



# Motivation for Biodiversity Action: vocabulary, theories and framework.





## **BIOMOT & BESAFE Team meeting**

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## Preface

BIOMOT (Motivations for Biodiversity) is a research project funded by FP7 of the EU. Its aim is to better understand why people, including governments, may act for nature, e.g. by establishing a national nature conservation policy, decide to green one's business, volunteer in an NGO to save the whales, or work to get a butterfly-friendly corner in the neighborhood park.

Strange as it may seem, no-one has any systematic knowledge on why people do this. Up to some ten years ago, people were supposed to act for biodiversity for lofty altruistic reasons (e.g. the 'intrinsic value' of nature). At present, we are all supposed to be motivated only by economic reasons (e.g. the 'ecosystem services' of nature). The BIOMOT project is set to generate a more stable wisdom in this area. Hopefully one day, this will enable societies to be more aware and more effective in the expression and activation of their own moral foundations to keep nature with them in the course of their development.

BESAFE is a sister project of BIOMOT, with basically the same aims but with a more directly practical orientation, focusing on the arguments used for biodiversity conservation. The picture heading the present document was taken during a joint workshop, one of the subjects of which was the identification of joint case studies.

BIOMOT explores the foggy lowland that lies between two towers of knowledge on human motivation. One tower is that of ethics. Philosophers, typically, engage the full diversity of human capacities, intuitions and reasonings but then - sadly, one could say - construct a tower of knowledge on why we *should* act rather than why we *do* act. The other tower is the one of rationality, constructed, typically, by economists and social psychologists, with biologists added when they explain animal behaviour. Characteristic of this tower is its narrow foundation: human action is supposed to be grounded only in deliberation, in which self-interested reasons hold central place.

Somewhere in the foggy in-between land lies BIOMOT's holy grail: a theory of action for biodiversity that combines the empirical character of the rationality tower with the richness of the ethics tower.

How to get there? What will be BIOMOT's method? A few things are certain. (1) A foggy in-between land requires a broad, flexible, underdefined vehicle to travel. For that reason, BIOMOT engages a broad range of disciplines, such as philosophy, psychology and economics. (2) BIOMOT needs help from others who have also set out to travel this land. Freud for instance surmised that in the end, people are moved more by anxiety than by deliberation. Kahneman, to take another example, states that people do use a system of deliberation but are moved primarily by what he calls System 1, which is

largely intuitive and partly unconscious. (3) Finally certainly, BIOMOT has to move slowly. That's always easy in international projects, the cynic would say, but for BIOMOT it is necessary. BIOMOT has to take in much of the richness of different paradigms, avoiding directing itself too early to one attractive light in the fog.

The present document is the first deliverable of the project, and therewith starts out in a purely explorative mode, going slow and broad rather than fast and narrow. These chapters serve as the foundation for the construction of a narrower and more coherent framework that will subsequently be used to build the protocols for the many interviews planned in the BIOMOT project. This Framework forms the document's last chapter.

The explorative chapters have a structure (of sorts), aiming to prevent a total loss of the reader's way in the fog. We start out with some basic definitions and then move to the economic style of reasoning on motivation for biodiversity, with ecosystem services central. Next come elements from the ongoing discussion on the limitations of economic valuation, touching for instance on the difference between the value of abstract categories and of concrete, named entities. The longest chapter then goes into the proposals made mainly by psychologists on the deliberative and broader motivations for human action, examples of which are identity and personal significance. This is followed by a shorter contribution from governance science and, titled as 'patterns of a theory', a number of carefree, intuitive exercises trying to define elements of what is finally integrated into the Framework.

Three Annexes round off the document. They are annexed for the simple reason that they could as yet not be integrated into the main text. For Annexes 1 and 3, this is only a technical matter. Annex 2 however represents a harder nut to crack, speaking as it does mainly on the meta-level of how representations of nature, including BIOMOT's own, may in fact act as psychological fantasies and ideological vehicles, serving only to reduce the loneliness of our own selves and perpetuate the destructive ideology of our societies. The Framework responds to this challenge in some degree, but more work has to be done to fully integrate it in BIOMOT's work. Fortunately, we have a Work Package designed to do so.



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# Biodiversity, natural capital and ecosystem services

## Biodiversity

There are many possible definitions of biodiversity. We will use the below mentioned one, for the time being as working definition.

*The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems'. Definition by the Parties to the Convention on Biological Diversity (CBD).*

The key attribute in this definition is variability on different levels between biological entities (1) within species; (2) between species; (3) of ecosystems; (4) biodiversity as cause and consequence.

Biodiversity is variously defined as diversity of species, living resources of the planet, total number of genetic lineages, array of organisms, biologically mediated processes and organically derived structures out there on the globe. It refers variously to genes, to species and/or to ecosystems and landscapes, i.e. biodiversity is conceptually understood on three spatial levels. At times, populations are also included as a fourth aspect.

