# Translating "Positive Visions for Biodiversity" into research practice

**Meeting of the European Platform for Biodiversity Research Strategy (EPBRS)**
**18-19th November 2010**

# executive summary

In November 2010, the meeting of the European Platform for Biodiversity Research Strategy (EPBRS) under the Belgian presidency of the EU took place in Brussels and was associated with a large participatory summit "Positive Visions for Biodiversity" (PVB).

This PVB event engaged into an highly participative process over 230 participants from academics to businessmen, philosophers to politicians, architects to journalists etc. The product of PVB was an inspirational vision of a future world where humans have established a sustainable relationship with the rest of the living world.

The EPBRS meeting on November 18-19 engaged over 50 scientists and policy makers from 25 countries in a lively discussion inspired from the World Café format to reflect upon the results of PVB.

The objective was to translate the PVB vision framework into research practice by identifying priority research topics and recommendations for science policy strategies (e.g. research organization and structure).

This report presents some key areas where research would be critically needed to implement the PVB vision framework including:

➢ To ensure more transparent and effective governance, *research is needed on ways to mainstream biodiversity into governance at each level and in each sector without losing local specificities (cultural, ethical values) through up-scaling*

➢ To implement more participatory and efficient management of land, seas and urban areas in the context of global change, *research is needed on proactive and creative management connecting monitoring with the development of scenarios in dynamic social-ecological systems*

➢ To develop sustainable use of resources (energy, raw materials…), *research should focus specifically on building scenarios on dynamic links between carrying capacity and resource use, incorporating: scales (spatial/temporal – incl. migration), Technology (levels, new), Biodiversity and ecosystem services*

➢ To contribute to a more sustainable food production, *research is needed on new ways of assigning prices to food production, internalizing the diverse and multiple costs of food production related to biodiversity*

➢ To contribute to a better communication and more appropriate education to ensure biodiversity is integrated at all levels and into every part of life, *research should focus on sociological, philosophical and linguistic studies on the implications of the concepts currently used and to develop new terms for less loaded discussion*

➢ To understand the value systems used to account for biodiversity in our economy and in all different fields and sectors, *research is needed on different value systems, including their fundamental principles, how value systems can change and how people can get inspired and engaged, especially for biodiversity*

In addition some key principles relevant for all research priorities were extracted from the discussion results such as the requirement to engage a wide range of experts and stakeholders outside the usual environmental community, the need to implement effective Interdisciplinary Research (IDR), and the importance of transdisciplinary approaches for knowledge generation that would serve as a tool to reach integrative research and efficient interfaces with stakeholders.

The participatory approach of this EPBRS meeting was an opportunity for scientists from various disciplines and policy makers to have an open, constructive and integrative discussion on the role of research in addressing the current biodiversity crisis and its underlying causes. However, the results of the discussions presented in this report should be seen as a first step in a longer process in which additional workshops could help explore suggested topics and recommendations more comprehensively.

# contents

# introduction

Generating, promoting and sharing the knowledge necessary to bring human societies into a sustainable relationship with the living world is the mission of the European Platform for Biodiversity Research Strategy (EPBRS)

To implement its mission, EPBRS organizes twice a year a meeting under each presidency of the European Union (EU). In November 2010, the Belgian EPBRS meeting took place in Brussels and was associated with a large participatory summit "Positive Visions for Biodiversity".

"Positive Visions for Biodiversity" was held on November 16-17 2010 and gathered over 230 participants engaged in a highly participatory process involving academics and journalists, the private sector and philosophers, scientists and politicians, architects and photographers, etc. The product of this innovative meeting was an inspirational vision of a future world where humans have established a sustainable relationship with the rest of the living world.

# EPBRS
## Belgium 2010

The EPBRS meeting on November 18-19 engaged over 50 scientists and policy makers from 25 countries in a lively discussion to reflect upon the results of Positive Visions for Biodiversity summit (PVB). Most participants had attended the PVB summit (72%). EPBRS delegates represented 42% of the participants of which half had attended the PVB event. Natural sciences were represented by 75 % of the participants while social sciences were represented by 23% of the participants (This refers to participant background). 67% of the participants were scientists, 25% policy makers (in science or environmental policy) and 8% related to other professional expertise.

