patenting “delays the publication process”, whereas the ECVAM process “takes a really long time” and “does not have the highest priority” (my translation) (Interview work package leader NTC 2, 2011). It seems that the funder’s demands thus conflict in some respect with the daily practice of doing science, especially when it comes down to those aspects that are not necessary science-awarding.

Secondly, the NGI’s emphasis on creating economic value had unintended consequences for the practice of research, especially with regard to the predictive value and the potential regulatory acceptance of ‘omics-based tests. For example, the patenting of certain gene profiles requires the lowest number of genes possible to avoid patent infringement, while this may conflict with the scientific predictive value of the gene profile. A work package leader, involved in the patenting of such a gene profile, explained it to me as follows:

\textit{The test involves 2x20 genes, but the eventual patent is about 2x3 genes. The reason for this is that patenting is vulnerable. Not expensive, but vulnerable, because others can change one gene in the profile without causing patent infringement. (…) Those three genes have a bit lower predictive value than the 20 genes, though. (my translation) (Interview work package leader NTC 2, 2011)}

Furthermore, there was some tension within the consortia about the possibility of the patenting of gene profiles as such hampering the regulatory acceptance of ‘omics-based tests, which would work directly against the societal promise of developing animal-testing alternatives. One of the NTC work package leaders, who was also involved in the regulatory acceptance of animal-testing alternatives, said he experienced this “split” and was still uncertain how to deal with it:

\textit{[T]he OECD\textsuperscript{152} has guidelines on how to do toxicological research. Those guidelines hardly involve patents, because once they do so, the OECD actually says: “you need to use that particular test of that company”, and they won’t do that. So they prefer tests that are not patented at all. (…) On the one hand, the NGI wants all sorts of products on the market with economic value. One of the vehicles to do so is patenting, and that is what we do. (…) Yet, I don’t understand it from the perspective of regulators who want an OECD test. (my translation) (Interview work package leader NTC 3, 2012)}

On the other hand, others believed that there was no reason for concern in this respect, especially as patents are very common in the modern life sciences.

\textit{Patents are everywhere, so why should the alternative tests not be allowed patents? (my translation) (Interview commercial partner NTC, 2012)}

However, this man also acknowledged the difference and a certain “tension” between a more generic patent, like a “new way to read out genes” and a more innovative patent

\textsuperscript{151} It must be said that the filing of a dossier to ECVAM is not the holy grail of indicators, as “you will need a file for the OECD with a well-validated test, but that does not necessarily have to be done by ECVAM. You can also organise it yourself with other labs” (Interview commercial partner NTC, 2012). Yet, this same person acknowledged, in the light of animal-testing alternatives, that the filing of the dossier to ECVAM or OECD “might be more important”.

\textsuperscript{152} The OECD refers to the Organisation for Economic Co-operation and Development. Its mission is “to promote policies that will improve the economic and social well-being of people around the world” (OECD, 2015a). The OECD has published many Test Guidelines which require the use of research animals, including the Herhberger Bioassays in rats (TG441) and the Amphibian Metamorphosis Assay (TG 231) for the screening or testing of chemicals for endocrine disruptions (OECD, 2015b).
based on a particular “mechanism and the involvement of particular genes”. Furthermore, he stressed that the value of the patent depends on the buyer as well, “you may have patents, but who is going to buy these?” (my translation) (Interview commercial partner NTC, 2012).

Thus while it remains unclear whether patenting gene profiles truly obstruct the regulatory acceptance of ‘omics-based 3R-tests, it seems at least worthwhile to look into the dynamics of patenting on the one hand and the development and (regulatory) acceptance of patent-based tests on the other hand prior to the establishment of new research requirements related to animal-testing alternatives.

### 5.4.3 The struggle for societal relevance

The societal relevance of scientific research is rapidly growing in importance, especially to secure research funding. Balancing and achieving this societal relevance, however, seems more difficult in practice than on paper, both for the researcher and the funders of research. Because how does one evaluate what societal relevance means in the light of individual projects? This section showed that the NGI has emphasised the economic valorisation of research, supported by the “incubator model”, over societal valorisation. Furthermore, its rather ill-defined definition of societal valorisation functioned primarily to explain genomics research to the public (i.e. Public Understanding of Science).

With this narrow definition of societal relevance and the complex network of animal research, the NGI seemed under-equipped to evaluate the societal relevance of the NTC progress in relation to its jointly shaped promise of developing animal-testing alternatives. They simply did not have the in-house expert knowledge of the systems in which the NTC’s research was to be embedded, especially not with regard to the (regulatory) acceptance of ‘omics-based tests. Hence, custom-made indicators to evaluate the progress on this level were lacking. To this end, the NGI more or less relied on the NTC in its efforts to live up to its promise of developing animal-testing alternatives.

In the dynamics between conducting scientific research and securing research funding, however, this reliance poses a serious threat to the development of animal-testing alternatives, let alone the societal expectation of reducing animal numbers. Positioned in a system that expects delivery in the short term, researchers are likely to choose the activity that best secures the near future. As long as both the reward systems of science pay little attention to the societal valorisation of research and the funder’s requirements mainly emphasise economic valorisation, it seems rather unlikely that researchers will employ those activities that are needed to secure direct societal benefits (e.g. development of animal-testing alternatives).

We can thus conclude that the funder’s emphasis on economic valorisation and the science rewarding systems (e.g. bibliometric analyses) may produce tensions on the level of science assessment in the orientation towards societal relevance.

### 5.5 Tension in the execution: developing ‘animal-testing alternatives’

A third tension developed on the level of research execution as the development of animal-testing alternatives was by many NTC researchers understood as a side product of other more mainstream research.

The scope of the NTC programme was said to cover possible application in the fields of pharmaceuticals, industrial chemicals, cosmetics and foods. Yet the question remains how the work package leaders within the NTC interpreted the “development of applied system toxicology methods” with a “substantial reduction in the use of animal-based tests” (NTC, 2007, p. 7) in their work.

Against the backdrop of the European REACH enforcement in 2007, some NTC partners focused on the alternative methods for regulatory toxicology. REACH came into force on 1 June 2007. It was adopted to improve the protection of human health and the environment against the risks that chemicals can pose. In principle, REACH applies to all chemical substances, including those used in industrial processes, cleaning products, paints, as well as clothes and furniture. REACH affects a wide range of companies across many sectors, including manufacturers, importers and downstream users (e.g. ECHA, 2015). The regulation was expected to have a great impact on the number of research animals, because of the additional animal testing that is required. The exact impact of the regulation, however, differed significantly between the EU Institute of Health and Consumer Protection’s “2.6 million vertebrate animals” (Van Der Jagt, Munns, Tørsløv, & De Bruijn, 2004) and the Transatlantic Think Tank for Toxicology’s “(10) “54 million vertebrate animals” in 2009 (Rovida & Hartung, 2009). Yet, both estimates agreed on the huge percentage to be used for reproductive toxicological endpoints.

153 It is fair to note that it is not necessarily up to the NGI alone to develop such custom-made indicators. Measuring the progress regarding animal-testing alternatives is rather difficult and currently a topic of debate (e.g. Van Zijverden et al., 2013b). Yet, and especially with regard to the legitimisation of the societal promise of research programmes, research funders also have a responsibility to measure, contribute to and achieve the societal relevance of scientific research.

154 REACH stands for the Registration, Evaluation, Authorisation and Restriction of Chemicals (ECHA, 2015).
REACH legislation was enforced, which also showed that the required reproduction test, such as the two-generations studies, required by far the most research animals. When developing alternatives, it therefore seems logical to think about this area. Overall, you need about 60% of all research animals for these kinds of tests: adult animals, as well as their offspring. (my translation) (Interview work package leader NTC 4, 2011)

According to the ECHA, REACH also promotes alternative methods for the hazard assessments of substances in order to reduce the number of tests on animals (ECHA, 2011).

Alternative test: alternative techniques that can provide the same level of information as current animal tests, but which use fewer animals, cause less suffering or avoid the use of animals completely. Such methods, as they become available, must be considered wherever possible for hazard characterisation and consequent classification and labelling for intrinsic hazards and chemical safety assessment. (ECHA, 2011, p. 7)

The researchers used the NTC programme to further validate the tests they had been working on for years in order to make the test more sound and robust, and to convince the regulators of their relevance.

What we try to do is to scientifically, mechanistically characterise these tests, so that we know what happens. Is what happens in the test really relevant for what happens in the research animal? If we can show the relevance, then we may be able to convince the regulator that it is useful to use the alternative test. Maybe not as a complete substitute, but perhaps in some sort of pre-stage, that one pre-screens the substance in an in vitro test, or a battery of in vitro tests, and that one subsequently decides whether or not to test in vivo and how to do that. (my translation) (Interview work package leader NTC 4, 2011)

For others, this optimising stage was still a bridge too far. They used ‘omics technologies in the process of “hazard identification” to optimise their animal studies and thereby reduced the number of animals per study.

At this moment, I see the potential of genomics technologies primarily in the hazard identification and the reduction of animal use in the subsequent steps. We already have experience with this in our own institute (…) With this foreknowledge we can design animal studies with fewer animals. We are able to look more specifically into the parameters found during the hazard identification process. The intention is to use this for risk characterisation processes. (my translation) (Interview work package leader NTC 5, 2012)

Yet, other work package leaders seemed to apply ‘omics technologies for a better understanding of biological mechanisms with no direct reference to the development of animal-testing alternatives.

We start from an understanding of the mechanisms of disease to define drug targets and the development of compounds that are directed at those targets. (…) The cell model we use is not a validated system that everyone can use and that is for the regulatory toxicology of great importance, of course. A cell system of which everyone says, this is the method to predict whether or not something is hazardous. (my translation) (Interview work package leader NTC 6, 2012)

Look, one can only really measure cancer in an animal or a human. We look at the cancer characteristics that we know cause cancer and are related to it. But that is a very big step, which cannot be replicated in a cell tissue system. (…) We are just busy developing better systems that really tell us something about a substance and how we can relate that to cancer research. (…) You don’t look at cancer, you never look at cancer. I look at what piques the attention of a little reporter. (my translation) (Interview work package leader NTC 1, 2012)

The advantages of ‘omics based tests were, at least to some researchers, based on the pre-screening of the numerous amount of compounds within industries.

The future is about whether we can find interested companies for our test: companies that screen 10,000, 100,000 molecules for certain pharmaceutical characteristics (…) because many substances are excluded based on tests that may not even be predictive. Then they throw away substances that could have made billions in profit. So we think we can play a role in that niche. (my translation) (Interview work package leader NTC 1, 2012)

The researchers involved in the NTC thus differed in their interpretation of ‘omics in relation to the development of animal-testing alternatives. Most researchers interpreted the model development as ways to “unravel” and “understand” mechanisms underlying disease and toxic responses, whereas others used the ‘omics potential to optimise their previous work on alternatives for regulatory purposes or to gain more knowledge in order to refine animal experiments.
5.5.1 Ambiguous relation with animals as models

In the light of the NTC’s claim of contributing to and developing animal-testing alternatives, it is interesting how animals are positioned both within and just outside the NTC programme and involve the same partners.

The NTC business plan already showed the diverging and sometimes ambiguous relationship with animals in general, and animals as “biological models” in particular, among the different work packages (WPs). For example, mouse models were used to “expand our database of in vivo gene expression data” (WP1), whereas further studies in rodents were used as follow-up from the in vitro phase to compare selected genes and pathways with classical endpoints (WP2). The zebra fish developmental assay was used as an alternative to the mammalian embryo culture, and in vitro work was “supplemented with dedicated testing in the pregnant rodent to establish the relevance of the in vitro findings” (WP3). Blood samples from patients were compared with similar samples from mice and rats treated with the same drug (WP4), in addition to the use of “wild types” and specific transgenic mice to study organ toxicity (WP4) (NTC, 2007). These plans highlighted the importance of “animal models” in the NTC’s interpretation of developing animal-testing alternatives. Apparently, according to them, the contribution and development of alternative methods required more research animals.

The use of additional animal research to optimise models puts the work of the NTC - and that of many other programmes - in a strange light. While strictly speaking the partner’s work outside the programme exceeds the NTC’s responsibility, it highlights an important tension when developing animal-testing alternatives. After all, it can be debated whether additional animal work to “increase patent value” (Interview work package leader NTC 1, 2012) or to make “3D screenings models” based on human tumours (Interview work package leader NTC 1, 2012) is actually valid.

What we want eventually, for the reporters as well, is to make new mouse models. That is impossible within the alternative programmes; they won’t pay for that. No, I really want a mouse model with the reporter that predicts the carcinogenicity of a certain compound. Then I would like to show in a mouse that if the substance led to liver tumours, the reporter would primarily turn on in the liver as well. Such information can then be taken back to the reporter model to validate (...) to make even better reporters that better predict cancer. Preferably in vitro so I wouldn’t need mice at all, but I have to show in the mouse that it works first. (my translation) (Interview work package leader NTC 1, 2012)

Moreover, the technological possibilities in themselves do not replace the use of research animals in safety evaluation and toxicological research all together. Besides, the existence of false positives (the test tests positive but should have tested negative) and false negatives (the test tests negative but should have tested positive) may pose a problem to the full acceptance of in vitro models.

Eventually, all substances in need of market approval will be tested in research animals. You would want a system that is just as good as everything tested in rats and mice, that it all be negative. Then you could say, “my in vitro system is so good, there is no false positive”. On the other hand, you could also say, “it is too stringent, and no substance passes”. That is something you don’t want either. So you always have more false positives and false negatives than what you would like to achieve. (my translation) (Interview work package leader NTC 1, 2012)

The interpretations above highlight the complexity of developing animal-testing alternatives, especially as follow-up animal studies are needed to optimise in vitro models, whose likelihood of being accepted remains highly uncertain. Moreover, it also suggests the need for a systemic change (e.g. regulatory toxicology) in additional to the technical development itself. Apparently it is rather difficult to develop relevant and valid indicators to measure the societal relevance of programmes such as this one.

5.5.2 (Ir)relevance of research models

With regard to the societal promise of animal-testing alternatives, it is important to look at the researchers’ stated motives in their search for alternative research models. Note that alternative models do not necessarily equal animal-free or three-R models here.

Whereas all researchers emphasised the human irrelevance of animal models to some extent, the researchers differed in what they perceived to be the better alternative for their research. For example, some stressed the limited relevance of classic animal studies for human risk assessment. Their search for alternative models was driven by a more realistic, refined assessment of health risks.

During the risk assessment process with research animals, you come across all sorts of problems. Animal experiments are generally performed with an extremely high dose, which humans would never be exposed to. Subsequently, those results are extrapolated to values realistic to the situation in which humans are exposed. (...) The more precise the extrapolation, and the better one can take away the uncertainties, the better it is. If you know more about
the working mechanism, if you have sensitive biomarkers (...) you’re a step ahead. (my translation) (Interview work package leader NTC 5, 2012)

Yet, others questioned the relevance of basic ‘omics technologies (i.e. transcriptomics) with regard to the mechanistic understanding. Here the search for an alternative model was grounded in the belief that a more mechanistic understanding would be of greater relevance to the biological, human system.

What does decreased gene expression mean in a biological sense? What we try to do with functional genomics, eventually, is to turn off individual genes with DNAi and study which genes are relevant to the biology. (...) If one understands what a substance does, which proteins are involved, well, then we also understand the system better and can classify substances as either bad or good. (my translation) (Interview work package leader NTC 6, 2012)

It is possible to have three times more transcription and 20 times more protein, or 20 times more RNA and three times more protein, or 10 times more RNA without more proteins, so there is a lot of variety. (my translation Interview work package leader NTC 1, 2012)

Finally, some emphasised the difficult position of animal models in general. On the one hand, they argued that animal models were irrelevant to study the human response, because such models lacked certain important human features, but they also stressed, on the other hand, that animal models were still needed to answer more in-depth questions, for instance about immunology.

Well, can the mouse skin predict what would happen in the human skin? Mouse skin is much thinner and has much more hairs than human skin. Besides, there are certain repair enzymes present in the human skin that are not present in the mouse and vice versa. So there are quite a few differences between mice and humans that are also visible in the mouse study’s results. They cannot be applied to the human situation in practice. (my translation) (Interview senior scientist NTC, 2011)

It is a struggle between two thoughts, because mouse models can answer different questions that cannot be answered in the skin model. We can hardly include patients in our studies. (...) A skin model doesn’t have T and B cells, and if you want to reconstruct that in a skin model, that is very difficult and way beyond the truth as well, I think. (...) Besides, the longevity of a skin model is only a few weeks, and skin cancer develops in five to 10 years. (my translation) (Interview senior scientist NTC, 2011)

5.5.3 Animal-testing alternatives as side products of mainstream research

In sum, researchers in the NTC programme adhere to a widespread interpretation of animal-testing alternatives in their daily work practice and research projects. Whereas some try to improve the relevance of their earlier developed models for regulatory toxicology by including more sensitive ‘omics-based biomarkers, most researchers still found themselves a long way from any test application. They seemed not so much interested in test applications as in developing models that could better understand and predict human response. It can thus be concluded that in the daily research practice of individual researchers, other goals prevail over the development of animal-testing alternatives for risk assessment or regulatory toxicology.

Within the NTC, the search for alternative models was not seen as a separate activity or even a research field but as a “welcome spin-off” of other, more dominant research developments enhancing the mechanistic understanding of the human body (“third-generation alternatives”; see also §3.3.2 and §4.3.3).

5.6 Conclusion

This chapter studied which tensions developed within the Netherlands Toxicogenomics Centre in its quest to produce societally relevant knowledge, e.g. the development of animal-testing alternatives.

Firstly, the possibilities of establishing animal-testing alternatives played a crucial role in the societal legitimation of genomics research in the Netherlands in general, and of toxicogenomics in particular. With the increase in research animals’ numbers resulting from genetic modification in the 1990s still fresh in mind, it was anticipated that the allocation of some funding for animal-testing alternatives could help emerging technologies, such as genomics, to achieve societal acceptance. During the implementation process of this allocation, the developments regarding toxicogenomics were used to make a new package deal. The societal promise of improving the safety assessment with fewer animals while simultaneously gaining economical wins pulled the contested public debate on animal research out of its impasse. Developing alternatives was no longer limited to a handful of dedicated animal lovers but opened the door for new players to enter the arena. This positioning of toxicogenomics strengthened the societal expectation that the newly established the NTC would deliver models that could diminish the number of research
animals in risk assessment. The legitimisation of disputed research activities by pointing to the societal benefits poses a first tension in the programme.

Secondly, the NTC struggled to live up to the funders’ expectations regarding the valorisation of research. In line with more recent trends in research funding, the NGI emphasised a “business model approach” for doing science. They seemed primarily interested in the scientific and economic progress of the centres, as indicated by the emphasis on the numbers of published articles, dissertations, patents and spin-offs. The NGI’s interpretation of societal valorisation was rather narrowly defined as the public understanding of science and mostly included the centre’s effort with regard to science communication as measured by their non-scientific articles, among others. As both the NGI and the NTC claimed to value the societal valorisation of research, it is remarkable that the development and finding regulatory acceptance was not an integral part of the evaluation process and that there were no indicators in place to evaluate the progress in this regard. The absence of ways (e.g. relevant indicators) to evaluate the societal valorisation of research poses a second tension in the programme.

Thirdly, the research for 3R-alternatives becomes increasingly a “welcome spin-off” of other research. The advantage is that the search for such methods becomes integrated along the full range of scientific disciplines, instead of in a separate and scientifically uninterested subfield. The downside, however, is that far more research will be labelled as “alternative research”, which complicates the visualisation of progress in this respect. As such, the decision between dedicated or mainstream research development poses a third tension in the programme.

Overall, the acceptance of toxicogenomics within the alternative-discourse thus strengthens the shift towards the development of “third-generation alternatives”. This interpretation of animal-testing alternatives underscores the importance of understanding the underlying working mechanisms in the human body. While the focus on the “target organism” may surely be of great importance to advance knowledge of the human body, it remains uncertain whether existing animal models will actually be replaced or supplemented by such additional technological possibilities, and therefore, the effect on animal numbers remains unclear.

Moreover, the relevance of toxicogenomics for the screening of new compounds means these developments are now facing an even more complicated tension. As the system of risk assessment is not likely to change as rapidly as the emerging technologies develop, the contribution of ‘omics-like technologies may lead to a relative reduction but hampers an absolute reduction of research animals. In other words, the number of animals per test or substance may be reduced by including ‘omics-based parameters, but this leaves the total number of research animals untouched.

Thus, the inclusion of toxicogenomics in the alternative-discourse has silently moved the scientific interpretation of alternative models even farther away from the societal expectation of reducing animal numbers by developing animal-testing alternatives.

The tensions that developed during the execution of the NTC programme also opens up the (governmental) initiatives to develop animal-testing alternatives to public scrutiny. Surely, there are still many technical hurdles to overcome and fundamental questions to answer, not least of all is the extent to which the ‘omics-yielded data can be used to predict human responses of unknown substances. After all, increased DNA transcription does not necessarily lead to increased protein production, and increased protein production does not necessarily lead to an increased (toxicological) response. Even after decades of research, the mechanistic foundation of ‘omics technologies still seems to be in their infancy. However, regardless of the uncertainties, ‘omics technologies are increasingly applied in important fields in the natural sciences, including the life sciences (e.g. cancer and food research) and chemical sciences (e.g. toxicological and safety research).

The expectation seems that the availability of data from various sources, including for example omics-technologies and system biology (i.e “big data”), and the possibilities of emerging technologies such as organ-on-a-chip and organoids will increase our understanding of the human body. It seems highly unlikely that such technological progress depends on the development of animal-testing alternatives initiatives in order to flourish. However, initiatives to develop animal-testing alternatives are easily redirected to advance technologies and the mechanistic understanding of the human body.

155 In this respect, it would be refreshing to visualise the percentage of other types of funded research (i.e. other research programmes, or health funding organisations) that would also be granted under the present discourse of alternative research.

156 In short, system biology refers to the computational and mathematical modelling of complex biological systems, including humans. Organ-on-chip (e.g. long-on-a-chip, heart-on-a-chip) is a multi-channel 3D microfluidic cell culture chip that stimulates the activities, mechanism and physiological responses of entire organs and organ systems (see for example the Dutch start-up Mimetas). An organoid is a 3D organ bud grown from (human) stem cells that still have the possibilities to differentiate into different cell types (see for example the Dutch Hubrecht Organoid Technology not-for-profit organisation).
The real, more fundamental question thus remains whether small research projects such as the one funded by ZonMw (see also Chapter 4) or large research consortia such as the NTC can truly advance animal-testing alternatives and have ensure they live up to the societal expectation of decreasing animal numbers, or whether they are merely an excuse to reassure the public.