One problematic issue is that none of these four conceptualizations addresses individual specimen. This is especially critical for environmental ethics, as the ethical argument for the protection of biodiversity / nature frequently begins with the individual specimen – in the notion of 'intrinsic value' (Ott 2007).

A second problematic issue is the notion of 'variability.' The CBD definition clearly articulates "variability" as the essence of biodiversity. Yet what does this imply for practice? What are the practical implications if 'variability' is the focus and goal of biodiversity protection?

Furthermore, analysis of the use of the term biodiversity shows that it alludes to descriptive and prescriptive aspects (Takacs 1996 in Ott 2007). It is a constructed hybrid term [wissenschaftphilosophisches Hybridkonzept]. Takacs (1996 in Ott 2007) shows a comprehensive development of the 'biodiversity discourse'. He shows that 'biodiversity' was not created for scientific, but for political considerations. The



biodiversity concept includes various guidelines for nature protection and allows for a broad coalition of supporters. Dissents can be moved inwards and so become invisible to the public. The integrative function of the concept should be recognized. It could be a paradigmatic example for a practical-political convergence. The term 'biodiversity' stands for a comprehensive and integrative concept for nature protection (Blab & Klein 1997 in Ott 2007). Whenever the term is used, its non-scientific, political aspects need to be kept in mind. It is an integrative concept for a practice that can unite stakeholders with various, possibly competing interests. As such, it has motivational power.

## Natural capital

The two concepts of 'biodiversity' and 'nature' are in practice often equated. There are, however, important differences between the two. Biodiversity refers to living nature, it is a description of a characteristic of living nature, but it is not a synonym of living nature itself. 'Nature' is a more comprehensive concept that can include or refer to non-living elements, such as weather, mountains and landscape in general.

Biodiversity is clearly not a synonym for biological resources. It is important to distinguish between the two concepts, certainly for policy-making, and it makes clear why it is so important to preserve diversity, instead of only resources. Biodiversity is seen as a characteristic of nature, and the genes, species and ecosystems encountered in nature are a reflection of biodiversity.

As Wood (1997) argues, the genes, species and ecosystems are biological resources for humanity, and biodiversity is both the source of these resources and an emergent property of them. Moreover, it is an essential precondition for their long-term maintenance. Wood stresses the idea that diversity itself has different values than resources have. He lists three values of biodiversity (for humans). These are, in order of importance:

1. Biodiversity supplies humanity with biological resources.
2. Biodiversity facilitates adaptation and evolution, leading to a broader range of biological resources.
3. Biodiversity augments itself in positive feedback cycles (a contested, but according to recent research rather plausible hypothesis).

Biodiversity refers specifically to diversity amongst life forms. One can distinguish different levels of diversity: genetic, species, habitats, and ecosystems. One can also distinguish different kinds of diversity:

1. numerical diversity, e.g., the number of species;
  2. dimensional diversity - the degree of separation, or distinction;
  3. material diversity - difference in the substances and structural properties;
  4. relational diversity, e.g., differences in the kinds of interactions that obtain between organisms, such as those between predator and prey, parasite and host;
- and

5. causal diversity - differences in the way in which things have come into existence and evolutionary process to which they are subject;
6. functional diversity - the diversity of species traits present in an ecosystem.

### *Functional diversity*

Functional diversity is the diversity of species traits present in an ecosystem. During the last decade, a consensus has been reached between ecologists that the provision of ecosystem services is impacted not so much by species diversity in an ecosystem, but by the *functional diversity* in an ecosystem. Functional diversity groups species or even individual organisms by the traits they exhibit into functional groups, and provision is impacted by the diversity of functional groups. A greater variety of functional groups will lead to a greater utility of resources in the ecosystem, and so potentially a greater services provision (Cadotte 2011). Functional diversity is a more inclusive concept than species diversity in categorizing the effects of organisms on bio-geochemical processes in ecosystems. Consequences re: conservation: conserve functional diversity vs species diversity.

A species trait is defined as any feature of an organism that potentially affects performance or fitness, and this trait can be physical, biochemical, behavioural or temporal (Cadotte 2011). The argument goes that the identity, abundance and range of species traits in an ecosystem dictate the functioning of that ecosystem and hence the provision of ecosystem services. Consequences: preserve traits vs species. Questions: do humans have the obligation to preserve functional diversity and species traits?

## **Ecosystem services**

Colloquially, ecosystem services are the benefits that humans derive from nature. The term has gained currency because it conveys the idea that ecosystems are socially valuable and in ways that are not immediately intuited (Daily, 1997). Crucial is that ecosystem services and benefits are not identical – ecosystem services are ecological phenomena and not the benefits obtained from ecosystems as such. Services only generate benefits in a situation of need, significance, request or demand (Boyd and Banzhaf, 2007). These services do not have to be directly utilized and in fact many are intermediate and contribute to multiple final services.