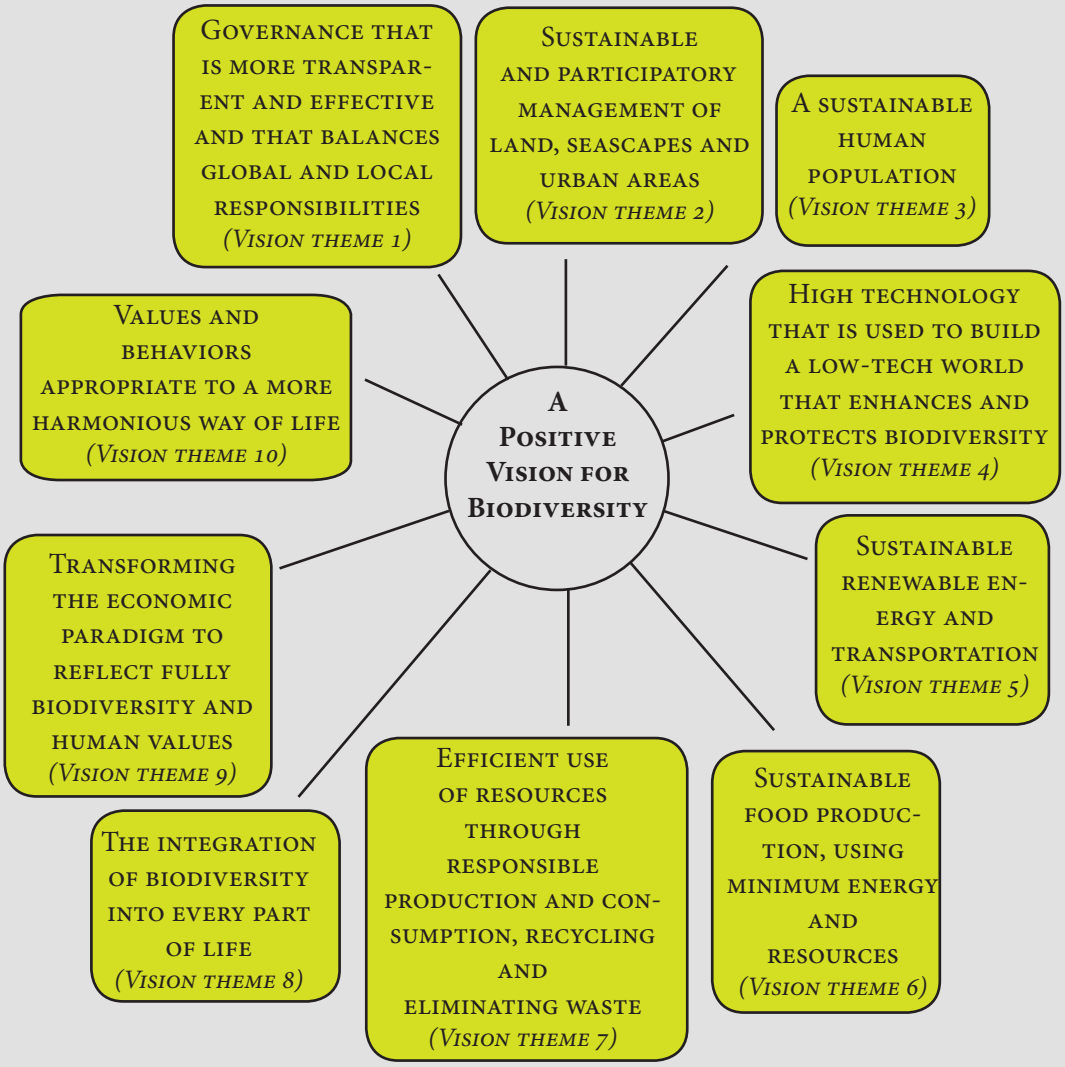
The intention of this meeting was to translate the developed "positive vision" into research practice by identifying priority research topics and recommendations for science policy strategies (e.g. research organization and structure). The outputs of this meeting are described in this report.

# method

The meeting was organized mainly relying on round table discussions based on the World Café participatory approach.

Each table was assigned one of the 10 main vision themes that had been identified during "Positive Visions for Biodiversity".
A facilitator and a rapporteur ensured that discussions focused on the questions related to the assigned theme and recorded all ideas expressed by participants. Every 20 minutes, participants would switch to another table where they would read results of previous groups on a flipchart and comment or find new ideas.