Without public deliberation on societal relevance and the values grounding research programmes such as the NTC, their activities and outcome are unlikely to meet the public’s expectations of the societal relevance of science. Even though the production of new package deals, such as the NTC’s combination of safety and animal-testing alternatives, may successfully attract new support and secure research funding, it may also create tensions on various levels. As such, the claimed societal relevance of research programmes may even, paradoxically, widen rather than bridge the gap between science and society in this respect.
Vulnerability of discourse coalitions

Tensions threatening the future of the present discourse coalition on animal-testing alternatives
The support for animal-testing alternatives as an answer to the societal concerns regarding animal experimentation appears to be deeply rooted in the Dutch policy-science nexus (i.e. Dutch policy in Chapter 3, research councils and programmes in Chapter 4, and research consortia in Chapter 5). Yet, it seems that this “normative horizon” is starting to look more diffuse. The quotations below, which come from a parliamentary debate in 2013, reveal that there is no such thing as political consensus on the issue of animal research and that investment in animal-testing alternatives is valued rather differently from one political party to the next.

Reduce, replace and refine is a nice approach of which nobody can disapprove. But let’s be clear, acceleration should be part of the list. (Party for Freedom MP Dion Graus)

If we do not know the effects of the present policy, we can talk all we want, but I wonder what we are doing. (GreenLeft Party MP Jesse Klaver)

At the same time, some spokesmen ask: What is a high budget? That is a political choice; I see that. (State Secretary of Economic Affairs, Sharon Dijksma) (my translation) (All quotations from Tweede Kamer, 2013)

The political debate also reveals a lack of consensus with respect to the effectiveness of current animal research policy in the Netherlands. Tied to a disappointingly limited decrease in animal numbers over the past decade, the policy seems to have lagged behind societal expectations. Animal-testing alternatives no longer seem to be a shared value but a topic for further political debate.

Building on the empirical work from the previous chapters, this chapter studies how the discourse coalition on animal-testing alternatives initially was able to accommodate a large variety of actors, values and goals but now seems to be falling apart. The research question addressed in this chapter is the following: How can the present tensions in the discourse coalition be explained in the light of the discursive processes that formed the coalition in the first place?

In this chapter, I will argue that the vulnerability of the discursive processes that helped to establish a new discourse on animal-testing alternatives, as well as the current tensions within the discourse coalition, seem to be taking their toll. The present discourse coalition is facing its limits.
A better understanding of the discursive processes that enabled the formation of the discourse coalition in the first place and insight into the tensions to which the coalition is presently exposed may help to explain the appearance of the blurry horizon at present and restore its former clarity.

The next section describes the theoretical notions needed for overall analysis in this chapter. Section 6.2 describes how a new discourse on animal research dislocated the previous one, making way for a discourse coalition on animal-testing alternatives. The chapter continues in section 6.3 with the discursive processes that enabled this new discourse coalition, including the vulnerabilities of these processes. Section 6.4 looks into the tensions to which this discourse coalition is exposed at present. The chapter concludes with some final remarks and builds towards concrete policy improvements that will be laid out in Chapter 7.

### 6.1 Discourse, discourse coalitions and the co-creation of promises and expectations

The discourse analysis central to this chapter builds on the theoretical framework of discourse, discourse coalitions and the co-creation of promises and expectations as outlined in the previous chapters (and especially §2.3).

As a reminder of the theoretical notions introduced in chapter two, discourse coalitions are understood as “the ensemble of a set of story lines, the actors that utter these story lines, and the practices that conform to these story lines, all organised around a discourse” (Hajer, 1993, p. 47). A discourse coalition is centred around a specific discourse and may entail a variety of actors, including NGOs, political parties, scientific organisations and research institutions (Hajer, 1995; Van den Brink, 2009).

A discourse coalition can be said to dominate a given political realm when it controls the discursive space: Central actors are persuaded or forced to accept the rhetorical power of a new discourse (“discourse structuration”) when the policy process is implemented according to the ideas of a given discourse (“discourse institutionalisation”). The concepts of discourse and discourse coalitions make it possible to study and grasp the orientation towards animal-testing alternatives in the Netherlands.

Discourse coalitions are thus always subject to tensions challenging the boundaries of the coalition. When the coalition can no longer manage the tensions, it will likely disrupt the corresponding discourse, too (“discourse dislocation”) (e.g. Hajer, 1995; Van den Brink, 2009).

Such tensions often result from diverging promises and expectations in the discourse coalition. The analytical distinction between promises and (societal) expectations is relevant to this chapter. Promises are understood here as the messages that the discourse coalition sends as a collective identity. Expectations, by contrast, are regarded as the messages received by either individual members of the coalition or the society at large (i.e. “societal expectations”; see also §2.6.2).

### 6.2 The creation of a new discourse coalition and its technological promise

To understand why the present discourse coalition seems to be facing its limits, we must first look into the process of how the new dominant discourse on animal-testing alternatives formed in order to replace the old one on animal experimentation.

#### 6.2.1 Making room for a new discourse

Towards the end of the 20th century, the development of new arguments opposing animal experiments dislocated what was then the leading discourse on animal experimentation.157 Before, animal experiments had mainly been rejected on ethical grounds. Many held that the “intrinsic value” of animals gave us the moral obligation not to use them in experiments, regardless of the potential benefits for humans and other animals (For an excellent outline of the use of the concept: Brom, 1999). This ethical argument divided stakeholders into two opposing camps: those opposing animal experiments under any condition and those who did not (yet) see any other way forward. However, new arguments against animal experiments evolved, which led to new coalitions between groups that had previously opposed each other. For example, an increasing number of researchers criticised the use of animal studies in drug development by referring to their low predictive value (For references refer to: Kooijman, 2013, p. 10). Moreover, the high rate of potential drugs that did not make it through the process of clinical trials, despite encouraging results in animal studies, increased companies’ incentives to search for methods with a higher predictive value (Kooijman, 2013). Scientific and economic arguments against animal experiments thus began to enter the field as well. With the rise of these new arguments, the boundaries between the two former discourse coalitions underwent a significant shift.

The disruption of the dominant discourse on animal experiments boosted the formation of a new discourse on animal research. With the introduction of the new arguments, the problem of animal experimentation was no longer solely ethical (and thus requiring an

157 Margo van den Brink (2009) used the concept of dislocation exclusively for extreme disruptions, such as replacing one discourse by another (see also Chapter 2).
ethical solution). Scientific and economic motives also became reasons to move away from traditional animal experiments. Stakeholders’ conflicting and opposing values, which hampered cooperation within the former discourse, were thus no longer perceived as problematic. Instead, a shared future would flourish, based on a shared need for “animal-testing alternatives”.

6.2.2 The maturing of a discourse coalition

The ethical, economic and scientific arguments fitted neatly into a bigger narrative that also formed the discursive glue for a new discourse coalition. After all, alternative methods with a higher predictive value (scientific argument) were to save money (economic argument) as well as animals (ethical argument). Animal-testing alternatives were presented as a “win-win-win situation” (see also Chapter 3) and attracted a diverse number of stakeholders into the discourse coalition. The discourse coalition was thus formed around the binding narrative or discourse rather than a shared norm and value system per se.

Despite the attractive power of the narrative, the boundaries of the discourse coalition were continuously being tested by the exclusion of some and the inclusion of other actors. Some actors, like ADC and SHAC-NL158, were successfully kept out of the coalition by being labelled as “extremists” or even “terrorists” (e.g. AIVD, 2004, 2007; AIVD, 2009)159. By contrast, actors working on the development of emerging technologies were included in the coalition because of their potential to keep the narrative vivid and promising (see also Chapter 5 on ‘omics technologies).

6.2.3 The establishment of a new dominant discourse

Meanwhile, the new discourse structured the way in which animal research was conceptualised and the central focus on animal-testing alternatives became more and more institutionalised (Hajer, 1995: See also Chapter 2). The attention for alternative methods grew, both in the Netherlands and abroad. For example, animal-testing alternatives became part of both national and international legislation (e.g. Wod and Directive 86/609/EEC) and developed into a separate policy issue (e.g. VWS, 2011b: see also Chapter 3). Further institutionalisation of the discourse was accomplished by newly established research programmes on alternatives methods (e.g. AXL8, 2014. See also Chapter 4 and 5), specialised scientific journals (e.g. ALTEX, AATEX) and the establishment of several validation centres (EURL-ECVAM, 2014; ICCVAM, 2014; JacVAM, 2014). The narrative on animal-testing alternatives thus started to dominate the conceptualisation of the field (“discourse structuration”) and solidified into specific institutional arrangements and organisational practices (“discourse institutionalisation”). In other words, the new discourse on animal research became dominant in the Netherlands (Hajer, 2005).

6.2.4 The discourse coalition’s shaping of promises and expectations

The discourse coalition’s binding narrative co-created different promises and expectations, of which some were more prominent and present than others.160 The discourse coalition’s promise was built on the belief that science and new technologies are the answer to the problems associated with animal experiments. Furthermore, there was an assumption that the development of new animal-testing alternatives would guarantee the use of such methods (see also Chapter 4 on the “technology push” approach). In public, the anticipated reduction of research animals’ numbers thus legitimised the investment in animal-testing alternatives (see Chapter 3 for the legitimisation as found in policy documents, Chapter 4 for research councils and Chapter 5 for the academic community). In other words, the discourse coalition created a technological promise regarding the investment in animal-testing alternatives.

The creation of promises inevitably yielded various expectations as well. For example, some members of the scientific community expected three-R alternatives to deliver “better science” (see also Chapter 5), whereas for others such methods were expected to improve overall animal welfare in research and testing circumstances. Still for other members, three-R alternatives were expected to stimulate cooperation between various stakeholders. Many of the expectations that were created were not always congruent.

More important in the light of this research, however, was the shaping of an expectation among the public at large. This societal expectation entailed a direct relationship between (an investment in) animal-testing alternatives and the number of research animals used. This societal expectation was further strengthened by the claims the discourse coalition made on various semi-public occasions, such as meetings and public debates on this topic, and in a range of documents, including policy documents, research calls and research proposals (for examples, see Chapters 3-5). The societal expectation thus followed the technical solution as shaped by the discourse coalition and was reinforced over time by the discourse coalition’s claims and promises.

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158 ADC stands for the Dutch Anti Dierproeven Coalition (Coalition against Animal Testing), and SHAC-NL is an abbreviation of Stop Huntington Animal Cruelty Nederland.

159 This research has not explicitly paid attention to the formation and maturing of the discourse coalition as such. The so-called outsiders may thus well have made a deliberate decision not to enter the coalition. For the purposes of this chapter, while I am personally opposed to actions undertaken by individuals, groups or organisations to violate Dutch law, these “activist” or “terrorist” groups play an important role in establishing the boundaries of the dominant discourse in the Netherlands and are therefore relevant to this analysis.

160 The distinction between promises and expectations here is analytical and does not seek to compromise their co-creating relationship over time. The created promise is thus as much the result of the societal expectations regarding animal-testing alternatives as the societal expectation is the result of the coalition’s promise.
6.2.5 The successful reframing of an old discourse
The narrative of animal-testing alternatives paved the road for a technical solution to the problem of animal experiments. The contrasting values with regard to (research) animals, which had led to a deadlock in the old discourse on animal experiments, changed significantly with the introduction of a new discourse (i.e. “discourse dislocation”; See also §2.3.2). The discourse coalition’s shared need for animal-testing alternatives provided guidance and was able to end the stalemate on the issue of animal experimentation. The focus on animal-testing alternatives thus successfully reframed the problem of animal experiments as a technical problem that required a technical solution.

With this technical focus, the discourse coalition co-created the societal expectation that an investment in animal-testing alternatives would directly lead to a decrease in animal numbers.

6.3 Discursive processes binding the new discourse coalition
The previous section described the establishment of a new discourse coalition around animal-testing alternatives, including its technological promise to reduce animal numbers. Yet, the question remains how the new discourse coalition was able to accommodate such a diverse assortment of actors, values and goals into a single narrative. This section answers this question by looking into three different, yet related discursive processes: the level of policy reflection, the concept’s flexibility and the function of promises and expectations. In addition, it addresses the vulnerability of the present discourse coalition by sketching the opposite pole of each of these processes.

6.3.1 The level of policy reflection
One of the processes that may make it possible for the discourse coalition to accommodate such a variety of stakeholders, values and goals may be its presence on the first-order level of policy reflection (Fischer, 2003; Grin & Van de Graaf, 1996a; Schön, 1983). The different interpretations and expectations with respect to the seemingly shared goal of animal-testing alternatives, as well as their underlying structuring values and norms, were not addressed.

The discourse coalition functioned on the basis of a technical-analytical discourse on the first-level of policy evaluation (Fischer, 1995, 2003; Fischer, 2007a). The binding narrative and discourse coalition’s promise were both built on the assumption that more three-R research would lead to increased implementation and use of animal-testing alternatives. Whether this type of research was relevant to the problem at hand was hardly discussed within the discourse coalition.

The technical-analytical focus of the discourse coalition was strengthened by delegating the national policy’s implementation process to a research council. Since their main assigned and perceived role was to stimulate research into and development of animal-testing alternatives, the implementation of such methods and the reduction of animal numbers were placed at somewhat of a distance. Besides, the leading dominant “science and technology push” approach focused more on development than the use and need of such methods (see also Chapter 4, and especially §4.4.2).

Furthermore, the evaluation of scientific programmes as part of the national policy on animal-testing alternatives remained within the scope of technical verification. The goal of technical verification is “to produce a quantitative assessment of the degree to which a certain programme fulfils a particular objective (...) and a determination (...) of how efficiently the objective is fulfilled (Fischer, 2003, p. 193). Both the evaluation of the DPBI-III programmes (Chapter 4) and the NTC programme (Chapter 5) fit into this prime concern of measuring the efficiency of programme outcomes.

The functioning on this first-order level of policy reflection made it possible for all members in the discourse coalition to work with - instead of against - each other. They were able to recognise themselves in the binding narrative and the discourse coalition’s promise without needing to discuss their different or even opposing values and norms with the other members. Politicians, NGOs, industries, funding organisations and scientists, among others, all worked towards the seemingly shared goal of animal-testing alternatives. The discourse coalition and its first-order level of policy reflection thus provided concrete guidelines on how to act.

161 Following Grin and Van de Graaf (1996a), I argue that the object of Fischer’s first-order discourse is analogous to the object of Schön’s first-order reflection in action, and what Fischer calls second-order discourse corresponds to Schön’s second-order reflection. Therefore, these concepts are used interchangeably throughout this chapter. Fischer’s framework offers the logic of four interrelated discourses that outlines the concerns of a post-empiricist policy evaluation. The first two discursive phases of the logic of the policy evaluation, constituting the level of “first-order evaluation”, are technical verification and situational validation. First-order evaluation focuses on the specific action setting of a policy initiative and the situational context in which they occur. The second two discursive phases of the logic, or the level of “second-order evaluation”, are societal vindication and ideological choice. Here, evaluation shifts to the larger societal system of which the action is part. For more information on the model, please see Fischer (2003), p. 191-198 and Chapter 2.

162 It is fair to say that ZonMw aims to stimulate the implementation of animal-testing alternatives by funding possibilities (so-called VIMPs) and the active connection of stakeholders in recent years. However, ZonMw’s research agenda remains dominated by scientific inputs and research questions rather than market demands (an approach known as “demand pull” in innovation literature).
The central tenet of three-R research as “societally relevant” (see also Chapters 4 and 5) contributed to strengthening the discourse coalition further. Developing and contributing to the three Rs as a spin-off from other research evolved into a new and interesting way of legitimising research.  

6.3.1.1 Vulnerability: neglect of second-order policy reflection  
On the one hand, we may thus argue that the discourse coalition’s functioning on the first-order level of policy reflection facilitated the cooperation between a diverse range of actors in the field. All members were able to recognise themselves in the overarching and binding narrative of the coalition that provided them with concrete guidelines on how to act. 

On the other hand, this neglect of the second-order level of policy reflection may also pose a threat to the future of the present discourse coalition. Given that the diverging values, prioritisations and norms are hardly discussed within the discourse coalition, it remains unclear whether individual members really strive for the same goal of decreasing animal numbers. 

This lack of clarity poses a threat to the present discourse coalition, as members may be working together with different and irreconcilable understandings of the preferred social order (i.e. second-order reflection). The empirical chapters have already indicated that members from within the coalition have different reasons to work on animal-testing alternatives. To some, better-informed science may prevail, while others saw the reduction of research animals as a top priority.  

Animal-testing alternatives are still being presented as a technical solution to animal experimentation (first-order reflection) in the present discourse coalition, without the need for further specification and elaboration on the different ideas of the preferred social order (second-order reflection). This operating on the first order was an absolute necessity for the establishment of the discourse coalition in the first place, as the member’s second-order differed too much from each other to find overlapping and shared ideas. Complete ignorance of this second order, however, may lead to a false sense of security regarding animal experimentation and research. Contrasting ideas on this matter may drive the present discourse coalition apart in the long(er) term.  

6.3.2 The flexibility of the concept  
Another discursive explanation of why the discourse coalition was able to accommodate such a diversity of norms and values may be the flexibility of the concept. The concept of ‘animal-testing alternatives’ was robust, yet flexible enough, to integrate the three arguments (i.e. economic, scientific and ethical) into a trustworthy narrative, while still leaving room for new players and their interpretations. 

The strength of the concept was determined by its simultaneous provision of guidance as well as flexibility (Note the resemblance with a “boundary object” Star, 2010; Star & Griesemer, 1989: See also Chapter 2). The concept made clear that something had to be changed (i.e. guidance), but it lacked the details on how to achieve this (i.e. flexibility). This combination made it possible for diverging stakeholders to work together towards one normative horizon (i.e. the use of animal-testing alternatives) without the need to express their conflicting values on numerous issues related to animal experiments.  

The guidance and robustness of the concept minimised the need for stakeholders to express their different opinions, values and norms. Building on Russell and Burch’s ideas regarding the three Rs (Russell & Burch, 1959), the members of the discourse coalition ostensibly felt that their different prioritisations, ideas, norms and values were well-represented within the concept. For example, animal welfare NGOs were primarily interested in the replacement alternatives, statisticians in the reduction alternatives, and zoologists in the refinement alternatives. As most stakeholders could position their own work, agendas, values and norms within the range of the concept, there was no need to express these with the same openness and hostility as in the previous discourse regarding animal experimentation and research. 

Moreover, the flexibility of the concept provided room for new players to enter the discourse coalition and alter the concept’s meaning. With the inclusion of new stakeholders, the interpretation of animal-testing alternatives expanded towards a broader and more scientific understanding. Animal-testing alternatives became a synonym for ethical, economic and scientific improvement, as opposed to classical animal models (see also Chapter 3 on shifting policy frames as reflected in Dutch policy documents since the 1970s). 

Moreover, this process of inclusion also affected the discourse coalition’s interpretation of what counted as good animal-testing alternatives. At first, only those models that could...
replace the animal experiment were labelled as “alternative” (i.e. “first-generation animal-testing alternatives”). Later, animal-testing alternatives were understood as either the replacement, reduction or refinement of the former animal model (i.e. “second-generation alternatives”). With the inclusion of new players and emerging technologies, this definition was even further broadened. Methods and technologies that could only partly replace, reduce or refine animal experiments in a testing strategy also became labelled as an alternative. Animal-testing alternatives became more and more “positive side effects” of other research. In recent years, the **avoidance** of animal experiments has also been included in the definition of animal-testing alternatives. It seems that research, technologies, methods and other initiatives no longer have to be directly linked to (former) animal experiments in order to be named an “alternative” (i.e. “third-generation alternatives; See also Chapter 5).

### 6.3.2.1 Vulnerability: over-flexibility

On the one hand, we may thus argue that the flexibility of the concept was needed to accommodate a diversity of stakeholders, view, values and norms within the same discourse coalition at first. We may even claim that without this flexibility, the formation of a discourse coalition would not have succeeded.

On the other hand, this same flexibility also poses a threat to the present discourse and coalition. The inclusion of more and more interpretations runs the risk of over-flexibility: The concept becomes an umbrella concept without any, or at least with much less, distinctive power. New methods that never used animal models before can then also be **relabelled** as animal-testing alternatives and as such gain widespread legitimacy, while other non-animal methods fail to jump on the alternative bandwagon. As with the concept of “sustainability”, the distinctive power between an animal-testing alternative and a non-animal-testing alternative runs the risk of becoming less clear due to over-flexibility.

The broadening of the concept may also directly backfire at the discourse coalition, as the gap between the technological promise and the societal expectations increases. After all, the inclusion of new technologies such as ‘omics technologies and 3D-printing (i.e. “third-generations alternatives”) makes it even more difficult to position animal-testing alternatives inside the context of fewer research animals as it remains to be seen whether such technologies will truly overcome the use of research animals or whether they will supplement present animal experiment. Therefore it can be expected that the inclusion of new technologies and the broadening of the concept make it even harder for the discourse coalition to live up to its own technological promise and the societal expectation that is derived from it.

The flexibility of the concept of ‘animal-testing alternatives’ was needed to accommodate the various stakeholders and their ideas, values and norms in one discourse coalition. However, this strength may also turn against the discourse coalition and pose a threat to its future existence and success. The distinction between an alternative and a non-alternative becomes less clear, which makes the concept increasingly susceptible to exploitation: It is a matter of (re)framing and marketing whether, for example, a new technology is regarded as an animal-testing alternative or not. When this happens, the gap between the technological promise and societal expectations is likely to widen even more.

### 6.3.3 The functionality of promises and expectations

The third explanation of the discourse coalition’s ability to accommodate such a diversity of stakeholders may lie with its powerful use of promises and expectations. The discourse coalition created a strong technological promise to which all members could relate, while the inclusion of new technologies kept the coalition’s binding narrative alive and strong.

Promises and expectations play a crucial role in everyday life, as they guide activities, provide structure, attract interest, foster investment and legitimise actions (e.g. Borup et al., 2006; Van Lente, 1993: See also Chapter 2 on the STS field “sociology of expectations”). Likewise, the **technological promise** played a crucial role in the formation of the new discourse coalition. It provided the internal structure of the coalition and guided its activities towards the ostensibly shared goal of animal-testing alternatives. Furthermore, the promise mobilised societal and financial support for three-R research (see also Chapters 4 and 5). The technological promise thus made a strong verbal and discursive link between animal-testing alternatives and animal numbers in experiments.

Nonetheless, promises continually require attention to maintain and renew their supportive function.165 In this case, the inclusion of emerging technologies kept the binding promise alive and vivid. Chapter 5 showed how the promise of the emerging ‘omics technologies fuelled the discourse coalition’s technological promise, and the positioning of such technologies was able to re-boost the coalition’s promise. At present, the promise of 3D printing seems to have partly taken over this position (NKCA, 2014; Proefdierijvrij, 2014c).166 Like biofuels, it seems that animal-testing alternatives need ever-newer ‘generations’ to re-strengthen the power of the technological promise.

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165 See, for example, the discussion on biofuels. Once hailed as a solution to many emerging problems, including climate change and energy security in developed and developing countries, biofuels are increasingly a topic of debate for their contribution to rising food prices and a loss in biodiversity.