For a further understanding of their characteristics and functioning, ecosystem services are commonly differentiated using the following categorization proposed by the Millennium Ecosystem Assessment (MEA, 2005):

1. **Provisioning services**—ecosystem services that combine with built, human, and social capital to produce food, timber, fiber, or other “provisioning” benefits. For example, fish delivered to people as food require fishing boats (built capital), fisherfolk (human capital), and fishing communities (social capital) to produce.
2. **Regulating services**—services that regulate different aspects of the integrated system. These are services that combine with the other three capitals to produce



flood control, storm protection, water regulation, human disease regulation, water purification, air quality maintenance, pollination, pest control, and climate control. For example, the storm protection services of coastal wetlands require the wetlands and the built infrastructure, people, and communities to be protected. These services are generally not marketed but have clear value to society.

3. **Cultural services**—ecosystem services that combine with built, human, and social capital to produce recreation, aesthetic, scientific, cultural identity, or other “cultural” benefits. For example, to produce a recreational benefit requires a beautiful natural asset (a lake), in combination with built infrastructure (a road, trail, dock, and so on), human capital (people able to appreciate the lake experience), and social capital (family, friends, and institutions that make the lake accessible and safe).
4. **Supporting “services”**—services that maintain basic ecosystem processes and functions such as soil formation, carbon fixation, and habitat for animals. These services are “necessary for the production of all other ecosystem services” (MEA 2003, p. 78). Those services affect human well-being *indirectly* by maintaining processes necessary for provisioning, regulating, and cultural services. They also refer to the ecosystem services that have not yet been combined with built, human, and social capital to produce human benefits but nevertheless underlie these benefits. For example, net primary production is an ecosystem function that supports carbon sequestration and removal from the atmosphere, which combines with built, human, and social capital to provide the benefit of climate regulation. Some would argue that these “supporting” services should rightly be defined as ecosystem “functions”, since they may not yet have interacted with the other three forms of capital to create benefits. We agree with this in principle, but recognize that supporting services/functions may sometimes be used as proxies for services in the other categories, such as when the benefits cannot be easily measured directly.

Note the distinction between (a) final ecosystem services, i.e. provision of goods or values to humans, regulating and cultural services, and (b) underpinning (MEA: supporting) services, i.e. ecological and environmental processes within ecosystems. In economic valuation and in management the focus often is on A at the cost of B. If the question is what is the value of an ecosystem (to humans) this would be correct as including the supporting services would lead to double counting. However once this assessment of the value of the final services has been made the supporting services should take center stage in management in order to maintain the ecosystems.

## **Ecosystem services and biodiversity**

With a multi-layered relationship approach Mace et al. (2012) propose a scheme that takes into account the complex interactions of biotic and abiotic ecosystem components:

(i) *Biodiversity as a regulator of ecosystem processes*: biodiversity is a factor controlling the ecosystem processes that underpin ecosystem services. For example, the dynamics of many soil nutrient cycles are determined by the composition of biological communities in the soil.

Biodiversity as a regulator manifests itself through functional diversity and ecosystem functioning. Ecosystem functioning: the mechanistic links between organisms and the productivity of biogeochemical processes. Ecosystem functioning manifests itself through the traits of the organisms present. The relation between functional diversity and species diversity, however, is still not very well understood (Hooper et al. 2005). A study of enzyme activities and bacterial communities in soils samples conducted by Frossard et al. (2012) demonstrate, that communities and their functions can be disconnected in specific contexts.

Further limits of the regulating role of biodiversity on ecosystem processes are listed in Bullock et al. (2011), e.g.:

- The increase in ecosystem processes often reaches a plateau at moderate species numbers;
- Rare species frequently targeted by conservation efforts often have minor effects on ecosystem processes, whereas more common species can have a dominant role;
- Studies examining how the variation of ecosystems across landscapes affects service delivery are only now beginning.

Hooper et al. (2005) give a very comprehensive overview about the current knowledge concerning the role of biodiversity as a regulator of ecosystem processes.

(ii) *Biodiversity as a final ecosystem service*: biological diversity at the level of genes and species contributes directly to some goods and their values. For example, the potential value of wild medicines. Biodiversity can be a potential source of health and well-being for human beings. Recent studies (see Scopelliti et al., in press) suggest that the level of biodiversity impacts psychological restoration, that is the recovery of cognitive resources and stress levels.

(iii) *Biodiversity as a good*: here, biodiversity itself is the object valued by humans and this role of biodiversity therefore resembles the conservation perspective outlined above. Many components of biodiversity have cultural value, including appreciation of wildlife and scenic places and spiritual, educational, religious and recreational values.



Humans value places with a diversity of species, especially the more charismatic animals and plants, and retaining a full complement of wild species is important to many. Therefore, biodiversity is a good in itself with a distinct value.