By 2050, a sustainable relationship with biodiversity has been established through:



# Questions

Participants addressed the following two questions for each of the 10 themes:

**Question 1**
What Scientific knowledge do we NOT have today that will be essential in the next decade and beyond to achieve our visions?
*The question was addressed focusing on identifying major gaps and research needs*


**Question 2**
How should we most effectively conduct research to tackle these essential research topics? Are the necessary expertise, institutions, educational programmes,and
financial schemes ready/available? If not, how can they be developed, reached, or engaged?[3]

3 The Question was addressed differently within the groups, either more generally in relation to all topics (Appendix 3), or quite specifically by developing rough description of potential research topics/projects for a particular subject (Appendix 2)

# results

## Recommended Research Areas/ Topics

Although participants addressed knowledge gaps and potential research needs separately for each theme, several key research priorities turned out to be similar across various themes (e.g., research on the valuation of biodiversity).

We highlight here the 19 research topics that were identified as the most important ones (Complete list available in Appendix 1). These research topics are grouped by categories (as headers in bold) which related to one or several vision themes.

**To ensure more transparent and effective governance, research is needed on:**
➢ Ways to mainstream biodiversity into governance at each level and in each sector without losing local specificities (cultural, ethical values) through up-scaling

**To implement more participatory and efficient management of land, seas and urban areas in the context of global change, research is needed on:**
➢ Proactive and creative management connecting monitoring with the development of scenarios in dynamic social-ecological systems
➢ Where to designate protected areas and how to manage them in the face of global change
➢ Relations between adaptation of ecosystems to diverse pressures, their resilience across different scales, and their ability to provide ecosystem services

**To develop sustainable use of resources (energy, raw materials…), research should focus specifically on:**
➢ Building scenarios on dynamic links between carrying capacity and resource use, incorporating:
a. Scales (spatial/temporal – incl. migration)
b. Technology (levels, new)

c. Biodiversity and ecosystem services
➢ "Life cycle impacts of products on organisms, populations and their interactions in ecosystems
➢ Incentives to move society towards transition communities (building for biodiversity, permaculture, local energy, local jobs…)
➢ The transition from modern industrial intensive toward traditional or innovative low impact practices
➢ Better understanding of ecosystems as models for a more effective use of energy nutrients, water and natural carbon cycles (sequestration)

**To contribute to a more sustainable food production, research is needed on:**
➢ New ways of assigning prices to food production, internalizing the diverse and multiple costs of food production related to biodiversity
➢ An ecosystem approach to food production based on co-cultivation of multiple species for multiple services, without waste production

**To contribute to a better communication and more appropriate education to ensure biodiversity is integrated at all levels and into every part of life, research should focus on:**
➢ Sociological, philosophical and linguistic studies on the implications of the concepts currently used and to develop new terms for less loaded discussion
➢ The effects of environmental and sustainability education on values and behavior, and on obstacles for successful implementation of existing advanced teaching methods
➢ Education that encourages a holistic understanding of the role of biodiversity in technology, energy, and transport and focuses thought on what is necessary, not what is possible
➢ The effectiveness of ways and methods used to communicate the importance of biodiversity, including the assessment of different media, different types of information and different processes (e.g. experiential, participative dialogue)
➢ The communication challenge posed by the common acceptance of economic growth as paradigm (use the economic crisis as an opportunity for changing the paradigm, This should include understanding of the precautionary principle and uncertainty.

# results

**To understand the value systems used to account for biodiversity in our economy and in all different fields and sectors, research is needed on:**

- Different value systems, including their fundamental principles, how value systems can change and how people can get inspired and engaged, especially for biodiversity
- The role of biodiversity in economics and the value systems that are used to assess biodiversity across various disciplines, including but not limited to economics
- Non-economical ways of valuing biodiversity (cultural, ethical aspects) as part of our natural capital

## Recommended changes in research

Some participants worked on a specific research topic and went into more details on how to implement it. Results of these discussions are available in Appendix 2. Other participants addressed the second question (How do we most effectively conduct research to tackle these essential research topics?) with a more general discussion on issues related to the way research is carried out, education and how research institutions are structured and funded. Some key principles relevant for all research priorities were extracted from the discussion results and are reported below. A comprehensive report of all suggestions is available in Appendix 3.