166 The NKCA report points out that the most likely effect of 3D-printing is on the substitution (“vorkomen”) or avoidance (“vermijden”) of animal experiments. Furthermore, the report addresses several points of interests, including the monitoring and evaluation of the three Rs and the socio-ethical aspects of 3D printing, such as human enhancement.
6.3.3.1 Vulnerability: over-promising

On the one hand, we may argue that the introduction of new promises from time to time is crucial in order to keep the discourse narrative alive and vivid. It mobilises research funding, gives direction to policy and attracts the attention of the general public.

On the other hand, this same function of promises also poses a threat to the present discourse and coalition. The inclusion of promises runs the risk of over-promising: improbable views of the future without reflection on the present situation and earlier promises. Such overstretched promises may not to be limited to the research field but could appear in the funding and policy area, too.

This process of over-promising might divert attention away from earlier promises and avoid overall policy reflection on the topic. Firstly, the positive effects of emerging technologies on the numbers of research animals are more present in the policy discourse than the counter stories of an increase in animal numbers related to the same technologies. For example, genomics technologies were embraced because of their likely role in decreasing animal numbers, while the simultaneously expected increase in genomics was mostly denied by the discourse coalition (see also Chapter 5 and the establishment of the NTC). Secondly, the inclusion of new technological promises might strengthen the focus on technological solutions to the problem associated with animal research. Therefore, the process of over-promising may hamper a more fundamental reflection on the present policy (i.e. second-order policy reflection).

Finally, the process of over-promising risks an overall decrease in the discourse coalition’s credibility. Promising claims may find their way into the discourse coalition but are likely to raise eyebrows soon after. As these over-promising claims cannot live up to their own made expectation, they also risk spoiling it for other, more feasible and realistic claims. In the long run, they may place the entire coalition under pressure, and the discourse coalition would no longer be seen as reliable and credible.

Promising claims play an indisputably crucial role in the establishment and preservation of discourse coalitions, especially in areas with great uncertainty and high societal expectations, like the field of animal-testing alternatives. However, over-promising may hamper more fundamental policy reflection and lead to an overall loss in the discourse coalition’s credibility. It may be wise to take this into consideration before a new (technological) claim is accepted in the discourse coalition, given that anyone or anybody would be able to hinder its inclusion.

6.3.4 Balancing discursive processes

This section described three discursive processes that may explain how the new discourse coalition on animal-testing alternatives was able to accommodate such a diverse range of actors, values and norms. The processes identified were labelled as: the level of policy reflection, the concept’s flexibility and the function of promises and expectations. Collectively, these processes seemed to have played a crucial role in the establishment and maintenance of the power of the discourse coalition.

However, the processes that are responsible for binding the discourse coalition may also pose a threat to the coalition if they become too one-sided. First-order policy reflection may draw away the attention from a more fundamental second-order policy reflection; the acceptance of all new understandings under the heading of animal-testing alternatives may lead to a meaningless concept, and over-promising may lead to a decrease in the discourse coalition’s legitimacy.

The discursive processes that were so successful in pulling the public debate out of its impasse may therefore also pose a serious threat to the stability of the discourse coalition in the long(er) term. Like any other discourse coalition, it is always vulnerable to evolving tensions from both within and without. The next section asks whether the discourse coalition regarding animal-testing alternatives is currently under pressure by looking into the tensions surrounding the discourse coalition.

6.4 Discourse coalition under pressure?

Discourse coalitions are always subject to tensions challenging the boundaries of the coalition (e.g. Hajer, 1995; Van den Brink, 2009), and the present coalition is no exception. The previous section showed that the establishment of the present discourse coalition befitted from at least three discursive processes, but that these same processes may also pose a threat to the preservation of the discourse coalition in the long run.

This section looks into several tensions surrounding the discourse coalition, including the dominant orientation towards the development of alternative methods, rather than their use and relevance for animal numbers (i.e. “science and technology push” approach), the stable number of animals used in research and testing, and the growing discontent of members within the discourse coalition.
6.4.1 Tension from the foundation: the technology-push argument

The first kind of tension seems to have been created by the discourse coalition’s view that science and technology would overcome the need for animal experiments. To a large extent, research proposals have driven the scope of developments, and the animal-testing alternatives that have been developed have been pushed towards the market. This approach was built on the belief that the availability of alternative methods would guarantee their use and subsequently have an impact on the animal numbers, too. This linear assumption of knowledge progression has become known as the technology-push argument in Innovation and Science and Technology Studies (e.g. Nemet, 2009: See also Chapter 4). Recall that “the core of the science and technology-push argument is that advances in scientific understanding determine the rate and direction of innovation” (Nemet, 2009, p. 701).

The original technology-push argument has been criticised primarily for ignoring prices and other economic conditions affecting the profitability of innovations. In addition, its emphasis on a unidirectional progression within the stages of the innovation process was incompatible with work emphasising feedbacks, interactions, and networks (Freeman, 1994; Nelson & Winter, 1977). By contrast, the demand-pull argument, which was developed later on, argued that demand (instead of scientific understanding) drives the rate and direction of innovation.167

The criticism of the technology-push argument may explain why the primary focus on science and technology in the area of animal-testing alternatives has not been able to create substantial innovations in the animal-testing practice. For example, Chapter 4 showed that ZonMw programmes on animal-testing alternatives were more science-driven than orientated at the challenges users of animal research (e.g. industry, academia) experienced. In fact, only academics and knowledge institutes were allowed as project leaders in the research proposals. Moreover, Chapter 5 showed that the Netherlands Genomics Initiative tried to include some ideas of the demand-pull argument in the organisational infrastructure of their centres by requiring matching of industries. This idea was built on the assumption that matching selects only those projects that are of serious interest to the users of research animals and create long-term commitment. However, as the Netherlands Toxicogenomics Centre primarily received in-kind matching (e.g. sharing experiences, databases and compounds results), it is at least questionable whether this assumption truly holds.168 It seems that the present three-R scientific practice, including its funding, is inadequately connected to the users’ practice of animal models (i.e. academia, knowledge institutes and industries).

Moreover, there are some indications that the role of leading scientific groups and journals play a crucial role in the acceptance of three-R innovations in scientific research, although this has not yet been studied intensively. Overall, non-scientific factors (e.g. legislative context, acceptance, risk minimisation) seem to determine the rate of innovations more than the investment in three-R research per se.169

6.4.2 Tension from the promise: stable numbers

The second type of tension may have been created by the absence of visible results in terms of animal research numbers. The discourse coalition co-created a promise that the investment in alternative methods was directly related to the decrease in animals used for research purposes. However, this number has remained relative stable around 600 000 animals per year since 2000 (NVWA, 2014 p. 14/15). Based on these numbers, we may conclude that the coalition’s promise has not lived up to its own expectations.

In response, the majority of the discourse coalition has argued that the decrease in numbers was stunned by the increased generation of (scientific) knowledge.170 Indeed the policy on animal-testing alternatives seems to have led to a relative reduction in animal numbers, for example per substance or per experiment or knowledge question (see Chapter 4 and 5). The discourse coalition’s promise was thus at least partly reinterpreted as a relative, rather than an absolute, decrease in animal numbers. This difference in the interpretation of “reduction” may have placed the discourse coalition under more pressure.

6.4.3 Tension from the inside: members’ discontent

Finally, public discontent from within the discourse coalition seems to have contributed to the third tension. Some of this discontent focused on the perceptibly slow progress of Dutch policy and the lack of transparency. Others’ objections related to the usefulness of animals numbers as a policy indicator. These examples of resistance indicate that the individual values of discourse coalition’s members are currently tested and put the survival of the coalition under pressure.

167 Later work offered a less deterministic version of the technology-push argument, while still emphasising the role of science and technology. The concept became more multi-dimensional and acknowledged some of the nuances of the innovation process that the strictly ‘linear’ model ignored. Furthermore, the demand-pull argument was criticised on different grounds as well, including for its definition of ‘demand’, the failure to account for discontinuous change and the argument’s assumptions concerning firms’ capabilities in identifying ‘unrevealed needs’ (For an overview, see Nemet, 2009, p. 701).

168 In one of their latest calls, the ZonMw MKMD programme required substantive in-cash contributions from industrial or other societal partners in research proposals. Many researchers experienced problems in the formalisation of this type of contribution (Personal communication programme assistant ZonMw, 2013). Apparently, the in-cash contribution requirement did not work out as intended.

169 For a general overview of factors stimulating or obstructing the implementation of the three Rs in the regulatory process, see (Schiffelers et al., 2007).

170 However, the indicators that are available at present do not demonstrate this. See also (Van Zijverden et al., 2013b)
Some members of the discourse coalition have openly and frequently shared their frustration with the lack of transparency and the slow progress towards a research animal-free situation. For example, the Party for the Animals has raised concerns on numerous occasions about the exclusion of “killed-in-stock animals” from the yearly tally of research animals (e.g. Tweede Kamer, 2011b). Because these animals were not counted as research animals, they were not included in the annual number, either. As such, the number of research animals reported was almost half as low as the total number of research animals indirectly involved in scientific experiments. Furthermore, the Dutch Society for the Replacement of Animal Testing (‘Proefdiervrij’) has frequently and publicly shared its concerns about the slow progress (Proefdiervrij, 2013, 2014b; Zuidgeest, 2013). To support the transition towards an animal-free research world, Proefdiervrij has been collaborating with ZonMw on the development of “animal-free techniques” since 2005 (Proefdiervrij, 2015: See also Chapter 4).

On a related but slightly different note, other members have raised their concerns about the effectiveness of the current policy on animal research and animal-testing alternatives. For example, the Dutch GreenLeft Party (GroenLinks) and Democrats (D’66) wondered whether the policy was successful, given the absence of a clear decline in animal numbers (Tweede Kamer, 2011b).

### 6.4.4 A discourse coalition under pressure

The present discourse coalition on animal-testing alternatives in the Netherlands has faced at least three different, yet related, types of tension. These include the coalition’s focus on research and technology (i.e. “science and technology-push approach”), its promise to reduce animal numbers in an absolute sense and several of the coalition’s individual members’ public discontent.

The focus on research and technology may be regarded as the least visible tension here, as it has been rooted in the discourse coalition and forms the core foundation of the discourse’s promise. As such, it seems very unlikely that this tension can be solved without the coalition collapsing into smaller new discourse coalitions.

The second tension originates in the focus on animal numbers as a primary policy indicator. Both the coalition’s promise and the effectiveness of the Dutch policy on this topic are measured in terms of research animal numbers. This type of tension relates to the discourse coalition’s foundation on science and technology but may be more susceptible to change. For instance, indicators other than research animal numbers may be capable of showing the current progress of the field (e.g. number of implemented animal-testing alternatives, or qualitative progress reports by experts).

The public discontent of several coalition members is certainly the most visible tension out of the three. This does not mean, however, that the tension is easy to solve in the present coalition. On the contrary, the fact that actors resist the current state of affairs indicates that their individual and represented values are not addressed well enough by the present discourse coalition, and they may not accept this state of affairs much longer.

All in all, these tensions indicate that the present discourse coalition in the Netherlands is under serious pressure and may not be able to continue for very long in its present form.

### 6.5 Conclusion

This chapter examined how the current vulnerability of the present discourse coalition on animal-testing alternatives could be explained by looking at the discursive processes that helped to mature the new discourse.

The discourse on animal experimentation was gradually replaced by a new discourse that placed animal-testing alternatives at its core. This new discourse created room for a new discourse coalition as well: One that believed in animal-testing alternatives as the solution for animal experimentation. This new coalition attracted the majority of relevant stakeholders, including the ones that were in rather different discourse coalitions at first (e.g. NGOs and industry). Collectively, this coalition created a technological promise: The investment in research on animal-testing alternatives would lead to a decrease in animal numbers.

This new discourse coalition was made possible by the accommodation of at least three discursive processes: the relatively low level of policy reflection, the concept’s flexibility and the function of strong, appealing promises and expectations. Owing to these processes, stakeholders with rather divergent ideas, values and solutions were able to work alongside each other towards an ambiguously shared future of animal-testing alternatives. These processes were therefore of great value, and probably even indispensable, for the formation...
and maturation of the new discourse. Without the processes and new discourse, the old discourse on animal experimentation would likely still be deadlocked.

However, these discursive processes likely will not hold forever, as each one has some vulnerability. For example, ignorance of second-order policy reflection may lead to a false sense of security regarding animal-testing alternatives, whereas over-flexibility runs the risk of losing distinctive power, and over-promising may lead to an overall loss of the discourse coalition’s credibility.

Indeed, there are some indications that various tensions place the present dominant discourse coalition on animal-testing alternatives under pressure. These tensions include the discourse coalition’s orientation on science and technology as a solution to animal experimentation, the created societal expectation of a decrease in animal numbers as a direct result of the investment in three-R research, and the public statements of discontent by several members from within the discourse coalition.

Based on these tensions and the vulnerabilities of the discursive processes that helped to establish the discourse, we may conclude that the present dominant discourse on animal-testing alternatives is currently losing its ability to mobilise and attract support (i.e. “power” Avelino, 2011). The discourse coalition is still expanding thanks to new scientific actors but seems unable to attract new players (i.e. “outsiders”) that are crucial for a sustainable transition that better reflects the societal values regarding animal research (e.g. animal-free research or reduction of absolute research animal numbers). Without others, the desire for change only seems to circle inside the heads of a handful of committed individuals, which makes it quite difficult – if not impossible – to influence the dominant system of animal experimentation.

Finally, the unconditional belief in science and (new) technologies to overcome animal experimentation steers clear of some rather difficult political and societal choices. Given the vulnerability of the present discourse, however, a more thorough policy reflection is essential: The dominant belief in science and technology to live up to the societal expectation of reducing animal numbers in research is no longer tenable.

The next chapter elaborates on issues that need public deliberation as to stimulate a more meaningful policy reflection and to advance sustainable policy change.
Chapter 7 - Sustainable policy change

In the previous chapter I argued that the current dominant discourse coalition on animal-testing alternatives is losing its power and therefore slowing down a sustainable transition that better reflects the societal values regarding animal research. In this chapter I will elaborate on issues that need to be further addressed in public deliberation as to stimulate a more meaningful policy reflection and to advance sustainable policy change.

This chapter anticipates the various levels of policy evaluation and reflection (e.g. Fischer, 1995; Grin & Van de Graaf, 1996a) and suggest several means on how policy may be performed (and improved) from a central governments perspective. I will address some of the choices that need to be made without claiming to provide the normative answers: The direction and outcome of policy reflection requires public deliberation. The central question structuring this chapter is therefore the following: What possible means and corresponding policy instruments, reflecting the different levels of policy evaluation on animal research, may stimulate a more meaningful policy reflection to advance sustainable policy change in the Netherlands?

This chapter starts from the premise that at least some level of policy change is desired in the Netherlands. Firstly, this desire aligns with the trend of a more conscious attitude towards animals in general, including the on-going discussions about circus animals, bullfighting and minks, the growing interest in organic farming and green labels in fishery, and the continuing attention directed at research animals. This growing awareness is also reflected by the two seats that the Party for the Animals (PvdD) occupies in the Dutch Parliament. Secondly, the attention trained on animal-testing alternatives fits within the broader academic and political debate regarding the societal relevance of scientific research. The latter includes the large body of academic literature on the transformation in knowledge infrastructure and the relevance of science (Gibbons et al., 1994; Martin, 2003; Rip, 1988; Weingart, 1997), the collective initiative of some major Dutch players that led to the “Evaluation of Research in Context” report (EriC, 2010a), and the national NWO programme on Responsible Innovation (NWO, 2013) that followed the European move towards Responsible Research and Innovation (RRI) (EC, 2013a; Owen et al., 2012. See also Chapter 5).

Lastly, it seems that some level of policy change is required in order to move...
7.1 Policy evaluation, reflection, and policy instruments

The chapter builds on Fischer’s framework of policy evaluation (Fischer, 1995; Fischer, 2007b: See also Chapter 2), with additional insights concerning policy reflection (Grin & Van de Graaf, 1996a, 1996b), user-involvement (e.g. Nahuis et al., 2012; Oudshoorn & Pinch, 2008), and transparency and accountability (Koppell, 2005; Roberts, 2009).

Frank Fischer developed his framework to analyse different layers of argumentation within existing policies. Each of the different levels raised a different set of questions assembled in different discourses. In other words, in his work, Fischer followed an evaluation approach to policy. The present chapter applies Fischer’s framework to distinguish between the different levels of policy reflection that may be achieved in public deliberation. In this chapter, his work is thus used for a prospective approach to policy evaluation and policy design.

The adopted framework makes a distinction between first-order policy reflection, which assumes animal-testing alternatives as a solution to the various problems (e.g. economic, ethical and scientific) associated with animal research, and second-order reflection, which positions animal experimentation inside the broader societal context driving these experiments. In the second order, neither the use of animal experiments nor the development of animal-testing alternatives are taken for granted. Each of the orders is divided into two other levels (“discourses”), thus creating a framework of four levels in total. The framework clearly demonstrates the interrelatedness of all the levels and treats each of them as equally important. However, the most fundamental questions concerning animal research are raised within the framework’s “ideological discourse”, and addressing the questions within this particular discourse will likely yield the largest level of policy change.

This chapter also addresses several approaches on how to achieve the different policy objectives (i.e. “approach”). For example, the involvement of users in the research process of animal-testing alternatives may help to develop more relevant three-R alternatives. Furthermore, reflection on the societal values that guide animal experiments may help to decrease the reliance on these experiments.

For each of the approaches, some viable public policy instruments are provided. Such instruments are understood as “sets of techniques by which governmental authorities wield their power in attempting to ensure support and effect social change” (Bemelmans-Videc, 1998, p. 3). These categories follow Vedung’s (1998) “stick-carrot-sermon” classification. This trichotomy refers to the application of rules and regulations (i.e. “stick”), the use of economic means such as taxes and subsidies (i.e. “carrot”), and the provision of information that seeks to influence people with reasoned arguments, the exchange of knowledge, and persuasion (i.e. “sermon”). This differentiation between policy instruments may be difficult to uphold in practice. For example, producers may regard the labelling of products as regulation while consumers see it as information (Hadden, 1986 in Vedung, 1998). Yet, the classification is analytically useful for the purpose of this chapter and outweighs the limitations of the trichotomy (e.g. Hood & Margetts, 2007). This chapter thus describes three categories of policy instruments for each approach that may support the desired policy objective corresponding with the level of policy reflection. This approach can be summarised by the figure below.

![Policy objectives, Assumptions, Approach, and Corresponding policy instruments](image_url)

**Figure 7-1. Backbone of chapter as divided into three policy instruments per approach. The approach corresponds with the four levels of policy objectives as based on the theoretical framework of policy reflection.**

The description of the approaches, and corresponding public policy instruments, lay bare some of the issues that need public deliberation without claiming completeness. After all, the decision for the final policy approach and its instrument(s) is the result of the public deliberation and further policy reflection which have yet to take place. Furthermore, the selection of a particular instrument remains the outcome of a theorisation of the relationship...
between the governing and the governed rather than a neutral means (e.g. Lascoumes & Le Gales, 2007). The suggestions are gathered from the realm of animal experimentations, as well as other policy fields, including health research, pollution, and sustainability.

The table below provides an overview of the different levels of policy reflection as applied to the issue of animal experimentation. Each row represents a different level of policy argumentation and reflection. The columns indicate the paragraph and corresponding level as distinguished in the framework (1); the objectives and questions raised within the particular level (2); the inferred policy objective (3), the policy question (4) and the approach (5) relevant to the practice of animal research in the Netherlands.

Table 7.1. The chapter’s theoretical backbone and outline.

<table>
<thead>
<tr>
<th>Chapter’s paragraph and corresponding level</th>
<th>Argumentation concerns</th>
<th>Inferred policy objectives</th>
<th>Policy question</th>
<th>Approaches</th>
</tr>
</thead>
<tbody>
<tr>
<td>§7.2: Technical-analytical discourse: programme verification</td>
<td>Evaluation of the policy objections, means, and ends</td>
<td>Development of animal-testing alternatives</td>
<td>How do we improve the efficiency and efficacy of research programmes on animal-testing alternatives?</td>
<td>Develop useful animal-testing alternatives</td>
</tr>
<tr>
<td>§7.3: Contextual discourse: situational validation</td>
<td>Problem definitions and the meaning of objectives, means and ends</td>
<td>Use of animal-testing alternatives</td>
<td>How do we improve the implementation and use of animal-testing alternatives?</td>
<td>Stimulate use of animal-testing alternatives</td>
</tr>
<tr>
<td>§7.4: Systematic discourse: societal validation</td>
<td>Empirical and normative background theories</td>
<td>Avoidance of (certain) animal experiments</td>
<td>How do we avoid animal experimentation altogether?</td>
<td>Responsible animal use</td>
</tr>
<tr>
<td>§7.5: Ideological discourse: social choice</td>
<td>Normative-ontological preferences</td>
<td>Addressing social choices (which indirectly affect animal research)</td>
<td>How do we wish to live?</td>
<td>Life choices</td>
</tr>
</tbody>
</table>

The next section studies how it might be possible to stimulate policy change by having research produce more relevant animal-testing alternatives (i.e. “programme verification”).

### 7.2 Technical-analytical discourse: development of relevant 3R-alternatives

The Dutch policy on animal-testing alternatives is grounded on the assumption that the development of such alternatives through research will lead to the replacement, refinement, or reduction of contemporary animal experimentation. Yet, questions can be raised about the efficiency and effectiveness of such research programmes (i.e. “programme verification”). This section investigates how the current research programmes could develop more relevant animal-testing alternatives by involving the user in the research process of development.

#### 7.2.1 The need for user involvement

The development of three-R alternatives is no guarantee for their actual use. Most studies conducted in the area of animal-testing alternatives focus on the technical possibilities and limitations of specific methods and underlying mechanisms. The evidence on the implementation and use of such models is scarce (Freriks et al., 2005, p. 21), but there are indications that animal-testing alternatives face problems upon implementation and use. For example, newly developed alternatives face problems with “regulatory acceptance” (Schiffelers et al., 2007), as well as during drug development (Kooijman, 2013). Moreover, professionals experience difficulty in finding existing animal-testing alternatives to use in their own work (Van Luijk et al., 2011). These indications suggest a mismatch between the developed alternatives and the demands and needs of (potential) users of animal-testing alternatives.

Some of these problems could be caused during the development of these 3R-alternatives (i.e. 3R-innovations), especially by the relative absence of specific users in the development process. A number of different strands of scholarship have increasingly drawn attention to the importance of understanding “user-technology relations” (Oudshoorn & Pinch, 2008). These studies show that intensified user interaction increases the chances for successful innovation (e.g. Smits & Boon, 2008 for innovations in the pharmaceutical industry). This literature suggests that the involvement of users in the development process of animal-testing alternatives may improve implementation and speed up their use. As Wouter Boon (2008) summarises the process in his dissertation, “[T]oday, innovation is no longer

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176 Both Schiffelers and Van Luijk speak of “three Rs” or “three-R models”, referring to the Replacement, Reduction and Refinement of animal experiments. Kooijman talks about “innovative methods”. In this study, these terms and animal-testing alternatives are used interchangeably.