**1. Engaging a wide range of experts and stakeholders**

In order to better address complex biodiversity-related issues, a number of ideas related to engagement of a broader range of experts and stakeholders. This included the need to develop large networks and large projects involving different disciplines with appropriate funding and incentives. Another idea was to increase the use of participatory processes and engagement of stakeholders, citizens and local communities in scientific projects. This could be developed through a diversity of means such as citizen science, conferences, public talks, surveys, etc.

Participants also highlighted the need for an efficient transfer of scientific results to stakeholders (policy makers, wider society, etc), and the importance of linking better scientific knowledge on global change with knowledge of local communities on ecosystems and landscapes to develop adaptation strategies.

A key issue that came out of these discussions was the need to implement effective Interdisciplinary Research (IDR) and to explore transdisciplinary approaches for knowledge generation that would serve as a tool to reach integrative research and efficient interfaces with stakeholders.

**2. Implementing interdisciplinary/transdisciplinary research: the need to structure research institutions and funding to address complex issues related to biodiversity:**

The call for more interdisciplinary research is not new but there is still much to do to create and support more efficient interdisciplinary projects.

Discussion highlighted the current obstacles to implementing IDR such as the need to address side requirements (e.g. geographical balance, gender etc), the difficulty to deal with very different cultural references between scientific disciplines (e.g. methodology, vocabulary, conceptual approaches etc), and the question of evaluating IDR projects as real interdisciplinary experts might be lacking or incentives to carry IDR might be limited.

Participants suggested developing Science/Science interfaces in order to bring institutions and working groups together and even to establish centers of excellence on cross-cutting issues. Participants also suggested that IDR should be integrated in all scientific education to ensure better networking and understanding between scientific disciplines.

Although not a goal in itself, all participants agreed that innovative ways for collaboration between disciplines (interdisciplinary to transdisciplinary) were now a critical requirement for generating the knowledge needed to address the biodiversity crisis. Research institutions and funding agencies should have a responsibility to support the development of these multidisciplinary networks in order to help build capable consortia based on trust and long-term collaboration.

In this context, participants saw a need for top down, structured research programmes supported by operational tools. Participants suggested to organize

# results

research programmes around a focused goal and structured questions which could attract and gather scientists (e.g. management of social-ecological systems), allowing for increased interactions between disciplines.

This significant research effort on complex systems would need to rely on infrastructure and tools (e.g. models, databanks, monitoring networks, etc.), in particular tools to integrate and mobilize different kinds of information from various disciplines with more efforts toward sharing information and improving open access to publications and data. Using existing networks (monitoring and site networks such as the Long Term Ecological Research network (LTER), the Man and Biosphere programme of UNESCO (MAB), should be more promoted as well as the use of new technologies (e.g. GIS, internet, wikis, etc.).

Scientific career management was also highlighted as an area which needed more attention, particularly the need to include more incentives for scientists to engage in IDR (e.g. high factors journals opening up to more IDR studies.) and innovative ways to support scientists working on improving collaborative work across disciplines and interaction with stakeholders. It might also be necessary to explore new funding mechanisms (private sector, Lifeweb, etc) that could support this collaborative research.

# Evaluation

Evaluation forms were filled in by participants and collected by the meeting organizers at the end of the meeting. Participants were asked to assess whether it was worth attending the meeting and why, and to identify what they most and least appreciated.
From a total of 37 completed forms, 30 participants stated that they were satisfied overall with the workshop while 7 participants were unsatisfied.

The main aspects identified by participants as most satisfying were the opportunity to have discussions with people from a wide range of different disciplines and the opportunity to address biodiversity in a more integrative way, opening up the debate to issues not usually on the table.

The use of round tables/World café was also appreciated as it gave each participant the chance to express his ideas and to have a lively and rich discussion.
Participants also appreciated that the process was flexible enough to allow for adaptation of what emerged from discussions. However many participants found that it was not structured enough considering the time constraint and that it would have been improved with more focused questions and clearer guidelines.
A main concern was related to the weak representation of non natural-science disciplines, especially sociology, economics, philosophy etc. Participants also expressed the preference for more preparation prior to the workshop (e.g. more time between the PVB summit and the scientific workshop).

# conclusion

The EPBRS participatory scientific workshop occurred directly after the Positive Visions for Biodiversity summit and illustrated some of the challenges facing the scientific community, namely the need to widen the scope of biodiversity research and look at the underlying causes directly linked to society that were identified at the Positive Visions for Biodiversity summit.
While some scientists found it difficult to think outside of their disciplinary field, many were engaged in this new approach and interested by the challenges, new requirements and opportunities it entailed.
The participatory approach was an opportunity for scientists from various disciplines and policy makers to have an open, constructive and integrative discussion on the role of research in addressing the current biodiversity crisis and its underlying causes.
Participants identified some key research priorities in relation with the vision framework developed in the Positive Visions for Biodiversity summit. Participants did, however, highlight the need to complement these research priorities with the input of additional social scientists to have more pragmatic and applied recommendations taking into consideration relevant information. Indeed, a clear recommendation was the need to work on implementing interdisciplinary research and transdisciplinary approaches to have a more integrative approach of biodiversity issues in relation with societal concerns.

The results of the discussions presented in this report should therefore be seen as a first step in a longer process in which additional workshops could help explore suggested topics further and more comprehensively.

# Acknowledgements

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Positive Visions for Biodiversity was delivered in partnership with national and international partners, including the Royal Belgian Institute of Natural Sciences, the Department of Economy, Science and Innovation of the Flemish Government (EWI), the French Foundation for Biodiversity Research (FRB), the UNESCO Man and Biosphere Programme (MAB), the Biostrat project and the European Commission. The event was also sponsored by Thalys.

Special thanks are given to the table facilitators, the Management Centre Europe, the EPBRS members and the Belgian Biodiversity Platform.

# list of participants

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|---|---|---|---|
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# Appendixes

# appendixes

## Answers to question 1:

### All proposals or research priorities are organized by theme

Participants voted on the results of question 1 through a gallery walk voting process using green sticky dots to identify the most relevant ideas in their opinion, but also using red dots when they did not support particular ideas. Votes are reported at the end of each proposal: number of supportive votes-number of non supportive votes (e.g.: *14-1 = 14 supportives votes - 1 non supportive vote*)

Governance that is more transparent and effective and that balances global and local responsibilities *(Vision theme 1)*

## Research is needed on:

1. Non-economical ways of valuing BD (cultural, ethical aspects) as part of our natural capital *14-1*
2. How to ensure local specificities (cultural, ethical va ues) are not lost through upscaling *7-0*
3. Developing generic ecological principles for manage ment of our natural capital that applies at a range of scales (local to global) linking these to multi-level governance *7-2*
4. How to develop regulatory and compliance tools for BD conservation *2-1*
5. How do we develop a more inclusive concept of BD (more than species) to help go from local to global *1-3*
6. Research on procedures and procedural skills that are necessary to build overarching integrative principles *4-0*
7. How to overcome BD-related barriers in languages, cultures, values, concepts, methods from different fields and sectors *3-0*
8. Clarify the role of responsibility in BD governance in different levels, different roles, different actors and how this responsibility is politically expressed *3-0*
9. How do we identify the obstacles that block the change of the dominant worldview *6-5*
10. How could society learn from ecological resilience to create a more resilient governance system *6-5*
11. Designing global biodiversity governance *3-4*
12. The role of improved communication to raise awareness in governance related audiences *0-0*

# Appendix 1

Sustainable and participatory management of land, seascapes and urban areas *(Vision theme 2)*

**Research is needed on:**

1. Proactive and creative management connecting monitoring with the development of scenarios in dynamic social-ecological systems *13-0*
2. Where to designate protected areas and how to manage them in the face of global change *14-2*
3. Identifying species and functions supporting ecosystem services for designing green cities and connectivity between urban and non urban areas *10- 1*
4. Potential adaptive capacities of species for management of land and seascapes *9-0*
5. Land use scenarios for food production (agriculture) vs development of urban/peri-urban areas *2-0*
6. Relationships between management of ecosystems and governance regimes (government, community, market based…) *7-0*
7. How to create or restore complex habitats (including vegetation dynamics, species assemblages, genetic diversity, propagation techniques, etc.) *17-1*
8. Assessing durability of restoration projects (considering future conditions) *7-0*
9. Participatory management methods *7-1*
10. The spectrum between exclusion and participation of local communities (including zonation) for the management of protected areas *4-0*
11. Assessment and accounting of ecosystem services to rationalize investments in landscape management *4-5*