177 Besides these instrumental arguments, user participation is also justified on moral and political arguments (Caron-Flinterman, Broerse, & Bunders, 2007; Collins & Evans, 2002; Nahuis et al., 2012). Moral arguments focus on the rights of people to participate in decisions that will (eventually) affect their lives. Political arguments are related to the idea that democratising scientific research is a public good.
seen as an autonomous process dominated by scientists and industrialists, but as part of a ‘game’ in which a heterogeneous set of actors is involved” (p.30). If users are involved in the development process, they may articulate the specific needs of the context of use, which leads to more suitable technologies and a greater likelihood of the technology’s further “domestication”.

7.2.2 Improving the relationship between users and developers in three-R research

Insights from various user studies suggest a three-step approach to optimise user involvement: identify the user, organise contact, and determine the level of participation.

7.2.2.1 Identify the user

Technology users reflect a rather heterogeneous set of actors who can be found at every stage of the value chain (Oudshoorn & Pinch, 2008). As such, funding organisations may be relevant to users in one situation, whereas peer scientists, animal researchers, and colleagues from other disciplines may be more relevant in others. In yet another situation, the inclusion of “non-users” (Wyatt, 2003) may be favoured, including scientists deliberately working with non-animal techniques or cosmetic industries.

The identification of the relevant users can be supported by various methods, such as focus groups and semi-structured interviews (e.g. Reed et al., 2009), among others. It is important to keep in mind that these methods may also determine who is included and who is omitted. This is of vital value, as it affects “who and what really counts” (Mitchell et al. quoted in Reed et al., 2009, p. 1938). For example, bottom-down approaches tend to identify the “usual suspects” and therefore run the risk of under-representing the marginalised or powerless groups (see Reed et al., 2009, p. 1939 for references on this topic). While there is no universal checklist available, Femke Merkx (2012, p. 28-31) and Mark Reed et al. (2009) both provide a valuable starting point.

The list of users in the domain of three-R research thus depends on the specific situation but may include individual patients, patient organisations, fellow scientists, animal caretakers, cosmetic industries, clinicians, regulatory agencies, toxicologists, policy advice groups, food consumers, and R&D scientists, among others.

The question remains as to who the relevant user is within a specific research project. There are some indications that scientists experience difficulties in naming the user of their research or that those identified are too far removed from the research process to be of direct relevance at an early stage of development. For example, a recent call within the MKMD research programme received many proposals in which general end-user categories, such as “patients” or “regulators”, were listed instead of specific persons and names (Personal communication programme assistant ZonMw, 2013). This corresponds to the experiences from the national knowledge centre NKCA’s employees, who were often asked to “name a regulator” who could be referenced in research proposals (Personal communication NKCA employee, 2013). All in all, the identification of relevant users is not as self-evident as it may sound at first.

Based on these experiences, it would be wise to start with the actual research product or process (e.g. a specific molecular mechanism in one organism, the differentiation process of a specific cell culture) rather than working backwards from the ultimate research goal (e.g. the specific disease, model, or technique) to identify the relevant user. The scientists will play the largest role in this identification process, although funding organisations may facilitate and support identification by providing workshops and offering advice. Such initiatives may stimulate user involvement amongst project leaders in the research field of animal-testing alternatives, given that funding organisations take such initiatives seriously, too. Without a further placing in the infrastructure of research, it is likely that a gap remains between the actual relevant users of research and the relevant users as promised on paper.

7.2.2.2 Organise contact

A growing body of literature in the fields of Science and Technology Studies and Innovation Studies has explored the variety of ways in which users can be involved in the innovation processes but largely circumvents the research process (Boon, 2008; Merkx, 2012; Nahuis et al., 2012; Oudshoorn & Pinch, 2008). In addition, the few studies that do focus on the participation of users in research emphasise patient participation in applied areas of health research, including health technologies research, clinical studies, public health, and prevention (For references, see Caron-Flinterman et al., 2007). These studies also point to the struggles to involve users. For example, patient participants experience great difficulty with committees of experts, because they do not speak the same language, or because they do not feel that they are being taken seriously (e.g. Caron-Flinterman et al., 2007).

In addition, many scholars have signalled the need for a neutral facilitator and overall coordination of user participation (For references, see Merkx, 2012, p. 13). Femke Merkx

178 Since the European testing ban on finished cosmetic products in 2004 and ingredients in 2009, research facilities from cosmetic industries have been encouraged to look into alternatives. See also http://ec.europa.eu/consumers/sectors/cosmetics/animal-testing/, retrieved on 23 October 2013.

179 In 2013, I asked the Rathenau Institute to facilitate a workshop on knowledge dissemination and user identification as part of a larger meeting for ZonMw project leaders (November 14th, co-organised by ZonMw, NKCA and the CSG Centre for Society and the Lifesciences). The ‘Value of Science’ workshop was set up to encourage the project leaders and other attendants to think of their own relevant users.
also provided an excellent overview of the methods to facilitate such a dialogue on participation (p.32-36). For example, in the “world café setting”, several participants work around one question or challenge in several rounds (Brown & Isaacs, 2005; Merkx, 2012).

The question remains how to involve users in the three-R research process. Again, there are indications that scientists experience problems in the actual involvement process or that their initiatives stall in a later phase because of differences in perspective. For example, one senior scientist argued that, despite the early involvement of regulators, it always remains a precarious process, because of the uncertainty as to whether the test will in fact be implemented in new regulations. He explained that this process was sometimes “frustrating”, and that his role as a scientist was limited. In the end, he argued: “it remains a political process”. In addition, he explained that the involvement of users such as regulators in an early phase of research may also experience resistance, as the projects are perceived as too technical to make a meaningful contribution (Interview work package leader NTC 4, 2011). This example suggests a clear need for information on the ways in which users could be involved in the research process and the support of scientists in doing so.

I suggest that funding organisations could play a more active role in facilitating user involvement on the programmatic and project level of three-R research. This role thus exceeds the inclusion of overall end-user categories in call committees, as these users did not always prove to be the relevant users for individual projects. Moreover, the inclusion of regulators may need a different approach.\(^{180}\)

### 7.2.2.3 Determine level of participation

Finally, it may be wise to manage the expectations regarding the level of user participation in research beforehand in order to avoid disappointment. Users can be involved in different ways with ranging levels of influence on the decision-making process. The “ladder of participation” (Arnstein, 1969) may provide a helpful tool to differentiate between different levels of participation and to manage the expectations of both the users and producers of knowledge. For example, participation may be interpreted in some cases as “informing” or “consulting” and as “co-creation” in others (Reumapatientenbond, VSOP, & ZonMw, 2006, p. 19).\(^{181}\)

### Table 7-2: Some viable policy instruments to stimulate, motivate, or force scientists to involve users in their research practice

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Possible instruments</th>
<th>Characteristics, limitations</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sermon</td>
<td>Stimulating scientists to involve users in their research</td>
<td>Societal relevance paragraph</td>
<td>Risk of symbolic and only on-paper involvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information (i.e. course) on user involvement</td>
<td>Optional; depends on scientists’ willingness to participate</td>
<td></td>
</tr>
<tr>
<td>Carrot</td>
<td>Motivating scientists to involve users in their research</td>
<td>Scoring criteria for funding</td>
<td>Requires the quantification of user involvement (what to measure?); risk of on-paper involvement as part of funding strategy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subsidy for undertaking user involvement, visiting user-relevant congresses</td>
<td>Relatively simple; no guarantee for good involvement (how to qualify good involvement?)</td>
<td></td>
</tr>
</tbody>
</table>

Despite good intentions and careful preparations, the involvement of users in technology development (e.g. animal-testing alternatives) is never an absolute guarantee for success. Based on numerous retrospective studies of technological innovations, the type of interaction also seems to depend on the phase of technology development (Rip & Schot, 2002), the flexibility of the technology, and the heterogeneity of the user population (Bijker, Hughes, & Pinch, 1987; For an overview: Nahuis et al., 2012).

#### 7.2.3 Policy instruments to stimulate user involvement in research

Involving users in the three-R research practice may be stimulated by various policy instruments, ranging from the relatively inactive role of scientists (e.g. writing societal relevance paragraphs) to a more active role taken by the funding organisation (e.g. appointing user-brokers). The table below describes some policy instruments that may either stimulate, motivate, or force scientists to involve users in their research practice.

\(^{180}\) Given the different route of regulatory acceptance of animal-testing alternatives in comparison with the development of three-R alternatives in the academic setting, more insight is needed into the role of the regulator in the acceptation process. Marie-Jeanne Schifflers (dissertation expected in 2015) addresses this issue in more detail.

\(^{181}\) The participation of patients is central in this handbook. However, this typology could well be applied to other users, including regulatory bodies, fellow researchers, or social movement organisations. For criticism of Arnstein’s ladder and suggestions for improvement, see Jonathan Quetzal Titter and Alison McCallum (2006), among others.
Forcing. For example, Marlous Kooijman and colleagues. Furthermore, ZonMw encourages the publication of.

In other words, the successful use of co-financing required drivers and barriers that stimulate and obstruct, respectively, the implementation and use of animal-testing alternatives. There are also other drivers that may either improve or hamper the implementation of such methods in specific fields and for specific actors (e.g., Schiffelers et al., 2007 for the “3R acceptance model” for regulatory use). For example, Marlous Kooijman and colleagues found that the institutional logic of medicine regulation hampered the use of animal-free methods in the case of EPO potency testing (Kooijman, Van Meer, Moors, Schellekens, & Hekkert, forthcoming). Besides, the few journals that are publishing articles on three-R alternatives have a relatively low impact factor, which makes them less attractive for many scientists looking to publish, especially so-called “negative data” (i.e., animal studies that have not yielded positive or the expected results).\textsuperscript{182} These examples suggest that the animal welfare argument of implementing animal-testing alternatives is not able to lead to a breakthrough in the use of three-R methods alone. Therefore, we need to look into the stakeholders’ values and assessment criteria (i.e., different frames) in order to stimulate the use of 3R-methods.

182 In a pure technology-push approach, animal-testing alternatives are delivered to the “market” without further guidance or embedding. See Chapters 4 and 6 for more information about this approach and references to the literature.

183 The criticism directed at impact factors remains outside the scope of this research. For an overview, please see (Amin & Mabe, 2000; Garfield, 2006; Seglen, 1997). Furthermore, ZonMw encourages the publication of negative (or neutral) data via the ‘Amendment 21’ module (currently the knowledge infrastructure-module) as part of its newest MKMD programme.

<table>
<thead>
<tr>
<th>Stick</th>
<th>Forcing scientists to involve users in their research</th>
<th>Co-financing required</th>
<th>Appoint user-brokers within each scientific three-R project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In-kind and in-cash possibilities; criticism regarding the focus on enterprise in academia and the long-term effects; increased competition between scientists (requires other competences)</td>
<td>Expensive; success rate is unknown; different types of expertise needed; production of ‘brokering knowledge’</td>
<td>Almost all suggestions, except for the last one, build on the scientists’ responsibility and depend on their intrinsic willingness to involve users and invest energy. However, funding organisation may play a role in the match-making between scientists and potential contributors (industries, SME, public organisations).</td>
</tr>
</tbody>
</table>

7.3 Contextual discourse: connecting to stakeholders’ values

The previous level assumed that the development of three-R alternatives is a guarantee for their implementation and use as well. In this section, I will argue that this “science and technology-push argument” does not match the current practice of three-R alternatives. To go beyond this approach, this section looks at the practices in which three-R alternatives might be implemented (e.g., academia, industries) or the contexts in which they may play a role otherwise (e.g., innovation policy, start-ups investments, public crowd-funding initiatives). Following up on the empirical verification of outcomes in the previous section, this section deals with the validation of the policy programme and asks whether or not the particular programme objective(s) are relevant to the particular problem situation (“contextual discourse”). Animal-testing alternatives thus remain the accepted solution for the problems associated with animal research, but the placing of these 3R-alternatives within their larger infrastructure is challenged. Accordingly, this section considers how the implementation of animal-testing alternatives may be improved by connecting to the stakeholders’ values and assessment criteria by the process of reframing (see also Chapter 2).

7.3.1 Need for other drivers of three-R use

There are indications that neither the “science and technology-push” approach model (see also Chapters 4 and 6), nor the sole focus on the animal welfare rationale can guarantee the successful implementation and use of animal-testing alternatives. There are also other drivers and barriers that stimulate and obstruct, respectively, the implementation and use of such methods.
Bottom-up approaches allow frames and parameters to be defined by the stakeholders, so that the analysis reflects their concerns more closely (Merkx, 2012). In addition, the involvement of “upstream end users” (Lyll, Bruce, Firn, Firn, & Tait, 2004) may influence the decision-making process through formal channels. This type of involvement may stimulate mutual learning amongst actors (e.g. on their different assessment criteria) and may avoid the failure of policy initiatives and instruments. Collectively, these attempts – either non-anticipated or strategic manoeuvres – can be recognised as reframing: Creating room for animal-testing alternatives to gain ground within various contexts, including the academic research practice, the innovative drug development practice and the R&D departments of the food and chemical industries.

7.3.2 Reframing ‘animal-testing alternatives’ as to fit the situation

The development, acceptance, and use (i.e. “implementation”) of animal-testing alternatives may be stimulated by active reframing of the issue (e.g. Gray, 2003. See also Chapter 2). Such a process may disconnect animal-testing alternatives from sole animal welfare motives as to align with issues more relevant to the various users’ values and assessment criteria (e.g. better predictable tests in drug development, improved scientific relevance of models in academia, and reliable screening methods for food products and chemical substances).

The process of reframing is best described in literature for various types of conflicts (see also Chapter 2). For example, Roy Lewicki and colleagues (2003) have described various local environmental cases where reframing helped to move beyond the intractability of the conflict. Yet, in the context of animal-testing alternatives, active reframing may also help to fit the ‘animal-testing alternative’ within the appropriate situation in the right wording. Like the introduction of the concept of “sustainable development” and “alternative to animal testing” (Merkx, 2012), new notions (e.g. “patient-centred innovation”, “animal-free research model”, “predictable screening method”) may be able to attract new players to the field of 3R-alternative and help to improve their implementation.

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184 In their definition, the category of upstream end users includes those who have formal channels to influence the strategies and programmes of research organisations through core funding, the creation of research needs, and the production of government documents, among others. This category includes bodies acting in the public interest, commercial companies, and other bodies acting on behalf of private or commercial interests. At the other end, they distinguish downstream end users from their upstream counterparts in that the former’s motivation for making links usually comes from the sponsored bodies, as a means to encourage knowledge transfer and the application of their research outputs. Downstream end users (by definition) do not commission research or influence the organisation’s research programme; if they do, they are also included in the upstream category. This category includes members of the public acting in various roles, business users of information, and services that the research organisations provide (See Lyll et al., 2004, p. 78 and beyond).

185 During the rise of environment issues in the late 1960s and early 1970s, the focus was on the “limits to growth”, which proved to be something of a non-starter for the business community. However, the introduction of the concept “sustainable development” in 1987 opened new possibilities. By drawing on the discourses of both business and the environment movement, the new concept opened the way for both groups to sit at the same table (Fischer, 2003, p. 147). Fischer speaks of a “discourse hegemonic shift” rather than reframing.

This process of reframing already occurs in various places and on several occasions in the field of animal research. For example, researchers are encouraged to develop and use animal-testing alternatives in their research, as some of these methods are thought to produce “better science” (see also Chapters 4 and 5). On a similar note, industries are motivated to work on and implement such methods because of the “innovative character” of the latter (e.g. SlM, 2013). For others, the animal welfare perspective remains the main driver. The continuous process of (re)framing is reflected in the naming of the methods and (subsequent) changes in the field. For example, the mixed use of “three-R innovations”, “animal-free methods” and “alternatives to animal testing” points to users’ different values and relevant assessment criteria. This mixing is not just rhetorical: Reframing the issue may actually work in a way that is performative and may subsequently change the field of animal-testing alternatives as well (see also Chapter 2 and 3). Eventually, one or more of these new frames may replace the different co-existing frames and become the new societal norm, or “global discourse” (Zwartkruis, 2013).

Furthermore, it needs to be accepted that finding integrative win-win situations (e.g. by reframing) often only scratches the surface in complex disputes (Putnam & Wondolleck, 2003). At the contextual discourse level of policy evaluation, animal-testing alternatives are still accepted as the solution to the many problems associated with animal research. The problems are, however, defined in ways that make them more recognisable to users and other stakeholders than the animal welfare problem definition (i.e. ethical framing) often used in public. It remains at least questionable whether reframing of the issue truly satisfies multiple stakeholders with their diverging world views, values and expectations.

7.3.3 Public policy instruments

To stimulate the use of three-R methods, this level of policy reflection aims to incorporate the contexts of such methods into the development and dissemination process. Given the large range of actors (e.g. chemical industries, funding organisations, animal welfare organisations, regulatory bodies, academic institutes, patient organisations, and consumers), the type of products and purposes (e.g. food, education, pharmaceuticals, chemicals, defence, and knowledge), as well as the range of public perceptions (varying from complete rejection to acceptance under specific conditions), it is necessary to customise the policy instruments in order to meet the specific users’ needs. Nevertheless, the scheme on the next page may serve as a useful starting point.

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186 Given the relatively large amount of money spent on pharmaceuticals and the low market introduction of substances (roughly only 1 in 5 000–10 000), the motives for alternative (better) testing methods to screen substances and to study pharmacovigilance seem indisputable (Van Meer, 2013).

187 My interpretation of animal-testing alternatives covers all of these interpretations and frames. As such, I do not intend to be normative about whether some methods are better alternatives than others.
Table 7-3. Some viable policy instruments to stimulate, motivate or force (re)framing of three-R alternatives.

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Possible instruments</th>
<th>Characteristics, limitations</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sermon</td>
<td>Interesting users for the use and potential of three R alternatives</td>
<td>Addressing the relevant issue in communication with and to the users (e.g. translational research, or the predictive value)</td>
<td>What is the relevant issue for which stakeholder?; much time needed for research and consultation</td>
<td>(Van Luijk et al., 2013; Van Luijk, Cuijpers, Van der Vaart, Leenaars, &amp; Ritskes-Hoitinga, 2011)</td>
</tr>
<tr>
<td>Carrot</td>
<td>Motivating users for the use and potential of three R alternatives</td>
<td>Three-R databases</td>
<td>Difficulty to define search entries</td>
<td>(Van Luijk, 2013)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Three-R benchmark¹</td>
<td>Development of relevant indicators needed; likely resistance from industry; large amount of funding needed</td>
<td>(ATMF, 2012; SLIM, 2013)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extension of patent expiry date</td>
<td>Risk of increasing health care costs</td>
<td>(Mulder in Tweede Kamer, 2011a)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceptance of patented innovations in regulation</td>
<td>(Kooijman, 2013); Chapter 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Challenge driven 3R-development competition²</td>
<td>Includes SMEs and other “solution providers” besides the scientific community</td>
<td>(NC3Rs, 2015)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceleration of market approval when use of animal free techniques</td>
<td>Difficult to judge; only one-to-one-replacements</td>
<td>(Kooijman, 2013)</td>
</tr>
<tr>
<td>Stick</td>
<td>Forcing users to use three R alternatives</td>
<td>Regulation</td>
<td>Already in place (through legislation) but hard to control in practice</td>
<td></td>
</tr>
</tbody>
</table>

¹ This benchmark aims to include companies’ animal research policies as well. As such, this instrument is positioned on the boundary of this and the next level of policy evaluation (i.e. systematic discourse).
² CRACK IT is an open innovation programme designed to accelerate the development, application and commercialisation of technologies with 3R-potential as they emerge from the research base. As the sponsors (e.g. pharmaceutical, chemical or consumer products sectors) develop the challenges, the programme is more organised around a demand-pull approach to innovation than the present Dutch science-push approach of 3Rs (see also Chapter 4 and 5).

7.4 Systematic discourse: responsible use of research animals

Many practices still rely on animal experiments to understand the mechanisms of disease, determine dose-response curves of adverse effects, and support the health claims of products, among others. This use of research animals is grounded in the general assumption that their use yields reliable and useful information for the human situation. ¹⁸⁸ Nevertheless, questions can be raised about the efficiency of the individual animal experiment (“systematic discourse”). This section builds on the idea that discouraging animal research, as well as the dissemination of more publicly available information concerning animal research, will lead to more a responsible use of research animals in the Netherlands.

7.4.1 The need for additional information

It seems that many of the societal and parliamentary questions and concerns regarding animal research in the Netherlands surface as a result of ambiguous or missing information on this topic (e.g. Van Zijverden et al., 2013b). Apart from the factual information in the yearly nVWA reports ZoDoende and the annual reports from publicly funded licensee holders, the sharing of information with the general public is rather limited. ¹⁸⁹ For example, there is no detailed information available on the use of animals within the industry and other private institutions. Moreover, animals that fall outside the category of “research animal” (i.e. most invertebrates, embryonic forms and “animals killed in stock”) are not included in the problem definition of most political and public debates. ¹⁹⁰

The contexts under which animal experiments are judged and performed also fall largely outside the purview of the general public. For example, the evaluation process of the Animal Ethics Committee is not publicly available, ¹⁹¹ and only studies with significant results end up in scientific journals. ¹⁹² Furthermore, privately performed experiments only scarcely end up in papers, databases, or otherwise publicly available sources, and the various dilemmas that researchers and institutions face when performing the experiments largely go

¹⁸⁸ As animal experiments are also performed to advance the veterinary sciences, it’s more appropriate to speak of the relevant target organism, including being humans (e.g. drug development) and animals (e.g. veterinary research and livestock improvements).
¹⁸⁹ As a result of the revised EU directive, licence holders will need to provide more information to the general public, including layman’s project summaries. For research performed in the Netherlands, these summaries can be found on the website of the Central Authority for Scientific Procedures on Animals (CCD, 2015).
¹⁹⁰ See also the problem of counting as in Chapter 1. Note that “animals killed in stock” (i.e. animals that are used to breed a specific strain but are not used in an experiment) have been listed on a separate page in the yearly reports Zo Doende for a number of years.
¹⁹¹ Since 2010, all committees are obliged to publish the layman’s summary of their activities and evaluation using a standard format (see also the website of the umbrella organisation NVDEC, www.nvdec.nl).
¹⁹² However, ZonMw and others do promote the publication of “negative results” (see also Chapter 4).
unmentioned. Besides, the academic contribution to this topic is relatively small and falls predominantly within particular domains of animal research, such as drug development (Kooijman, 2013; Van Meer, 2013) and regulatory testing (Schiffelers, 2016 (expected)).

It would appear that the absence of this kind of information hampers an honest public evaluation of the relevance and acceptability of animal experiments in the Netherlands and beyond. By being more transparent about the choices that need to be made prior to an experiment and the animals that are used, stakeholders might improve their accountability on this topic. Subsequently, such an increase in accountability may further lead to more responsible animal use: Animal research that falls within the boundaries of that which is societally accepted.

### 7.4.2 Accountability: moving beyond numbers and outcome indicators

On this level, the need for additional information comes close to the call for increased transparency on this topic. Various studies suggest the positive potentials of transparency as a regulatory instrument to stimulate and improve the practice of animal experiments, although there is no guarantee, because of reframing and spin. In the words of John Roberts (2009), the promise of transparency is its presumed mechanism of accountability: “to cast light upon what would otherwise remain obscure or invisible and to do so in order to provide the basis for confidence for distanced others” (p.957). Jonathan Koppell (2005) goes a step further and differentiates between five levels of accountability, including transparency (“Did the organisation reveal the fact of its performances?”) and responsiveness (“Did the organisations fulfil the substantive expectation?”).

Nevertheless, the call for additional information and (thus) more transparency should not be seen as the Holy Grail. Increased transparency may cause panic and crisis and has the unintended consequence of changing that which is rendered transparent (Roberts, 2009).

In this sense, we may speak of the “performativity of transparency” (Mackenzie, 2006 in Roberts, 2009) rather than just the act of making things visible. So while transparency in policymaking does not necessarily increase public trust, the lack thereof may increase public distrust (e.g. Brown & Michael, 2002; Paula, 2008).

Increased transparency is not new to the field of animal research. Many actors have initiated ways to increase the openness and transparency on animal experiments in the Netherlands. For example, the Netherlands Food and Consumer Product Safety Authority publishes an annual report on the numbers of research animals and animal experiments (e.g. NVWA, 2014), and many actors have their own webpage on the issue. Furthermore, the “Code Openness Animal Experimentation” (VSNU, NFU, & KNAW, 2008) strives for “a binding openness and dialogue on animal experimentation” through self-regulation. Since 2010, the Dutch Animal Ethics Committees are obliged to publish an annual layman’s summary of their decisions and activities, and most public animal research facilities have opened their doors to the general public by appointment. However, most of these initiatives focus primarily on the outcomes (i.e. numbers, decisions, and experiments) rather than the dilemmas and problems experienced by those in the field. Such initiatives seem to have tipped the scales and have given in to the pressure of audits, evaluations and performance indicators (i.e. “audit society”: Power, 1997).

In addition, some commercial parties have included their animal research’s policy in their Corporate Social Responsibility (CSR) reports (e.g. GlaxoSmithKline, 2014). With these reports, companies show their normative standpoint on the issue and take responsibility for the impact of their activities on animal experimentation. However, the extent to which...
their policies truly aim for change - and what this change is - is left up to the organisations and their stakeholders to decide.

The initiatives thus inform people on the outside of the animal research field (and three-R alternatives), while those that spread the information keep control over what is shared. The field lacks transparency mechanisms that would discourage the use of animal research. By opening up the “black box” that supports animal research, the support for particular fields, experiments, animal species, and goals may either be strengthened or weakened. As such, additional transparency may thus help to separate the wheat from the chaff and to differentiate between animal experiments. Consequently, transparency may lead to an improvement in responsible animal research, as only those experiments that are societally accepted will be performed.

### 7.4.3 Public policy instruments
This section looked into the possibility to tackle animal research directly rather than to stimulate the development and use of animal-testing alternatives (which was at the core of sections 7.2 and 7.3). The following policy instruments aim to stimulate responsible animal use in the Dutch research practice by either providing more information about animal research or by discouraging animal research altogether. Collectively, these instruments increase transparency around animal research in the Netherlands.

Table 7-4: Some viable policy instruments to encourage responsible use of research animals.

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Possible instruments</th>
<th>Characteristics, limitations</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sermon</td>
<td>Informed end users</td>
<td>- Labelling and traceability of products</td>
<td>Problem of inclusion, exclusion (“counting as”, Chapter 1); increased administrative work</td>
<td>(Marotta, Simeone, &amp; Nazzaro, 2014; Min Aung &amp; Seok Chang, 2014, both about food)</td>
</tr>
<tr>
<td></td>
<td>of animal experiments</td>
<td>- Cross-links between policy and policy documents</td>
<td>Telling a more coherent policy story between the various ministries and corresponding topics (e.g. health, safety, innovation, work)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Incorporate animal research into Corporate Social Responsibility (CSR) policy and documents</td>
<td></td>
<td>(Breems, 2006) (Proefdierervrij, 2012) (SLiM, 2013)</td>
</tr>
</tbody>
</table>

1. The Dutch government cannot force the inclusion of animal research in CSR policies. However, it can facilitate the topic and promote animal welfare according to the ISO guidelines (ISO, 2010; Van Gelder & Herder, 2010).
2. The possibilities of such a tax have frequently been placed on the political agenda in the Netherlands. Armed with report, The price of an animal of 2003, some politicians argued that the tax would raise the necessary funding to stimulate animal-testing alternatives. Up until this date, the minister has not agreed with such a tax. However, the Secretary Dijksma installed a taskforce that will look into other possibilities to fund animal-testing alternatives (EZ, 2014b).

### 7.5 Ideological discourse: reflection on societal values that guide animal experiments

The fourth and final phase of policy evaluation considers the fundamental ideals and values that organise the accepted social order of animal experimentation, including animal-testing alternatives. This ideological discourse asks whether fundamental ideals (or ideological principles) provide a consistent basis for a legitimate resolution of conflicting judgements (Fischer, 2003, p. 195). As such, this level is also concerned with the ways in which ideological discourse (re)structures the world we live in. Animal experimentation is approached as an outcome of – or a compromise between – different and often conflicting
values and ideologies, including safety, health, innovation, animal welfare, and economic progress. The questions raised on this level are the most fundamental and the most difficult to answer. Yet, they form an indispensable part of policy evaluation, and this discussion shines a light on the silent choices that organise our modern need for animal research. This section assumes that some fundamental ideals, such as our hunger for new knowledge and better health care, still rely on animal research. Hence, the development of animal-testing alternatives is understood as a means to escape the underlying ideals that drive animal research in the first place. Seeking a solution for the problems associated with animal research therefore seems unlikely to succeed without a more thorough understanding of the ideological discourse that underpins animal research.

This section starts with a reflection on some of the societal values that organise our modern social order and our fixation on technological solutions for social problems. It will conclude with some public policy instrument to stimulate discussion.

7.5.1 Society’s needs: organising values

The reason why animal experimentation generates an ethical dilemma lies with the large range of values involved and the different prioritisation that stakeholders adhere to these values. Animal experimentation is thus not an ethical dilemma purely because research animals are involved. Accepting animal experimentation as a compromise of different values opens the door to the many values that collectively form the ideological discourse structuring modern animal research. These values include our “zero-tolerance behaviour” towards side-effects of pharmaceuticals and other products, the perception of health and innovation as a goal in itself, and our increasing reliance on science and technology to live up to our own expectations, among others.

To a large extent, our dependence on animal experimentation originates from our extreme focus on risks and safety. To paraphrase Anthony Giddens and Christopher Pierson, “it is a society increasingly preoccupied with the future (and also with safety), which generates the notion of risk” (1998, p. 209). In other words, we live in a “risk society” (Beck, 1992; Franklin, 1998).

Over the years, many (medical) scandals have resulted in a tight network of rules and regulation, “pieced together like a patchwork quilt” (Hartung, 2012, p. 21). But what do all the (animal) experiments, rules, and regulations offer us? At most, they provide (some) answers to our own questions and driving values. In Beck’s words, behind today’s calculations, objectifications, and rationalisations, “the question of acceptance [arises] and with it anew the old question: how do we wish to live?” (1992, p. 28).

The way we approach health and sickness today is another example of an organising value that we cannot escape nor deny. We try to stay “healthy” (whatever that may mean) by eating “healthy products” (i.e. fruit, vegetables, and products low in salt, sugar and fats), while at the same time doing “unhealthy” things (i.e. smoking, over-eating). We take care of our sicknesses and rely on a broad range of (technological) possibilities to cure us. Many scholars have addressed this issue of the “regulated body”. For example, Deborah Lupton argues that “the pursuit of good health has become an end in itself rather than a means to an end” (1995, p.70). Rather than accepting sickness and death, modern Western science and health care try everything within their limits to cure people and defer death. For this, we rely to a large extent on science and technology, of which animal models are an important part. In other words, in order to tackle the issue of animal experimentation, one cannot neglect the fundamental ideas our modern society holds towards life itself.

7.5.2 Escaping the technological fix

The reliance on animal models as a technological solution for a variety of social problems associated with health, environment, safety and food consumption also points in the direction of a “technological fix” (Rosner, 2004) as part of the structuring device within the ideological discourse. A technological fix assumes that science and technology provide us with solutions for all kinds of problems. For example, the tissue engineering of organs as a solution for the problem of organ failure, bariatric surgery to solve extreme obesity, and the building of dykes to prevent water flooding large parts of the Netherlands. Wiebe Bijker (2006) has labelled this pervasiveness of science and technology in modern, highly developed countries as a “technological culture”.

Technological fixes often create quick wins and are generally assumed to be easier and less painful to achieve than political or social change. After all, how often do we over-think the location of the Netherlands when building dykes, address socio-economic factors during bariatric surgery, or challenge the quality of health when performing an animal experiment?

203 Animal experimentation is often regarded as an ethical dilemma because animals are involved. This understanding of an ethical dilemma, however, is rather limited. This section understands the totality of organising values (where some are more straightforward than others) as equally relevant in the creation of an ethical dilemma.

204 For Beck (1992), risk may be defined as “a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself” (p.21). He warns about exclusion, as such discussions “[run] the risk of atrophying into a discussion [of nature] without people, without asking about the matters of social and cultural significance” (p. 24. Italics in original).

205 Note the work of Machteld Huber (2014) on a new, dynamic definition of health in this respect as well. She proposes to reformulate the WHO definition of health as “the ability to adapt and to self-manage”. The strength of this concept lies in the integration of the three domains of health: physical, mental, and social.
However, to paraphrase another influential scholar in the field of risk and technology, the “very idea that there could be a technical solution to a disagreement about goals and purposes shows that political reconciliation is rejected” (Douglas, 1992, p. 33). Again, this underscores the importance of a more thorough public deliberation about the values and priorities that structure animal experiments as part of our modern society.

The absence of a meaningful policy reflection on the values that structure and organise animal research seems to keep the policy issue in its current state of deadlock. The societal values driving animal research and the tensions evolving simultaneously remain implicit in most public places, including policy documents, scientific papers, and annual reports. This silence suggests that a more thorough public deliberation about the values accepting and driving animal research is not encouraged. However, without reflection on and escape from the technological fix, the long-awaited policy change - or even a more radical, structural change of a societal (sub)system (i.e. transition) (Rotmans, 2005; Rotmans et al., 2001) - may be farther away than ever before.

7.5.3 Public policy instruments

The most radical (policy) change on animal research is expected from a more thorough policy reflection on present policies. Such reflection asks for a more meaningful public deliberation on the values that (in)directly drive animal research in our modern societies. The mediating organisations between research and policy that seems best equipped to fulfil such a role are the advisory councils and planning bureaus in the Netherlands, especially with their backstage processes206 that support the co-production of research and policy (Bekker, 2010 #747. See Halffman & Hoppe, 2005 for the changing science/policy boundaries in both advisory councils and planning bureaus in the Netherlands). Nicely summarised by Marleen Bekker and colleagues (2010), “[t]hese bodies have to be close to politics without being too close; they have to depoliticise policy problems without doing away with the normative choices associated with them; and importantly, they have to sustain their authoritative positions and credibility in order to perform these role (p.249).”207

In addition, Rathenau institute’s expertise on Parliamentary Technology Assessment may also be of help in supporting those who have to take decisions on science and technology policies.

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206 Back stage processes refers to the practical, yet often invisible, coordination work that needs to be done to make research evidence fit the policy perceptions and requirements (Bekker et al., 2010; Bijker et al., 2009). See also section 2.7.

207 Note that the depoliticising of policy problems may also hamper a more structural second-order policy reflection (see Chapter 4).

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Table 7-5: Some policy instruments to facilitate public deliberation on the values that (in)directly drive animal research

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>Possible Instruments</th>
<th>Characteristics, limitations</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sermon</td>
<td>Facilitate</td>
<td>Public deliberation</td>
<td>Who decides when the debate is closed?; societal learning or expert learning?</td>
<td>(e.g. Dortmans, 2016; Paula, 2008)</td>
</tr>
<tr>
<td>Carrot</td>
<td>Stimulate</td>
<td>Support research that addresses the structuring values of animal research</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 The moment of closure creates a big problem in the organisation of a public debate, especially if there is some form of time pressure as with the evaluation and reflection of the values structuring animal research. As Lino Paula has summarised accurately: “a debate on fundamental ethical issues cannot simply be declared as ‘closed’ by the arbitrary fiat of some authority like the government” (Paula, 2008, p. 186). He also points to the temporary character of closure: “Closure is, both in principle and in practice, only temporary” (idem, p. 187).

7.6 Concluding remarks

There are indications that there is a political and societal will in the Netherlands to change the current public policy on animal research. The question remains, however, to what extent and in which direction this policy change will occur.

The goal of this chapter was to consider the possible means of facilitating policy change for animal experimentation, including animal-testing alternatives. The chapter departed from the national government as central actor in such a change, even though I argue that implementation and outcomes are based to a greater extent on the interplay between the various actors, values, assumptions, and rationales involved (e.g. Colebatch, 2009; Wagenaar, 2011; Yanow, 2000b). Fischer’s logic of policy evaluation (1995, 2003) was used to distinguish between two levels of reflection within such a possible new policy framework. Applied to the present situation, first-order reflection assumed that the development and implementation of animal-testing alternatives would ultimately lower the number of research animal in the Netherlands. Animal-testing alternatives were thus regarded as the solution to the problems associated with animal research. On the technical-analytical level, I proposed to stimulate the involvement of relevant users in the research practice of three-R alternatives. On the contextual level, I suggested taking into account the context in which three-R alternatives ought to be implemented – in other words, looking into the stakeholders’ values, needs, and systems regarding scientific quality, animals, and innovation, amongst others issues. Both levels of suggestions focused on the development of more relevant three-R alternatives.
In the second-order of reflection, the logic of policy deliberation shifted to the societal context and the values (in)directly driving animal research. The problems associated with animal experimentation were thus attempted to tackle thorough consideration of the guiding infrastructures in place and the societal values of modern society. On the systematic level, I suggested providing additional information to stimulate a more responsible use of animals within Dutch research practice. On the ideological level, I recommended looking into and reflecting on the societal values driving our modern dependence on animal research.

Public policy may be understood as an interplay between all four levels of reflection, where the beliefs and values on the second order form the ideological base for the more concrete policy measurement on the first level. However, while new policies are formulated and policy is executed, this second order must not pass out of sight.208 After all, the development of animal-testing alternatives would appear to be inadequate and ineffective if they were not going to be used, nor if the values driving modern animal research remained the same. Therefore, effective policy design includes all four levels of reflection, which may include the policy focus: Making policy means making decisions.

Finally, animal experimentation remains a sensitive policy topic, and any of the proposed changes are likely to face resistance at the beginning. Therefore, and following John Grin and Henk van de Graaf (1996a), I suggest that further studies on the feasibility of potential means, objectives, and instruments should at least include a thorough understanding of the actors’ different interpretations in order to promote mutual learning between them. I believe that such an understanding helps to establish change in practice, instead of a more ritual dance on paper. In addition to a broader understanding of feasibility, I suggest including additional indicators that better visualise learning and change if the current outcome indicator of animal numbers (e.g. Drooge & Spaapen, 2011a; Drooge et al., 2011b; Power, 1997). This chapter aimed to inspire a sustainable transition as to better reflect the societal concerns regarding animal research (i.e. “sustainable development”, e.g. Grin, Rotmans, & Schot, 2010). Yet, the decision (of how) to move forward remains above all a societal and political consideration.209

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208 Policy change on this level is also likely to be less vulnerable to small societal and political changes, such as the expanding legal definition of research animals, or the inclusion of new techniques as animal-testing alternatives. The more animals are counted as research animals by law, the fewer animals are regarded as animal-testing alternatives, which results in a negative impact on the current indicator of policy effectiveness. Moreover, the inclusion of new techniques under the header of ‘animal-testing alternatives’ runs the risk of over-acceptance and loss of discriminative power between alternatives and non-alternatives. Which techniques and research will be granted funding and which ones will not? (See also Chapter 5).

209 Following John Grin, Jan Rotmans and Johan Schot (2010), such transitions also require the “quest for new value systems” (p. 2). It forms the third level of their analysis of transitions: values and their expression in life-styles.

Table 7-6: Summary of all four levels of policy evaluation, including their relevant questions and the underlying assumptions.

<table>
<thead>
<tr>
<th>Level of Policy Evaluation</th>
<th>Question 1</th>
<th>Question 2</th>
<th>Question 3</th>
<th>Question 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fischer’s level of policy evaluation</td>
<td>develop useful alternatives</td>
<td>stimulate use of alternatives</td>
<td>responsible animal use</td>
<td>life choices</td>
</tr>
<tr>
<td>Guiding questions</td>
<td>How do we develop more useful alternatives through research?</td>
<td>How do we create the conditions in which alternatives are in demand?</td>
<td>What type of animal research do we find acceptable?</td>
<td>How do we wish to live?</td>
</tr>
<tr>
<td>Assumes / Accepts</td>
<td>- necessity of animal research</td>
<td>- necessity of animal research</td>
<td>- necessity of animal research</td>
<td>- none of the previous</td>
</tr>
<tr>
<td>Actor</td>
<td>researchers</td>
<td>researchers and users</td>
<td>all actors in chains (thus including researchers and users)</td>
<td>society as a whole</td>
</tr>
<tr>
<td>Approach</td>
<td>developing useful alternatives by user involvement in research</td>
<td>connecting to stakeholders’ values by reframing</td>
<td>using research animals responsibly by discouraging animal research and the provision of additional information</td>
<td>reflecting on societal values that guide animal experiments by public deliberation</td>
</tr>
<tr>
<td>Possible policy instruments</td>
<td>impact paragraph in research proposals, training for user involvement</td>
<td>three-R databases, elongation of patent expiry date, rules and regulations</td>
<td>labelling and traceability of products, animal testing tax or levy, systematic reviews</td>
<td>public deliberation for more meaningful policy reflection</td>
</tr>
</tbody>
</table>
Lost in technification
Dutch discourse coalition partly reflects societal concerns regarding animal experimentation
This research project has studied the extent to which the Dutch discourse coalition on animal experimentation reflected societal concerns regarding this issue. The aim has been to understand the incongruence between scientific and technological promises and societal expectations on animal research, and perhaps more importantly, to stimulate a more viable and effective policy in the future.

This concluding chapter assembles the insights and scientific contributions that the research has provided. I will recapitulate the findings of this process as concisely but accurately as possible.

I argue that the present discourse coalition on animal-testing alternatives in the Netherlands has only provided a partial answer to societal concerns regarding animal experimentation in the country. Societal expectations on the decreasing numbers of research animals lagged behind the shifting discourse coalition’s understanding of animal-testing alternatives and three-R research, and this delay may have contributed to the present incongruence. I will also argue that some level of policy change is needed to stimulate a more sustainable future for animal experimentation – one that heeds societal expectations.

Firstly, I will answer the research questions that were presented in this dissertation’s introduction. Secondly, I will discuss the main insights in terms of their scientific contributions and relevance for the animal research practice in the Netherlands, including the implications for (future) three-R research. Finally, I will identify the most important questions that remain and the specific challenges for future research.

8.1 Answering the research questions

The main research question in this dissertation was: To what extent does the present discourse coalition on animal-testing alternatives have the ability to reflect the societal concerns regarding animal experimentation in the Netherlands? In this section, I recapitulate the answers to the three main sub-questions:

1. How can the present incongruence between societal expectations and technological promises from the dominant discourse coalition on animal-testing alternatives be understood from an interpretive framework of policy evaluation?

2. How can the mobilising power of the dominant discourse coalition on animal-testing alternatives in the Netherlands be valued?

3. How can there be a sustainable change in policy that would do justice to the societal expectations regarding animal experimentation in the Netherlands?
8.1.1 Understanding the present incongruence

The answer provided in Part II of this dissertation (Chapters 3-5), is primarily empirical. The case studies - Dutch policy discourse on animal experimentation including animal-testing alternatives, ZonMw research programmes on animal-testing alternatives, and the research practice of the Netherlands Toxicogenomics Centre - were analysed by using the interpretive framework of policy evaluation and reflection, as outlined in Chapter 2.

Chapter 3 described the shifting interpretation of the concept of animal-testing alternatives in Dutch policy discourse by means of an analysis of policy frames in documents dating to the time between the publication of the draft of the Animal Experimentation Act in 1970 and the Cabinet’s Action Plan in 2011. Chapter 4 described how the re-interpretation of animal-testing alternatives upon the delegation of policy implementation to the ZonMw research council strengthened the technification of the policy issue. Chapter 5 identified several tensions within the Netherlands Toxicogenomics Centre (NTC) in their attempt to produce societally relevant knowledge on animal-testing alternatives.

The empirical observations have focused on the Dutch animal research discourse(s), and on policy and research programmes related to animal-testing alternatives. Most observations have therefore been directly related to the policy framing and discourse coalition’s interpretation of animal research and animal-testing alternatives. However, having examined the research-policy mediation infrastructure in relation to three-R research as well, some observations touch upon the co-production of knowledge and policy, the way in which innovation was stimulated and on the societal relevance of science as well. The following are the nine most important empirical observations that help explain the present incongruence between the societal expectations and the discourse coalition's technological promises regarding animal-testing alternatives in the Netherlands.

The empirical case studies suggested that the introduction of the concept of animal-testing alternatives in Dutch policy discourse successfully reframed the policy issue of animal experimentation from a trade-off between animal welfare and public health to a win-win situation. This new discourse on animal testing established a new discourse coalition in which many opponents from the previous discourse(s) on animal experimentation were able to work together towards one ostensibly shared normative horizon.

This reframing redefined the policy problem in terms of an animal-testing alternatives shortage. This redefinition paved the way for a technical solution to the societal problems of animal experimentation: The development of animal-testing alternatives became the most successful policy intervention to reduce the numbers of research animals. Non-technical policy interventions, such as tax incentives to stimulate the use of animal-free research methods, were hardly debated.

For the realisation of these plans, the Dutch government depended heavily on the infrastructure that mediates research-policy interactions on this issue, including research councils and large research programmes. In the absence of an unambiguous moral government standpoint on animal experimentation, the fundamental and political choices regarding animal research and animal-testing alternatives’ development were left up to the research council ZonMw (Chapter 4), the Netherlands Genomics Initiative (NGI) and the Netherlands Toxicogenomics Centre (Chapter 5). These intermediary organisations gave meaning to the policy issue in interaction with other members of the discourse coalition (i.e. co-production of science and policy), including scientists, NGOs, and industries. Collectively, the discourse coalition (including the intermediary organisations) on animal experimentation created the promise that science and technology were the answer to the societal problems of animal experimentation. The negotiated and co-produced knowledge seemed to have further technified the policy issue of animal experimentation and overshadowed possible non-technological policy interventions.

Within this shaping practice of knowledge and policy, the interpretation of what counted as good animal-testing alternatives has shifted over the past decade as well. Upon its introduction into the Dutch policy discourse in 1970s, the term was understood as an alternative to the animal model in experiments (i.e. animal-free; “first-generation animal-testing alternatives”). In the 1980s, this term was re-interpreted to mean methods that could either replace, or refine and reduce animal experiments (i.e. 3Rs; “second-generation animal-testing alternatives”). Presently, a significant number of animal-testing alternatives focus on the understanding of underlying mechanisms of disease, toxic (side) effects and overall response and aim to overcome animal experimentation (i.e. “third-generations animal-testing alternatives”).

The discourse coalition’s understanding of the type of three-R research that needed (public) funding shifted alongside the changing interpretation of animal-testing alternatives as well. In the earlier programmes on animal-testing alternatives (such as PAD), only research substituting animal models was subsidised (i.e. “first-generation research on animal-testing alternatives”). Until around 2000, relevant three-R research was interpreted as research that would lead to a one-on-one replacement, refinement or reduction of the former animal model in an experiment (“second-generation three-R research”). This type of research was directly related to animal models in research and therefore also to the annual total of research animals. Meanwhile, emerging technologies, such as genomics and system biology, were welcomed into the discourse coalition thanks to their animal-reducing potential. This inclusion appeared to stretch the interpretation of three-R research to include fundamental
research focusing on the underlying biological mechanisms of disease and toxic responses, as well (“third-generation three-R-research”). While this type of research may eventually avoid the use of animal models in research altogether, thanks to the development of more relevant models, the impact on animal numbers seems more uncertain.

Along these expanding interpretations of animal-testing alternatives and three-R research gradually shifted the (technical) discourse coalition’s promise from an absolute to a relative promise of reducing animal numbers. Animal-testing alternatives from first-generation research aimed to substitute animal experiments for animal-free experiments (“replacement”) or experiments that used fewer research animals (“reduction”). Therefore, these first-generation animal-testing alternatives that were developed were to decrease the absolute number of research animals in the Netherlands. However, the second and third generation of animal-testing alternatives were not so much aimed at substituting the animal experiments, as it was to gain more relevant knowledge for the human health situation. In this understanding, increased knowledge production from an animal experiment (e.g. through ‘omics or imaging technologies) or methods that may improve the pre-screening of substances were also understood as animal-testing alternatives. The majority of such second- and third-generation alternatives are added to the present system of animal experimentation and may at best reduce the number of animals per test, method or substance. This shift in the understanding of animal-testing alternatives may thus lead to a relative reduction of research animals, but not necessarily to an absolute reduction in the number of research animal in the Netherlands as registered by the NVWA every year.

The public funding of the development of animal-testing alternatives takes a science and technology-push approach to innovation. Such an understanding assumes that scientific understanding (rather than demand) drives the rate and direction of innovation. This linear model of innovation supported the programmes’ investment in (three-R) research to develop animal-testing alternatives. Combined with the reframed policy problem of animal-testing alternatives shortage, this model supported the belief that the availability of animal-testing alternatives would guarantee their use and subsequently lower the number of research animals as well. Although the more recent programmes seemed to focus more on the implementation of animal-testing alternatives by demanding co-financing, the argument of scientific understanding appeared to be sustained as a crucial link to the development of animal-testing alternatives.

Moreover, the present science system seems not fully equipped to truly advance societally relevant research, including the development of animal-testing alternatives. For example, my analysis of the Netherlands Toxicogenomics Centre showed that policy believed the potential animal-reducing rationale of genomics, against the prevailing concerns regarding increased animal use in genomics research. The animal-reducing potential of genomics research thus seemed to legitimise the massive public investment in this type of research. Yet, in the execution of the research programme, the public goal of developing animal-testing alternatives seemed to have shifted to the background. The “business case” approach, as well as the dominant science rewarding system, seemed to value the economic valorisation and publication of research more than the reduction of animal numbers. The extent to which the research contributed to the progress or development of animal-testing alternatives within the programme seemed to rely more on the individual researcher than on the programmes’ organisation.

Finally, the infrastructure that mediates research-policy interactions on this issue seemed to limit the level of policy reflection in the absence of clear policy objectives and/or a moral standpoint. The evaluation of research programmes focused on the extent to which animal-testing alternatives were developed, rather than on evaluating the investment in three-R research in relation to the policy goals of reducing animal numbers. Reflection on the way in which other societal values, as reflected in other policies, influenced the need for animal experiments thus seemed to play no part in the neither the programme’s evaluation nor the discourse coalition’s deliberation (i.e. “social choice”).

I argue that societal expectations of reducing absolute animal numbers lagged behind the discourse coalition’s re-interpretations and shifts regarding animal-testing alternatives and three-R research. These gradual diverging understandings eventually resulted in the present incongruence between the societal expectation and technological promise on animal experimentation including animal-testing alternatives.

8.1.2 Valuing the mobilising power of the discourse coalition

Chapter 6 mainly provided the answer to this question. In this chapter I showed how ethical, economic, and scientific arguments led to a disruption of the old discourse(s) on animal research and boosted the formation of a new discourse with a strong orientation towards animal-testing alternatives. I also showed how the low level of policy reflection, the concept’s flexibility, and the creation of promises and expectations (i.e. “enabling discursive processes”) matured the new discourse into the dominant discourse in the Netherlands.

Thanks to its mobilising power, the introduction of the concept of animal-testing alternatives thus initially helped to move beyond the impasse of the discourse on animal experimentation
in the 1990s: Various actors were able to recognise themselves in the “replace-reduce-refine discourse” and to work towards one ostensibly shared normative horizon: Together they formed a new discourse coalition on animal-testing alternatives. Publicly, this newly formed discourse coalition created the technological promise that the investment in animal-testing alternatives would lead to a decrease in research animal numbers. The discourse coalition seemed to co-create and strengthen the societal expectation for this matter as well.

However, at present it appears that the enabling discursive processes have been pushed too far. Public disagreement on the current approach from within the discourse coalition (e.g. stimulating three-R research to decrease annual research animal numbers, and the effectiveness of the public policy on animal experimentation) seem to be breaking down the foundations of the discourse coalition. Furthermore, the coalition mainly consists of actors from within the direct science-policy nexus, including scientists, universities and other knowledge institutes, research councils and, to a limited extent, NGOs.

Based on the empirical findings, and the vulnerabilities of the present discourse coalition, I argue that the concept of animal-testing alternatives, or the “three Rs”, is losing its ability to act (i.e. “power” Avelino, 2011). The present discourse coalition is only marginally able to mobilise new players outside the direct science-policy nexus (e.g. professional technology investors, wealthy civilians, NGOs and other societal organisations, such as health organisations, and CSR-platforms) to join the discourse coalition. Yet, such mobilisation is urgently needed for the sustainable transition that better reflects the societal values regarding animal research. As Dutch public policy heavily depends on broad agreement to act, the vulnerability of the present discourse coalition demands a more thorough policy reflection in order to stimulate policy change in the desired direction.

### 8.1.3 Stimulating meaningful policy reflection for sustainable policy change

In Chapter 7, I elaborated on issues that need to be addressed further in public deliberation in order to stimulate a more meaningful policy reflection and to advance sustainable policy change. The chapter anticipated on the four levels of policy evaluation and reflection (i.e. “technical-analytical”, “contextual”, “systematic”, and “ideological discourse”) and suggested several means on how policy may be performed (and improved) from a central government’s perspective. The suggested approaches included user involvement in three-R research, the reframing of the issue so as to better fit the various stakeholder’s values and motives, the discouragement of animal experimentation, and reflection on the societal values driving animal experimentation. For each of these means, different potential public policy instruments were suggested (e.g. co-financing, patent elongation, cap-and-trade system, and the a more meaningful public deliberation).

I have differentiated between “first-order” and “second-order policy evaluation” (e.g. Fischer, 1995), both of which reflect the underlying assumptions guiding policy change. Policy evaluation on the first-order level assumed that animal experimentation is, at least to some extent, necessary and accepts animal-testing alternatives as a solution for the problems associated with animal research (i.e. ethical, economic, and scientific arguments). Policy change on this level is therefore primarily focused on the development of more relevant three-R models. Evaluation on the second order, however, seeks out an understanding of the mechanisms requiring animal experimentation models as a means to answer societal questions. Consequently, policy change on this level is primarily focused on stimulating relevant research models and a more balanced inclusion of other, yet related, societal values.

This research was based on animal welfare as the main societal value in the public debate on animal research (i.e. societal expectation on reducing animal numbers). However, I argued that real and sustainable policy change on this topic is rather unlikely without the inclusion of other, perhaps even conflicting, societal values that greatly affect the appreciation of animal models, including our present understanding of health (e.g. Huber, 2014), the acceptance of risks (e.g. Beck, 1992), the societal relevance of science (e.g. Hessels, 2010), and the stimulation of the “knowledge economy” (e.g. EZ, 2013), among others.

This research suggests that, without denying the first-order implications, public deliberation on the second-order level of policy reflection (i.e. “ideological discourse”) creates a more societally balanced policy on animal experimentation than the focus on animal welfare alone. Without a doubt, this deliberation will require some tough policy decisions.

### 8.1.4 Lost in technification

Based on the answers to this study’s sub-questions, I argue that the present discourse coalition on animal-testing alternatives has only partly lived up to the societal concerns regarding animal experimentation in the Netherlands. I explicitly say “partly”, because there are two sides to this conclusion. On the one hand, the discourse coalition on animal-testing alternatives has indeed failed to live up to the societal expectations of reducing numbers. The annual count of research animals has remained more or less stable over the past decade, despite members’ intentions and expenditure. The inclusion of the so-called “killed-in-stock” animals would have even led to a more negative evaluation, as this category would have doubled the total number of animals in the research context.\(^{211}\) On the other hand, however, the new discourse on animal research including the discourse

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211 By law, this category is not counted as research animals. See also Section 1.2.3 for a discussion on “counting as” (Stone, 1997a).
coalition on animal-testing alternatives has also been quite successful, as it has been able to overcome the impasse of the previous discourse(s) on animal experimentation and has placed the issue higher on the political and societal agenda. It seems unlikely that this could have occurred without the introduction of the concept of animal-testing alternatives (i.e. the 3Rs).

Yet, I also argue that the present Dutch discourse coalition on animal-testing alternatives is vulnerable and approaching a crossroad. In the near future, it appears likely that the present “three-R discourse” will disrupt and, as a consequence, boost the formation of new discourses, for example one organised around the transition towards an animal-free research world (i.e. replacement, avoidance), and another that is organised around the present system of animal experimentation (i.e. refinement and reduction). The foreseen crossroad underscores the urgent need to elaborate specific issues in public deliberation as to stimulate a more meaningful policy reflection and to advance sustainable policy change.

As on this moment, I argue that technification is deeply embedded in the current system(s) of animal research, including public policy, research programmes on animal-testing alternatives, and research practices. This includes a) the (policy) discourse’s assumption that the social problem of animal research can be solved with the technical solution of developing animal-testing alternatives; b) the policy problem definition as a shortage of animal-testing alternatives and the need for more funding; c) the primarily science-driven approach to innovation in the research programming of animal-testing alternatives; d) the understanding of animal-testing alternatives as a spin-off of other more mainstream research; and e) the technical/scientific understanding of a relative reduction of animal numbers as a result of the implementation of animal-testing alternatives. I conclude that because of this technification, the latent clash of societal values and the absence of some tough decisions, the present Dutch public policy discourse on animal research is “lost in technification”.

8.2 Scientific contributions and societal relevance

In this section I discuss the main insights of this research in terms of its scientific contribution and societal relevance, especially with regard to research funding and policy making.213

212 The assignment for a temporarily established Think-tank of which I have been involved as the secretary, also supports this policy assumption. The Think-tank was asked to formulate ways to generate additional funding to generate a “push” in research into animal-testing alternatives (Dijksma, 2014; EZ, 2014b).

213 The distinction between the scientific contributions and societal relevance of (my) research is purely practical, and I consider the “scientific contributions” to be just as social as the “societal relevance” of my research.

8.2.1 Scientific contributions

This study examined the extent to which the discourse coalition on animal-testing alternatives in the Netherlands reflects the societal concerns regarding animal experimentation. The approach combined theoretical insights from Science and Technology Studies, innovation studies and policy sciences. I will briefly discuss the four main scientific contributions emerged from this dissertation, which are related to the following themes: interpretative policy analysis, understanding societal relevance and the co-creation of promises, frame analysis, and policy reflection.

First, this study has contributed to a fuller understanding of the use of interpretive policy analysis and contributed to the increasing body of literature with new empirical data. Following Henk Wagenaar, Frank Fischer, Dvora Yanow and others, I argue that meaning is “constitutive” of political actions, governing institutions and public policy, and an integral part of the policy process. It is precisely for that reason that meaning can shape practices, institutions and policies that bring them into being (e.g. Fischer, 2007a, 2007b; Fischer & Forester, 1993: See also Chapters 1 and 2; Wagenaar, 2011; Yanow, 1996). Interpretive (policy) analyses seem essential to describe and understand societal incongruences or “implementation problems” for policy problems such as animal experimentation.

Second, this study has contributed to a fuller understanding how “persistent problems” are understood and re-interpreted along the science-policy nexus, especially within the interplay of expectations and promises (i.e. “sociology of expectations”, STS). My distinction between the promise and the expectation may provide a valuable analytical tool to describe the co-creation of promises, whereas the addition of the adjective “technological” to Fischer’s level of policy reflection may offer a useful way to describe incongruences between policy intentions and the public at large. The theoretical framework and empirical observations of this study may therefore be also relevant to scholars studying the interplay between societal values and policy goals in other domains and research programmes.

Third, it has contributed to a further operationalisation of frame analysis as part of the larger family of interpretative methods. Frames name and claim a specific situation in a way that provides an answer to the question of what is going on. Building on the work of Peter Scholten (2007, 2011), I classified four frame characteristics that represent the different features of (policy) frames. These are issue identification, which refers to the contextualisation of the issue; categorisation, which draws the boundaries of the issue...
defined; attributed responsibility, which describes which actors are held responsible; and causal story, which describes how the problems, categories, and actors are glued together in an intelligible and convincing story to make an issue comprehensible. The classification of the four frame characteristics proved to be of great value to describe the frame shifts over time and may be helpful to analyse frame shifts in other (policy) issues, too.

Fourthly, this study has shown how Fischer’s framework for policy evaluation (e.g. Fischer, 2003) reflected the various levels of policy change. This suggests that Fischer’s four-level model may also be of value in designing policy – in addition to analysing policy – and in proposing concrete policy instruments that could promote policy change in the desired direction. The integration of all four levels of policy reflection (“discourse”) in future policy appears to create a more coherent and robust policy change than change based on a first-order level of reflection only.

8.2.2 Societal relevance
This research has studied how diverging societal values have been translated and reinterpreted along the science-policy nexus in public policy, research programming and research practices for animal-testing alternatives. Given its empirical focus, this study holds particular relevance for the “animal research practice”, including (three-R) scientists, research councils, NGOs, political parties, industries, regulators, civil servants and the public at large. However, the empirical observations – including the functional flexibility of societal relevance and the observed tensions within research programmes – seem also relevant for studying and understanding other persistent problems.

This study has contributed to a fuller understanding of why the promise of developing animal-testing alternatives has not lived up to the societal expectation of reducing research animal numbers. It has also shown that the transition towards an animal-free research world is much more complex than often assumed and presented, exactly because of the diverging – and sometimes even conflicting – societal values and stakeholders’ priorities. This may help actors both within and outside the present discourse coalition to reflect on their own role in the establishment of the current incongruence and to improve the situation within reach of their abilities (i.e. shaping of sustainable policy change that better reflects the different societal values).

I have argued that the present Dutch public policy discourse on animal research is “lost in technification” and that at least some level of policy change is needed. Especially as put forward in Chapter 7, I have identified issues that need to be addressed further in public deliberation so as to stimulate more meaningful policy reflection and to advance a sustainable transition that better reflects the societal concerns regarding animal research. I argue that without a clearer picture of the future - or normative horizon - of animal experimentation in the Netherlands, public policies on this issue will continue to drift and are likely to lead to increasing societal and political debate with regard to their effectiveness.

This study has contributed in particular to a better understanding of the difficulties in developing animal-testing alternatives in both research programming as well as in research practices. The empirical observations suggested that the goal of developing animal-testing alternatives within three-R research have become “spin-offs” or “positive side effects” of more mainstream research. This observation raises the question whether the relatively low budget of three-R development is to be spent on (fundamental) knowledge development about the biological mechanisms underlying disease and adverse effects or emerging technologies. Without questioning the importance of such research, the question remains whether this type of research should indeed be part of the policy budget for animal-testing alternatives or be financed as part of the overall research budget in the Netherlands (i.e. by the ministry of Education, Culture and Science, ‘OCW’). It seems likely that scientists, public organisation, and private companies will further invest in emerging technologies when they are convinced of the scientific and/or economic advantages over traditional animal research. In other words, this type of innovative research is likely to more or less spontaneously find its way to those places where it can contribute to the reduction or replacement of animal research. (If this appears not to be the case, it seems wiser from a governmental perspective to invest in bridging those worlds than to develop more scientific knowledge). Spin-off research may thus well be relevant for scientific purposes, but apparently fails to live up to the societal expectation of reducing animal numbers in the short term.

I argue for a more systematic and demand-pull approach to these innovations with the conviction that research programming on animal-testing alternatives remains necessary in advancing the transition, but without wishing to pre-empt the decisions that are yet to be made in public deliberation. Such an approach implies that the research programming starts with the users’ needs and only funds that type of knowledge development (e.g. mechanisms, models, technologies) for which there is a need to improve – and perhaps even guarantee - their implementation. Given the on-going public debate on animal experimentation, one may also image a more “societal pull” approach in three-R development, in which the society at large helps to prioritise those fields in which animal research is least accepted (e.g. regulatory testing, academic use, industrial use for detergents and other household products).

214 His framework has been used to reconstruct policy theories on ethnicity policy arguments in the Netherlands (Hoppe, 1993), fleet ballistic missiles in the United States, the packing of fresh dairy products in the Netherlands (Grin & Van de Graaf, 1996b), wind turbine development in Denmark (Grin & Van de Graaf, 1996a), and eutrophication control (Lobe, 2003), among others.
Optimisation of such a demand/societal-pull approach to innovation also seems to require a structure different to the current research programming, especially with regards to the funding applicants and the type of funding available. In current research programmes on animal-testing alternatives, the main applicant for the research funding ought to be public (e.g. universities, knowledge institutes), excluding SMEs, larger industries, and other private organisations. The question arises whether such distinction of the public and private still holds in accelerating the transition. For example, SMEs may be much better equipped to translate scientific knowledge into commercial products and to advance the replacement of animal models in both science and industry than scientists alone. One may also imagine a system in which different types of funding (e.g. subsidies, philanthropy, venture capital) match the different phases of innovation, including the notorious ‘valley of death’. Government funding may then be spent on those projects, research, or experiments that others (including “the market”) are less likely to invest in. Whether this systematic approach to innovation and allowance of other applicants is desirable and legally allowed (e.g. whether it remains within the EU rules of state support) in the stimulation of sustainable futures (e.g. fewer research animals) requires further political deliberation. Here the issue on animal experimentation can learn from other (adjacent) policy issues as to stimulate a more sustainable society, for example in bridging the valley of death in eco-innovations (e.g. Van der Vooren & Hanemaaijer, 2015) and future-proof rules and regulation for technological developments (e.g. “big data”) and new business models (Kamp, 2015).

Besides reflecting on the structure and organisation of research programming on animal-testing alternatives, the transition may also be advanced when animal experimentation is truly understood as a means to answer a scientific research question rather than as a goal in itself. For example, the current debate on the “synthesis of evidence”, including the use of systematic reviews prior to animal studies, has the potential of a substantial game changer if made compulsory. Furthermore, such a understanding of animal experimentation may also help to connect the issue with other policy issues as to advance a sustainable transition, including health promotion and prevention, drug development, eco-innovations, and responsible research innovation. It is suggested that the interlinkage between animal research policies and these other relevant issues and their policies may help to gather more (political) support for the issue itself, as well as to help with the development of more relevant policy indicators to evaluate the policies’ effectiveness rather than on research animal numbers alone.

Finally, the empirical observations of this study suggest that the public legitimacy of scientific research is vulnerable to overpromising, which may contribute to the loss of a scientist’s or a scientific field’s credibility. This study may help actors (e.g. scientists, NGOs, research councils) to reflect on their role in the “science-credibility cycle” (Hessels, 2010), including their role in the retention of a public “science-on-demand image”, which presumably creates unrealistic societal expectations about the progress and contribution of science in society in general, and that of an animal-free research world in particular.

### 8.3 Remaining questions and challenges for future research

This project has explored the translation process of societal values regarding animal experimentation along the science-policy nexus in the Netherlands. Doing research - or any other type of work - requires demarcation at some point to establish closure. Several decisions in this study’s research design therefore lead to suggestions and requirements for further scientific research.

The first issue concerns the actors studied. I focused on the national policy concerning animal research and three-R alternatives, relevant funding organisations in this field, and researchers within relevant scientific programmes as part of the discourse coalition on animal-testing alternatives in the Netherlands. The role of industries, NGOs and health funding organisations, among others, in shaping the definition and policy on animal research and the three-Rs therefore remained largely outside the scope of this study. In addition, the focus was trained on the Dutch situation. Much of the legislation is left up to individual member states of the European Union to implement (i.e. “discretionary space”), as animal research for scientific purposes is not prescribed in legislation, and as the Netherlands still has its own policy and funding organisations on animal research and three-R alternatives.

215 This question was also raised in the “transition sessions” in June 2015 as part of the Think tank’s advice on additional three-R research funding.

216 The ‘valley of death’ refers to the funding gap between basis research and the commercialisation of a product (in Dutch better known as ‘de vallei des doods’, e.g. van der Vooren & Hanemaaijer, 2015).

217 In short, this issue relates to the gathering of scientific evidence prior and during the animal experiment and includes the meta-analysis of existing scientific literature (i.e. systematic reviews, SRs) on the topic. The use of systematic reviews is very common in clinical studies and its expected that the use of such reviews in preclinical animal studies lead at least to more relevant animal studies and likely also to fewer animal studies (e.g. Ritskes-Hoitinga et al., 2014).

The possible introduction of SRs in animal research leads to much tumult in the scientific community, as many share the opinion that SRs do not add anything to the present literature searches, are time-consuming, and as such fit not within the scope of the average research project (e.g. Swanikshuisen & Smit, 2014). Yet, ZonMW supports the work of the Systematic Review Centre for Laboratory animal Experimentation (SYRCLE) and has co-organised workshops for biomedical researchers on the topic. Currently, the Netherlands National Committee for the protection of animals used for scientific purposes ‘Nationaal Comité advies dierproevenbeleid, NCad’ is preparing a recommendation on the ‘synthesis of evidence’, which is expected to be due at the end of 2015.

218 This image includes the assumption that knowledge application, including the development and validation of animal-testing alternatives, may be feasible within the scope of a (four years) research project.
It would be of interest to expand the scope of this study to other, more internationally orientated actors and to look into (public policy) instruments from their perspective and range of influences, too.

The second issue relates to the current discussions on the reporting and evaluating of the societal relevance of scientific research. While this issue has been raised throughout the study – specifically in Chapters 5 and 7 – a more detailed elaboration (on specific indicators, for example) did not make it into the research design. However, the field of animal research and three-R alternatives may benefit greatly from these debates, as they argue for more societally relevant research without undermining the value of fundamental research or giving in to the “audit explosion” (Power, 1997), and they include work on the development of more suitable indicators to make such progress visible (e.g. Drooge & Spaapen, 2011a; Drooge et al., 2011b; Hessels, 2010; Spaapen et al., 2007). Given the vulnerability of the policy indicator of animal numbers, it seems prudent to study which (combination of) indicators can both visualise the progress of the field and evaluate policy in this respect. The development of such indicators, however, ought to start with a public deliberation of the normative horizon of animal experimentation in the Netherlands.

The third issue concerns the relation between research and policy in general and on animal research, including animal-testing alternatives in particular. Many studies have shown that what part of the policy problem belongs to the policy realm and what to the research realm, is often decided through processes of negotiation between research and policy makers rather than being clear cut from the outset (e.g. Bijker et al., 2009; Halffman, 2005; Jasonoff, 1990; Latour & Woolgar, 1986). In that sense, boundaries between research and policy should be seen as the outcomes of negotiating rather than as inputs to those processes (Bekker et al., 2010). The observed technification central to this study sheds new light on the increasing rational (and linear) perspective on the relation between research and policy (i.e. evidence-based policy making) in the Netherlands. As Wiebe Bijker and colleagues (2009) argue in their research on the backstage processes of the Health Council in formulating advice, such a linear model often misses the often unstructured and ambiguous nature of many policy problems. Rather than delegating the normative decision-making to intermediary organisations, such as research funding organisations (Chapter 4) or research programmes (Chapter 5), this study underscores the importance of research-policy interactions and negotiations as crucial elements for success. A further ‘decoupling’ of research and policy may lead to more losses than gains (Bekker et al., 2010). This study hints to the co-production of knowledge and policy in developing a shared understanding of the issue. Further research is needed as how to organise such co-production, for instance by explicitly studying the backstage of intermediary organisations as ZonMw in shaping the (policy) issue of animal experimentation and to consider the potential role of advisory councils and planning bureaus (i.e. “boundary organisations”) in facilitating the public deliberation on animal research in relation to other societal values.

8.4 Call for a sense of urgency

Despite the increasing societal and political attention directed towards animal research, the topic still seems to lack the sense of urgency that has been a great driver of change in other animal-related policy issue. For example, in response to PETA’s revelations about the harvesting of angora wool, some major textile and clothing industries banned this wool from their products. Here, reputational damage was a major incentive for change. In other issues, the looming threat of government intervention seemed an accelerator for change. For example, the practice of livestock husbandry reached self-regulation on the use of antibiotics in a covenant in 2008 (LNV, 2008).

Furthermore, animal research seems to differ from other practices involving animals because of the significant lack of influence that consumers and citizens seemed to have. For example, consumers may choose to eat organic meat or reduce their consumption of meat and fish. Citizens may choose not to visit circuses and zoos and to buy fur-free clothing. But when it comes to animal experiments, consumers do not really have a choice in the matter, unless they systematically abstain from the use of medication, surgery, household products, chemical products such as paint and pesticides, and many of the functional foods, such as hypoallergenic infant nutrition and specialised food for Alzheimer patients. Nonetheless, the use of research animals for the testing of cosmetic products was successfully banned in the EU after fierce public discontent. In addition, the use of non-human primates is subjected to stringent regulation. The public thus could be a fierce accelerator of sustainable policy change.

Moreover, bringing together various public policies into one normative horizon on animal research may facilitate a true and sustainable transition. Setting policy goals require some

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219 PETA is the acronym for the nongovernmental animal welfare organisation People for the Ethical Treatment of Animals.


221 In earlier years, the purchase of “cruelty free” cosmetics (e.g. Bodyshop, Lush) was an exception to this. Since the European testing ban on finished cosmetic products in 2004 and the marketing ban on ingredients or combination of ingredients in 2009, this distinction is no longer needed. See also http://ec.europa.eu/growth/sectors/cosmetics/animal-testing/index_en.htm.
though – and likely painful – decisions. However, without guidance and commitment from adjacent policy issues, public policy on animal research is too vulnerable for the overruling of other policies affecting the practice of animal research in the Netherlands. Such vision and ambition require measures to monitor and evaluate the policy as ways to learn and improve, rather than giving in into the increasing demand of the “audit society” (Power, 1997).

The principles of Corporate Social Responsibility (CSR) could provide the linking pin between various actors both in, as well as outside, the chains of animal research (see also §7.4). Embracing CSR is a way of showing that you take your clients, consumers, civilians and the society at large seriously, and that you are willing to share the dilemmas you face and hurdles you encounter in daily practice, regardless of what that practice is (doing research, making policy, funding research, breeding research animals, developing consumer products, teaching laboratory skills etc.) Building on Everett Rogers’ diffusion of innovation theory (2003), once the “innovators” and “early adopters” support the CSR framework in the field of animal research, others will eventually follow.

Lastly, I believe it is time to open up for public scrutiny the activities that still concern research animals instead of masking them, to develop a sustainable and responsible view of the use of animal research in the Netherlands, and to create a climate in which organisations can openly and truthfully stand behind their animal research choices, including the outsourcing of research, the housing of research animals, the investment in non-animal models, or the non-use of research animals altogether. A sustainable transition that better reflects the societal values regarding animal research may be much closer than anticipated.

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222 In The Audit Society: Rituals of Verification, Michael Power (1994) asks how auditing can be such a robust policy tool when it often seems to fail so spectacularly and what it mean when a society relies so heavily on an industry of checking (what Power calls “audit explosion”).

223 It is more appropriate to think of multiple chains linked together at some points than being one linear chain. Such an institutionalisation of CSR elements has also been reflected in Hub Zwart’s work on molecular genetics, in where he argues that the ethics of the research practices has shifted from an ego-centred concern towards the institutionalisation, operationalization and implementation of social norms and values (such as responsibility, transparency, fairness and the like, i.e. “macro-ethics”) (Zwart, 2008, 2013). Note that the CSR framework resembles the recent developments in funding research in both Europe and the Netherlands towards more responsible research and innovation (RRI) (EC, 2013b; NWO, 2013).
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Animal research. It is hard to think of another issue that generates so many strong emotions and is of such ethical concern among the public, even while it remains a relatively minor issue in public policy discourse. I wondered why research practices today still use research animals so frequently despite the general disgust and unease among Dutch society, the existence of public policy seeking to stimulate the development of alternative methods to animal experimentation, and the sky-high potential of emerging technologies. It is exactly this puzzle that is central to this study.

Furthermore, I was baffled by how animal research seemed to change meaning – that is, how differently it is interpreted and framed – in policy, research funding and research practices. This research analyses how abstract societal values with regard to human health, safety or animal welfare, for instance, as well as the more recent debate about the societal relevance of science, are translated into concrete policy and research programmes in the Netherlands. More specifically, it studies why public policy on stimulating animal-testing alternatives fails to live up to the societal expectation of decreasing animal numbers in research. The main research question of this thesis is: To what extent does the present discourse coalition on animal-testing alternatives have the ability to reflect the societal concerns regarding animal experimentation in the Netherlands?

To answer this question, animal-testing alternatives are studied as innovations amidst diverging (and often, conflicting) societal values along the science-policy nexus from an interpretive policy perspective. I study how animal-testing alternatives acquire meaning in three different yet related contexts: in public policy, in research councils and in research programmes. Moreover, I study where these understandings intersect and may create friction that hampers the transition to an animal-free research world. This research is based on the premise that there is at least some societal desire to limit animal research as much as possible, and that public policy on animal-testing alternatives indeed aims to stimulate the use and development of such alternatives.

With this research, I aim to provide to a fuller understanding of the complex implementation process of allegedly desirable innovations in society, such as animal-testing alternatives. Such an understanding may help to reflect on the desired normative horizon and stimulate a more meaningful public debate on the future of animal research in order to bring about a more sustainable policy change.
My theoretical starting point is that (policy) problems, including those concerning animal research and animal-testing alternatives, are socially constructed and organised in and through various discursive practices. This means that the way in which one approaches the issue, as well as how the issue is positioned, communicated and framed, shapes understanding in a particular context. This shaping also determines whether an issue is a problem or not, and how this possible problem may be solved. One can imagine that framing animal research as a lack of alternative, animal-free methods requires a different (policy) solution than the moral rejection of the use of animals, or the acceptance of animal experimentation to benefit human health.

Interestingly, and despite all the different and often conflicting values, individuals and organisations still find ways to work together: So-called discourse coalitions can be formed without the need to specify underlying values. The mobilising power of the present discourse coalition on animal-testing alternatives seems to lie in the promise – or perhaps even the expectation – of a sustainable future in which animal welfare is associated with other generally shared public values, such as economic progress, scientific relevance and technology development, in a fair and equal manner. As such, many realities about animal research can coexist, depending on how one makes sense of the issue.

This understanding of policy problems also implies that policy implementation is an integral part of policy-making and involves the (re)definition of the relevant concepts, as well as the prioritisation of public values. Building on interpretive approaches to policy that assume the discursive character of policy-making and the constant struggle over interpretation and power, this study fits within an argumentative tradition with regard to policy analysis. Based on this theoretical foundation, I develop and use three central concepts to analyse the interactive translation process of societal values into concrete policy and research programmes: policy frames, policy reflection and technification. Drawing on the framing literature, I develop a way to construct policy frames on animal research in Dutch policy discourse. Such policy frames capture the interpretation of animal research in a particular context and time, including policy documents in the ‘90s and in present research programmes. Building on Frank Fischer’s work on policy argumentation, I was able to evaluate the level of policy reflection. This understanding helps to explain the incongruence between societal expectations and the technical promise with respect to animal research, including animal-testing alternatives in the Netherlands. Finally, I introduce the concept of technification as the over-representation of technical and scientific futures as solutions to social problems, such as animal research.

This study follows a case study approach, as made clear in the empirical chapters of this thesis: Dutch public policy on animal research, the ZonMw programmes on animal-testing alternatives and the Netherlands Toxicogenomics Centre research programme. Data have been drawn from in-depth interviews with academic researchers and representatives of various organisations in the research system. In addition, I have analysed numerous governmental policy documents and policy debates on the issue of animal experimentation, as well as a selection of reports, strategic plans and evaluations of research councils and research programmes.

After the introductory Chapter 1, which presents the background of this study, Chapter 2 provides the thesis’s theoretical framework in greater detail. Drawing on discourse and framing theories, the vast body of literature on interpretive and argumentative policy analysis, as well as insights from Science and Technology Studies (STS) on the role of expectations in the research practice and the process of innovation, this chapter constructs a multidisciplinary theoretical framework. Central to this framework is the role of (policy) frames and the level of policy reflection. I consider frames to be sense-making devices that include both a problem definition and the presumed answer to this definition. Frames thus capture a particular understanding of animal research, including animal-testing alternatives for a certain period of time within a specific context. Frames may operate on a different level of reflection ranging from a more technical level of whether or not a particular (research) programme fulfilled its stated objectives, to the more fundamental level of how we value health and safety. This ordering of frames helps me to position the present policy discourse on animal-testing alternatives in the Netherlands and facilitates a better understanding of the apparent mismatch.

After the introductory and theoretical exercise, Part II continues with the empirical basis of this thesis. It approaches the science-policy nexus from different entry points: the Dutch public policy on animal research, the research council’s programmes on animal-testing alternatives and research practice. Chapter 3 shows how the Dutch policy discourse on animal research changed dramatically since the introduction of the Animal Experimentation Act in 1977. By analysing the various frame shifts over time, including a shifting interpretation of research animals, the expanding definition of animal-testing alternatives, the win-win positioning and the increased focus on chain responsibility, I revealed how animal-testing alternatives gradually became the leading, technical solution to the social problem of animal research. Chapter 4 studies how research councils, as intermediary organisations between science and policy, cope with various expectations from both worlds. By analysing various frame shifts in ZonMw’s research programmes on animal-testing alternatives, I argue that the implementation of animal research policies in research programmes has strengthened the technification of the policy issue. That is, the policy problem became increasingly framed as a shortage of animal-testing alternatives, supporting the development of more such alternatives. This chapter also exposes how the delegation of fundamental choices...
to a research council, as well as a particular science-push understanding of stimulating innovation and the technical level of programme evaluation, has increased this process of technification. Chapter 5 shows how the increasing quest for societally relevant research and the expectation of developing animal-testing alternatives produces several types of tensions in scientific practice. By studying the research programme of the Netherlands Toxicogenomics Centre (NTC), I argue that tensions over the public legitimisation of research, the assessment of research programmes and the daily practice of research may paradoxically widen rather than bridge the gap between science and society. Furthermore, the inclusion of emerging technologies like toxicogenomics in the alternative-discourse has quietly moved the scientific interpretation of alternative models even farther away from the societal expectation of reducing animal numbers: It has become more and more technical and hard to grasp from an outsider’s perspective.

These empirical chapters question whether small research projects, such as the one funded by ZonMw (Chapter 4) or large research consortia such as the NTC (Chapter 5), can truly advance animal-testing alternatives and ensure they live up to the societal expectation of decreasing animal numbers, or whether they are merely an excuse to reassure the public. These chapters suggest that without public deliberation on the societal relevance and the values grounding such policy and research programmes, their activities and outcomes are unlikely to meet the public’s expectations of the societal relevance of science.

Part III continues with the assessment and concluding chapters of this thesis. Chapter 6 studies how the discourse coalition on animal-testing alternatives was initially able to accommodate a large variety of actors, values and goals but now seems to be falling apart. Based on the insights from the empirical chapters, I conclude that the relatively low level of policy reflection, the flexibility of the concept of animal-testing alternatives and the strong and appealing promises and expectations accommodate the discourse coalition in the first place. However, I also show the downside and vulnerability of each of these gluing discursive processes. The discourse coalition’s orientation on science and technology as a solution to animal experimentation, the created societal expectation of a decrease in animal numbers as a direct result of the investment in three-R research and the public statements of discontent by several members from within the discourse coalition indicate that the present discourse coalition is under pressure and likely to rupture in the near future. Chapter 7 elaborates on issues that need to be addressed further in public deliberation in order to stimulate a more meaningful policy reflection and advance sustainable policy change that would better reflect societal values regarding animal research. It anticipates the various levels of policy reflection and suggests several approaches – and the corresponding public policy instruments – to design and improve policy. These instruments include the establishment of a three-R database, the introduction of a tax on animal experimentation and the labelling and traceability of products, among others.

In the concluding Chapter 8, I provide a further reflection on the material presented in the preceding chapters. I answer the general research question by addressing the following three sub-questions:

1. How can the present incongruence between societal expectations and technological promises from the dominant discourse coalition on animal-testing alternatives be understood from an interpretive framework of policy evaluation?

The case studies suggest that at least nine important empirical observations help to explain the present incongruence between the societal expectations and the discourse coalition’s technological promises regarding animal-testing alternatives in the Netherlands. These include successfully reframing the policy issue of animal experimentation as a win-win situation, redefining the policy problem in terms of an animal-testing alternatives shortage and supporting a technical solution to this problem: research programmes on animal-testing alternatives. The delegation of policy choices to research councils and research programmes has further technified the issue and overshadowed possible non-technological policy interventions. Moreover, with the shifting interpretation of what counted as good animal-testing alternatives and three-R research in need of funding, the coalition’s promise has drifted away from the societal expectations of reducing absolute animal numbers in research. With a focus on academic development rather than demand, the increasing pressure on the economic valorisation of research and the low level of policy reflection, the effect of such policies remains to be seen.

I argue that societal expectations of reducing absolute animal numbers lag behind the discourse coalition’s re-interpretations and shifts regarding animal-testing alternatives and three-R research. This gradual divergence in understanding eventually resulted in the present incongruence between the societal expectation and the technological promise of animal experimentation, including animal-testing alternatives.

224 Three-R (or 3R) refers to the replacement, reduction and refinement of animal experimentation and is often used as a more accurate synonym for animal-testing alternatives.
2. How can the mobilising power of the dominant discourse coalition on animal experimentation in the Netherlands be valued?

Based on the empirical findings, as well as the vulnerabilities of the present discourse coalition, I argue that the concept of animal-testing alternatives, or the “three Rs”, is losing its capacity to produce action. Besides, the present discourse coalition is only marginally able to mobilise new players outside the direct science-policy nexus to join the discourse coalition. Yet, such mobilisation is urgently needed for a sustainable transition that better reflects the societal values regarding animal research. As Dutch public policy heavily depends on broad agreement to act, the vulnerability of the present discourse coalition demands a more thorough policy reflection in order to stimulate policy change in the desired direction.

3. How can there be a sustainable change in policy that would do justice to the societal expectations regarding animal experimentation in the Netherlands?

In Chapter 7, I elaborate on issues that need to be addressed further in public deliberation in order to stimulate a more meaningful policy reflection and to advance sustainable policy change. Anticipating the four levels of policy reflection, I suggest several approaches and the corresponding public policy instruments to support the desired direction of policy change. And yet, the decision (of how) to move forward remains above all a societal and political consideration. This study does suggest, however, that public deliberation including more fundamental questions about what we consider as healthy and safe – that is, second-order reflection – will likely yield a more societally balanced policy on animal experimentation. Without a doubt, this deliberation will require some tough (policy) decisions.

Based on these sub-questions, I argue that the present discourse coalition on animal-testing alternatives in the Netherlands has only provided a partial answer to societal concerns regarding animal experimentation in the country. Societal expectations on the decreasing numbers of research animals lag behind the shifting discourse coalition’s understanding of animal-testing alternatives and three-R research, and this delay may have contributed to the present incongruence. Furthermore, I argue that the present Dutch discourse coalition on animal-testing alternatives is vulnerable and approaching a crossroad. The foreseen crossroad underscores the urgent need to elaborate specific issues in public deliberation in order to stimulate more meaningful policy reflection and to advance sustainable policy change.

In conclusion, I argue that technification is deeply embedded in the current system(s) of animal research, including public policy, research practices and research programmes on animal-testing alternatives. This technification includes a) the (policy) discourse’s assumption that the social problem of animal research can be solved with a technical solution, namely the development of animal-testing alternatives; b) the policy problem definition as a shortage of animal-testing alternatives and the need for more funding; c) the primarily science-driven approach to innovation in the research programming of animal-testing alternatives; d) the understanding of animal-testing alternatives as a spin-off of more mainstream research; and e) the technical/scientific understanding of a relative reduction in animal numbers as a result of the implementation of animal-testing alternatives. I conclude that because of this technification, the latent clash of societal values and the absence of some tough decision-making, the present Dutch public policy discourse on animal research is “lost in technification”.

My findings have two major implications for the debate on animal research policy and the deployment of research programmes to stimulate the reduction of animal numbers in experimental settings. First, my thesis shows that the present discourse coalition on animal-testing alternatives is under pressure to live up to the various and often diverging societal expectations related to modern animal research. Without a clearer picture of the future – or a normative horizon – of animal experimentation in the Netherlands, public policies on this issue will continue to drift and are likely to lead to increasing societal and political debate with regard to their effectiveness. Second, my work indicates that the stimulation of animal-testing alternatives through research (i.e. “three-R research”) alone will not accelerate the desired transition. I observed various tensions between research activities and funders’ criteria when it comes to striving for societally relevant research that will not be solved by the current approach.

Based on my findings, I formulate two sets of recommendations for animal research policies. Regarding policy design and evaluation, I warn about a short-term (economic) valorisation of alternative-research in terms of reducing animal numbers. The emphasis on short-term benefits leads to ineffective policy and overshadows the long-term ambition with regard to this issue. I recommend to:

- initiate public deliberation to develop long-term policy ambition with regard to this issue;
- aspire towards a coherent policy discourse that accounts for adjacent policy issues as well, including drug innovation, environmental legislation and science policies;
- actively bridge with related (policy) issues that help to accelerate the desired policy change – or perhaps even the transition, such as sustainability regulations and Corporate Social Responsibility (CSR), as well as the business case of disruptive technologies and innovations;
• broaden the criteria of policy evaluation and include (qualitative) indicators of societal impact as well.

With regard to science and innovation policies on alternative methods, I point to the perverse side effect of stimulating societally relevant research. My work indicates that research on animal-testing alternatives increasingly becomes a “positive side effect” of more mainstream research with an uncertain effect on animal numbers. Moreover, funders’ criteria and science system requirements often create tensions in the research practice. I recommend to:

• initiate a demand-pull approach in funding three-R innovations to safeguard implementation and use;
• focus on three-R innovations that are less likely to be picked up instinctively by academia or the market;
• allow for private organisations to apply for 3R-funding (without denying the rules of state support) so as to accelerate the desired policy change;
• broaden the criteria of performance evaluations and include (qualitative) indicators of societal impact as well;
• expand funding to social innovations that may help to accelerate the desired policy change.
Samenvatting

Dierproeven. Hoewel het een onderwerp is dat heftige emoties oproept onder de Nederlandse bevolking, is het slechts een marginaal onderwerp in het hedendaagse beleidsdiscours. Waarom gebruiken onderzoekspraktijken vandaag de dag nog proefdieren, ondanks de weerstand in de Nederlandse samenleving, de aanwezigheid van publiek beleid dat er op gericht is om de ontwikkeling van alternatieve dierproeven te stimuleren en het toehoog potentieel van opkomende technologieën? Dit vraagstuk vormt de kern van dit onderzoek.

Bovendien lijkt de betekenis – de verschillende interpretatie en framing – van dierproeven te veranderen tussen de verschillende praktijken van beleid, wetenschapsfinanciering en wetenschappelijk onderzoek. Dit onderzoek analyseert op welke wijze abstract geformuleerde en breed gedragen maatschappelijke waarden zoals gezondheid, veiligheid en dierenwelzijn, evenals het meer recente debat met betrekking tot de maatschappelijke relevantie van onderzoek, worden vertaald in concrete beleids- en onderzoeksprogramma’s in Nederland. Concreter, het onderzoek waarom het publiek beleid ten aanzien van alternatieven voor dierproeven niet in staat is om tegemoet te komen aan de maatschappelijke verwachting van afnemende proefdieraantallen. De centrale onderzoeksvraag van deze thesis is: In hoeverre weerspiegelt de huidige discourscoalitie ten aanzien van alternatieven voor dierproeven de maatschappelijke zorgen over dierproeven in Nederland?

Om deze vraag te beantwoorden, worden alternatieven voor dierproeven bestudeerd als zijnde innovaties tussen uiteenlopende, en vaak conflictierende, maatschappelijke waarden langs de wetenschaps-beleidslijn vanuit een interpretatief beleidsperspectief. Ik bestudeer op welke manier alternatieven voor dierproeven betekenis krijgen in drie verschillende, maar gerelateerde contexten: in publiek beleid, in wetenschapsfinancieringsorganisaties en in onderzoeksprogramma’s. Ik onderzoek waar de verschillende betekenisnissen elkaar ontmoeten en waar deze tot spanningen leiden die een grote verandering op dit gebied in de weg zetten. Deze studie is gebaseerd op de veronderstelling dat er een zekere maatschappelijke wens is om het aantal dierproeven zoveel mogelijk terug te dringen, en dat publiek beleid gericht op alternatieven voor dierproeven de ontwikkeling en het gebruik van deze methoden daadwerkelijk wil bevorderen.

Dit onderzoek draagt bij aan een beter begrip van complexe implementatieprocessen van ogenschijnlijk gewenste innovaties, zoals alternatieven voor dierproeven. Een dergelijke begrip kan helpen om te reflecteren op de gewenste ‘normatieve horizon’ en een meer betekenisvol publiek debat te stimuleren ten aanzien van de toekomst van dierproeven met
als doel om een duurzame beleidsverandering te bewerkstelligen.

Ik beschouw beleidsproblemen als sociaal geconstrueerd en georganiseerd binnen en door verschillende discursieve praktijken. Met andere woorden, de manier waarop iemand een bepaald kwestie benadert, evenals de wijze waarop de beleidskwestie is gepositioneerd en wordt gecommuniceerd, bepaalt in grote mate de betekenis in een bepaalde context. Hierdoor wordt een kwestie juist wel of niet tot een probleem gemaakt en wordt ook de oplossing voor een mogelijk probleem al indirect gegeven: het positioneren van de dierproefkwestie als een tekort aan alternatieven vraagt om een andere oplossing dan wanneer de kwestie wordt geërgzelt als een moreel vergrijp of als een onoverkoombelijk gegeven ten behoeve van de menselijke gezondheid.

Interessant genoeg, en ondanks alle verschillende en vaak tegengestelde waarden, zijn individuen en organisaties nog altijd in staat om samen te werken in zogeheten discurscoalities. De mobiliserende kracht van de huidige discurscoaliteit op het gebied van alternatieven voor dierproeven lijkt daarmee te liggen op de belofte – of mogelijk zelfs de verwachting – van een duurzame toekomst waarin proefdierenwelzijn even hoog wordt geïntegreerd als andere breed gedragen maatschappelijke waarden, zoals economische vooruitgang, wetenschappelijke relevantie en technologieontwikkeling. Binnen discurscoalities kunnen er dus verschillende ideeën en werkelijkheden ten aanzien van dierproeven naast elkaar bestaan, afhankelijk van de manier waarop iemand het issue benadert.

Een andere veronderstelling in dit onderzoek is dat beleidsimplementatie een integraal onderdeel is van beleid maken en onder meer de (her)definitie van relevante concepten en de prioritering ervan, behelst. Dit onderzoek bouwt voort op interpretatieve beleidsbenaderingen die het discursive karakter en het continue gevecht om interpretatie en macht van beleid maken, veranderen en past daarmee in de argumentatieve traditie van beleidsonderzoek.

In dit onderzoek ontwikkel en gebruik ik drie centrale concepten om de vertaling van maatschappelijke waarden in beleids- en onderzoeksprogramma’s te analyseren: beleidsframes, beleidsreflectie en technificering. Gebaseerd op de wetenschappelijke framing literatuur, ontwikkelt ik een manier om beleidsframes ten aanzien van dierproeven te construeren uit het Nederlandse beleidsdiscourse. Dergelijke frames omvatten hoe in een bepaalde context en tijdsperiode over dierproeven wordt gedacht. Deze frames kunnen bijvoorbeeld worden gehaald uit beleidsdocumenten uit de jaren ’90 en recente onderzoeksprogramma’s. Daarnaast ontwikkelt ik, voortbouwend op het werk van Frank Fischer ten aanzien van beleidsargumentatie, een manier om het niveau van beleidsreflectie te bepalen. Dit begrip helpt om de incongruentie tussen de maatschappelijke verwachtingen en technische beloftes ten aanzien van dierproeven en alternatieven voor dierproeven in Nederland, te verklaren. Tot slot introduceer ik het begrip ‘technificering’ (technification) als de oververtegenwoordiging van technische en maatschappelijke oplossingen voor sociale problemen, zoals dierproeven.

Dit onderzoek is opgebouwd uit verschillende casestudies die elk een apart hoofdstuk in het empirische deel van dit proefschrift beslaan: het Nederlandse publiek beleid ten aanzien van dierproeven, de ZonMw programma’s betreffende alternatieven voor dierproeven en het onderzoeksprogramma van het Netherlands Toxicogenomics Centre (NTC). Gegevens voor het onderzoek zijn verzameld door middel van diepe-interviews met universitaire onderzoekers en deskundigen en vertegenwoordigers van verschillende organisaties in het onderzoekssysteem. Daarnaast heb ik beleidsdocumenten, rapporten en strategische plannen en evaluaties van wetenschapsfinancieringsorganisaties en onderzoeksprogramma’s geanalyseerd.

Na een inleidend hoofdstuk 1 dat de achtergrond van deze studie behandelt, biedt hoofdstuk 2 een overzicht van het theoretische kader en de methodologie van deze studie. Dit multidisciplinaire kader is gebaseerd op zowel discours en framing literatuur, als op een toenemende hoeveelheid literatuur uit de interpretatieve en argumentatieve beleidswetenschappen, en inzichten uit wetenschap- en technologiestudies (STS) ten aanzien van de rol van verwachtingen in de onderzoekspraktijk en het innovatieproces. De rol van frames en het niveau van beleidsreflectie staan centraal in dit theoretische raamwerk. Ik beschouw frames als zogenaamde betekenisgevende middelen die zowel de probleemdefinitie als de oplossing voor dit probleem omvatten. Een frame vertelt ons dus iets over de wijze waarop dierproeven en alternatieven voor dierproeven worden geïnterpreteerd in een bepaalde context en tijdsperiode. Dergelijke frames kunnen zich op verschillende niveaus van reflectie begeven, variërend van een technisch niveau waarbij het er vooral om gaat of vooraf vastgestelde doelen zijn gehaald, tot frames die zich op een fundamenteel niveau begeven en bijvoorbeeld ingaan op de vraag hoe wij als samenleving willen leven en wat we verstaan onder gezondheid en veiligheid. Dit herschikken van frames helpt me om het huidige discours ten aanzien van alternatieven voor dierproeven te positioneren en een beter begrip te ontwikkelen van de ongenschijnlijke incongruentie.

Deel II vervolgt met de empirische basis van dit proefschrift. In dit deel wordt de interactie tussen wetenschap en beleid vanuit drie verschillende invalshoeken benaderd: het Nederlands publiek beleid ten aanzien van dierproeven en alternatieven, de programma’s van wetenschapsfinancieringsorganisaties betreffende alternatieven voor dierproeven en de onderzoekspraktijk. Hoofdstuk 3 laat zien dat het Nederlandse beleidsdiscours
Samenvatting onderzoekt vervolgens hoe aanzien van maatschappelijk relevant onderzoek ten goede komt. onderzoeksprogramma’s, het sterk de vraag is of hun inzet de publieke verwachtingen ten aanzien van de maatschappelijke relevantie en onderliggende waarden van dergelijke beleids- en
maken ten aanzien van de aantallen dierproeven, of dat dergelijke programma’s vooral het onderzoeksconsortia zoals het NTC (hoofdstuk 5) daadwerkelijk een verschil kunnen
Op basis van de inzichten uit de empirische studies kunnen we ons afvragen of kleine
verwachting ten aanzien van proefdierreductie: het discours wordt continu technischer en
van alternatieven voor dierproeven stilzwijgend afgedreven van de maatschappelijke
opkomende technologieën zoals toxicogenomics het wetenschappelijke discours ten aanzien
van innovaties en de technische aard van evaluaties heeft bijgedragen aan een verdere
laat ook zien dat het delegeren van de uitvoering van het dierproevenbeleid naar een
wetenschapsfinancieringsorganisatie, alsook de druk op wetenschappelijke ontwikkeling
laat zien dat het delegeren van fundamentele beleidskeuzes aan
beurten is gemaakt sinds de invoering van de Wet op de
dierproeven in 1977. In dit hoofdstuk komen verschillende verschuivingen in frames aan
wetenschappelijk beleid in onderzoeksprogramma’s de beleidskwestie heeft getechnificeerd: het beleidsprobleem
wordt in toenemende mate neergezet als een tekort aan alternatieven voor dierproeven
dat de verdere ontwikkeling van dergelijke alternatieven ondersteunt. Dit hoofdstuk
laat ook zien dat het delegeren van de uitvoering van het dierproevenbeleid naar een
wetenschapsfinancieringsorganisatie, alsook de druk op wetenschappelijke ontwikkeling van innovaties en de technische aard van evaluaties heeft bijgedragen aan een verdere

de technificering van de beleidskwestie. Hoofdstuk 5 laat vervolgens zien hoe de toenemende
wens naar maatschappelijk relevant onderzoek en de ontwikkeling van alternatieven
voor dierproeven leidt tot verschillende typen spanningen in de wetenschapspraktijk. Op
basis van het onderzoeksprogramma van het Netherlands Toxicogenomics Centre (NTC)
concludeer ik dat deze wens naar maatschappelijke relevantie paradoxaal genoeg juist leidt
tot spanningen in de publieke legitimering van onderzoek, de beoordeling van onderzoek
en de dagelijkse onderzoekspraktijk. Hierdoor wordt de kloof tussen wetenschap en
samenleving juist verbreed in plaats van overbrugd. Bovendien heeft de acceptatie van
opkomende technologieën zoals toxicogenomics het wetenschappelijke discours ten aanzien
van alternatieven voor dierproeven stiervigend afgedreven van de maatschappelijke
verwachting ten aanzien van proefdierreductie: het discours wordt continu technischer en
daardoor moeilijk te volgen voor een buitenstaander.

Op basis van de inzichten uit de empirische studies kunnen we ons afvragen of kleine
onderzoeksprojecten zoals die gefinancierd worden door ZonMw (hoofdstuk 4) of grote
onderzoeksconsortia zoals het NTC (hoofdstuk 5) daadwerkelijk een verschil kunnen
maken ten aanzien van de aantallen dierproeven, of dat dergelijke programma’s vooral het
publiek moeten geruststellen. Deze hoofdstukken suggereren dat zonder publiek debat
over de maatschappelijke relevantie en onderliggende waarden van dergelijke beleids- en
onderzoeksprogramma’s, het sterk de vraag is of hun inzet de publieke verwachtingen ten
aanzien van maatschappelijk relevant onderzoek ten goede komt.

Deel III gaat verder met de concluderende hoofdstukken van dit proefschrift. Hoofdstuk
6 gaat in op de vraag hoe het kan dat de discourscoalitie ten aanzien van alternatieven
voor dierproeven in eerste instantie juist in staat was om een grote diversiteit aan spelers,
waarden en doelen aan zich te binden, nu tegen zijn grenzen aan lijkt te lopen. Op basis van
dere empirische analyses beargumenteer ik dat het relatief lage niveau van beleidsreflectie,
de flexibele betekenis van het begrip ‘alternatieven voor dierproeven’ en de sterke en
aantrekkelijke beloftes in eerste instantie bijdroegen aan de vorming van de discourscoalitie.

Tegelijkertijd laat ik ook zien dat elk van deze bindende discursive processen ook een
zere mate van kwetsbaarheid in zich draagt. De focus op wetenschap en technologie
als oplossing voor het dierproevenprobleem, evenals de gecreëerde maatschappelijke
verwachting dat de inzet op 3V-onderzoek direct bijdraagt aan het terugdringen van het
aantal dierproeven en de recente uitspattingen van verschillende spelers in het discours,
suggereer dat de hedendaagse coalitie onder druk staat en elk moment kan bezwijken.

Hoofdstuk 7 gaat vervolgens in op de kwesties die nadere aandacht verdienen in publiek
debat teneinde een meer betekenisvolle beleidsreflectie te stimuleren en zorg te dragen voor
een beleidsverandering die beter aansluit bij de maatschappelijke waarden met betrekking
tot dierproeven. Vooruitlopend op de verschillende niveaus van beleidsreflectie biedt
het hoofdstuk verschillende manieren en bijbehorende beleidsinstrumenten om beleid
te ontwikkelen en te verbeteren. Deze instrumenten omvatten onder meer de oprichting
van een 3V-database, de invoering van een belastingsysteem op proefdiergebruik, alsook
het labelen en verbeteren van de traceerbaarheid van producten waarbij dierproeven zijn
gebruikt.

Het concluderende hoofdstuk 8 biedt een nadere beschouwing op het empirische materiaal
en ik beantwoord de hoofdvraag op basis van de drie deelvragen:

1. Hoe kan de huidige incongruentie tussen de maatschappelijke verwachtingen
   en technologische beloftes binnen de dominante discourscoalitie ten aanzien van
   alternatieven voor dierproeven worden begrepen vanuit een
   interpretatieve benadering van beleidsevaluatie?

De casestudies laten ten minste negen observaties zien die helpen om deze ogenschijnlijk
incongruentie beter te begrijpen. Deze observaties hebben betrekking op de succesvolle
wijze waarop de beleidskwestie is neergezet als een win-win situatie voor zowel menselijke
gezondheid als proefdierenwelzijn, net als de wijze waarop het probleem is gedefinieerd.
Door de kwestie te framen als een tekort aan alternatieven voor dierproeven ontstond
er meer ruimte voor de technische oplossing van meer onderzoeksprogramma’s
betreffende deze alternatieven. Het delegeren van fundamentele beleidskeuzes aan
wetenschapsfinancieringsorganisaties en onderzoeksconsortia heeft bovendien bijgedragen

aan de verdere technificering van de beleidskwestie waardoor mogelijke niet-technische beleidsopplossingen grotendeels buiten beschouwing zijn gebleven.

De empirische inzichten laten zien dat door de veranderende kijk op wat door de discourscoalitie als goede proefdieralternatieven en goed 3V-onderzoek wordt beschouwd, de beloftje van de coalitie steeds verder af is komen te staan van de maatschappelijke verwachtingen ten aanzien van proefdierreductie. Met de nadruk op de wetenschappelijke ontwikkeling in plaats van de vraagarticulatie ten aanzien van alternatieven voor dierproeven, de toenemende druk op de economische valorisatie van onderzoek en het relatief lage niveau van beleidsreflectie, is het de vraag of dergelijke programma’s daadwerkelijk tegemoet kunnen komen aan deze verwachtingen.

In mijn proefschrift stel ik dat de maatschappelijke verwachtingen over proefdierreductie achter loopt op de herinterpretaties en verschuivingen ten aanzien van alternatieven voor dierproeven en 3V-onderzoek binnen de discourscoalitie. Deze stapsgewijze divergentie heeft uiteindelijk geleid tot de hedendaagse incongruentie tussen de maatschappelijke verwachtingen en technologische beloften van de discourscoalitie ten aanzien van dierproeven en alternatieven voor dierproeven.

2. Hoe kan de mobiliserende macht van de dominante discourscoalitie ten aanzien van dierproeven in Nederland worden gewaardeerd?

Op basis van de empirische inzichten en de kwetsbaarheid van de huidige discourscoalitie betoog ik dat het begrip alternatieven voor dierproeven of “de 3V’s” zijn mobiliserende kracht aan het verliezen is. Daarbij is de huidige coalitie nauwelijks in staat om nieuwe spelers buiten het directe wetenschap- en beleidsdomein aan te verbinden, terwijl deze spelers juist hard nodig zijn voor de beoogde duurzame beleidsverandering. Omdat het Nederlandse publiek beleid sterk leunt op het creëren van draagvlak in de samenleving (het zogeheten “polderen”), vraagt de kwetsbaarheid van de hedendaagse discourscoalitie het om enkele lastige (beleids)beslissingen.

In hoofdstuk 7 ga ik in op de kwesties die nadere aandacht verdienen in publiek debat teneinde een meer betekenisvolle beleidsreflectie te stimuleren en zorg te dragen voor een duurzame beleidsverandering. Vooruitlopend op de vier niveaus van beleidsreflectie opper ik enkele manieren en bijbehorende beleidsinstrumenten om de gewenste beleidsrichting te ondersteunen. De keuze (hoe) verder te gaan blijft echter bovenal een maatschappelijke en politieke keuze. Dit onderzoek suggereert desalniettemin dat een publiek debat dat eveneens een antwoord probeert te vinden op meer fundamentele vragen betreffende gezondheid en veiligheid – zogeheten tweede-orde reflectie – een meer maatschappelijk gebalanceerd beleid ten aanzien van dierproeven oplevert. Dit debat vraagt zonder twijfel om enkele lastige (beleids)beslissingen.

Op basis van de antwoorden op de deelvragen, stel ik dat de huidige discourscoalitie ten aanzien van alternatieven voor dierproeven slechts gedeeltelijk tegemoet komt aan de maatschappelijke zorgen over dierproeven. Het feit dat de maatschappelijke verwachtingen ten aanzien van proefdierreductie achter lopen op de veranderende interpretatie van de discourscoalitie ten aanzien van alternatieven voor dierproeven en 3V-onderzoek heeft bijgedragen aan de aanwezige incongruentie. Bovendien stel ik dat de hedendaagse discourscoalitie kwetsbaar is en een tweesprong nadert. Dit onderschrijft de behoefte aan publiek debat teneinde een meer betekenisvolle beleidsreflectie te stimuleren en zorg te dragen voor een duurzame beleidsverandering op dit dossier.

Samenvattend concludeer ik dat technificering stevig is ingebed in de huidige systemen rondom dierproeven, inclusief publiek beleid, onderzoeksfinancieringspraktijken en wetenschappelijke onderzoeksprogramma’s met betrekking tot alternatieven voor dierproeven. Deze technificering beslaat a) de veronderstelling dat het sociale probleem van dierproeven kan worden opgelost met de technische oplossing van alternatieven voor deze dierproeven; b) de definitie van het beleidsprobleem als een tekort aan alternatieven voor dierproeven die de financiering van meer onderzoek veronderstelt; c) de voornamelijk door wetenschap gedreven innovatie-aanpak in de onderzoeksprogrammering ten aanzien van alternatieven voor dierproeven; d) het gegeven dat 3V-onderzoek voornamelijk wordt beschouwd als een zijstroom van meer gangbaar wetenschappelijk onderzoek; e) de relatie met proefdierreductie in relatieve zin. Ik concludeer dat door deze technificering, alsook de latente botsing van maatschappelijke waarden en het niet willen nemen van moeilijke beslissingen, het hedendaagse publieke beleidsdiscours ten aanzien van dierproeven aan het dwalen is. Of, zoals de titel van dit proefschrift stelt: “Lost in technification”.

De resultaten van dit proefschrift hebben twee grote implicaties voor het debat aangaande het toekomstige dierproevenbeleid en de inzet van onderzoeksprogramma’s om het gebruik van dierproeven terug te dringen. Allereerst laat mijn onderzoek zien dat de huidige discourscoalitie ten aanzien van alternatieven voor dierproeven moeite heeft om tegemoet te komen aan de maatschappelijke verwachtingen ten aanzien van hedendaags proefdiergebruik. Zonder een duidelijker beeld van de toekomst, ofwel de zogenaamde
normatieve horizon van het proefdiergebruik in Nederland, zal publiek beleid blijven dwalen en waarschijnlijk tot meer maatschappelijk en politiek debat aangaande hun effectiviteit leiden. Ten tweede, mijn onderzoek suggereert dat 3V-onderzoek alleen niet genoeg is voor de gewenste transitie. De door mij geobserveerde spanningen tussen onderzoeksactiviteiten en criteria van wetenschapsfinancierders zullen niet worden weggenomen met de huidige aanpak.

Op basis van mijn bevindingen formuleer ik twee soorten aanbevelingen voor het dierproevenbeleid. Met betrekking tot beleidsontwerp en -evaluatie, waarschuw ik voor een kortzichtige (economische) valorisatie van 3V-onderzoek in termen van proefdierreductie. De nadruk op de voordelen op de korte termijn leidt tot ineffectief beleid en overschaduwt de ambitie op dit dossier voor de lange termijn. Ik adviseer daarom om:

• in publiek debat toe te werken naar duurzame beleidsambities op het dierproefdossier voor de lange termijn;
• te streven naar een coherent beleidsdiscours dat aangrenzende beleidswetten, zoals geneesmiddelenontwikkeling, milieuwetgeving en wetenschapsbeleid met elkaar verbindt;
• actief aansluiting te zoeken bij gerelateerde (beleids)kwesties die de gewenste beleidsverandering—ofwellicht zelfs transitie—kunnen versnellen. Denk hier bijvoorbeeld aan duurzaamheidsregelingen (zogenaamde ‘groene regelingen’) en Maatschappelijk Verantwoord Ondernemen (MVO) alsook het verdienmodel van disruptieve technologieën en innovaties;
• de evaluatiecriteria ten aanzien van het dierproevenbeleid te verbreden en daarin ook (kwalitatieve) indicatoren voor maatschappelijke impact mee te nemen.

Met het oog op het wetenschaps- en innovatiebeleid betreffende alternatieven voor dierproeven, wijk ik op het perverse neveneffect in het streven naar maatschappelijk relevant onderzoek. Mijn onderzoek laat zien dat onderzoek naar alternatieven voor dierproeven in toenemende mate wordt gezien als een nevenspoor van regulier onderzoek waardoor het effect op de proefdierreductie op zijn minst onzeker is. Daarbij komt dat de criteria die wetenschapsfinancieringsorganisaties hanteren en de vereisten die vanuit het wetenschappensysteem zelf worden opgelegd, vaak leiden tot spanningen in de onderzoekspraktijk. Ik adviseer daarom om:

• toe te werken naar een vraaggestuurde aanpak in de financiering van 3V-innovaties om de implementatie en gebruik van deze innovaties te realiseren;
• de publiek gefinancierde onderzoeksprogramma’s aangaande 3V-innovaties te richten op die ontwikkelingen die minder vanzelfsprekend door de wetenschap of door de markt worden opgepikt;
• het mogelijk te maken dat private organisaties 3V-financiering kunnen aanvragen om de gewenste beleidsverandering te versnellen (zonder daarmee de regels voor staatssteun te overschrijden);
• de evaluatiecriteria ten aanzien van 3V-onderzoek te verbreden en daarin ook (kwalitatieve) indicatoren voor maatschappelijke impact mee te nemen;
• financiering van sociale innovaties die helpen om de gewenste beleidsverandering te versnellen, uit te breiden.
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