# appendixes

**Research is needed on:**

A sustainable human population *(Vision theme 3)*

1. Building scenario's on dynamic links between carrying capacity and RU, incorporating:
   –Scales (spatial/temporal – incl. Migration)
   –Technology (levels, new)
   –Biodiversity and Ecosystem services (ES)
   *21-2*
2. Relations between adaptation to ecosystems to diverse pressures and their resilience, across different scales, and their ability to provide ES *12-0*
3. Understanding/managing the impact of human migration (short/long spatial – temporal)(incl. Rural/ cities, tourism) on biodiversity and ES *5-0*
4. Developing/improving « cradle to cradle » processes : more TEEB *2-6*
5. Understanding/managing the direct and indirect (spatial-temporal) effects of introduction of new technologies, shifts in application & methods on RU/population & (biodiversity + ES) *3-0*

(*** Many micro-focus studies (what are safe ecological limits, barcoding for product tracing, bacteriological processes, …))

*(Vision Themes 3 and 7 are combined)*

Efficient use of resources through responsible production and consumption, recycling and eliminating waste *(Vision theme 7)*

# Appendix 1

**High technology that is used to build a low-tech world that enhances and protects biodiversity** *(Vision theme 4)*

**Research is needed on:**

1. Education that encourages holistic understanding of role of biodiversity in technology, energy, transport and focuses thought on what is necessary, not what is possible *16-0*
2. Incentives to move society towards transition communities (building for biodiversity, permaculture, local energy, local jobs…) *12-0*
3. Understanding based on ecosystems for more effective use of energy nutrients, water and natural carbon cycles (sequestration) *11-0*
4. Digital technology to help reduce need for transport, energy, delibartely to reduce impact on biodiversity (eg. virtual conferences) *3-7*
5. Reduced need for plastic bottles and paper cups at biodiversity conferences *0-0*
6. Local integrated energy and transport systems based on renewables and minimising risks to bioidversity *4-0*
7. Using biodiversity as technology for energy and transport and other sectors (e.g. plants to clean up pollution, fouling on ships, floods…) *2-0*
8. Best energy capture and saving for regions through database on impact on biodiversity and implementation in biodiversity impact assessment *2-0*
9. Helping energy-poor communities to access own energy at small scales *2-1*
10. Understanding on (new) biotechnologies and nanotechnologies that impact biodiversity *6-0*
11. Biofuel crops in functional ecosystems that do not compete for land or water and that reduce vulnerability to pests, diseases, climate change *7-2*
12. Specialised indicators of damage to ecosystems impacted by energy capture, transport or technology *1-0*
13. Closed-system bioreactors *0-0*

*(Vision Themes 4 and 5 are combined)*

**Sustainable renewable energy and transportation** *(Vision theme 5)*

# appendixes

**Sustainable food production, using minimum energy and resources** *(Vision theme 6)*

**Research is needed on:**

1. Finding new ways of assigning prices to food production, internalizing the diverse and multiple costs of food production related to biodiversity *24-2*
2. Ecosystem approach to food production based on co-culti vation of multiple species for multiple services, without waste production *21-0*
3. The transition from modern industrial intensive toward traditional or innovative low impact practices *12-0*
4. Improving knowledge on a wider set of species that can be used for food production: genetics, reproduction, … *7-3*
5. Adaption capacities of cultivated, harvested or managed varieties to global change *4-0*
6. How consumers can understand, and accept changes in prices on food products *2-3*
7. Evaluating and monitoring the diversity of varieties cultivated and food products *3-2*
8. How to integrate traditional and modern techniques of food production *2-0*
9. Carrying capacity of oceans and rivers to better evaluate releaser of stocks of hatchling of fish species, and their impact on native species *3-1*
10. How the changes in food production as cluster processes and high-tech will impact human, animal and biodiversity health, and ecosystem integrity *2-2*
11. How to better support local participation into food production systems and ecosystem management (e.g., subsidize systems) *8-0*

# Appendix 1

**Research is needed on:**

The integration of biodiversity into every part of life *(Vision theme 8)*

1. Sociological, philosophical and linguistic studies on the implications of the concepts currently used and to develop new terms for less loaded discussion *21-0*
2. Life-cycle impact on biodiversity of products (not only on the entire environment) *13-0*
3. How and when best to educate people on the impacts their actions/choices have on biodiversity *4-0*
4. Media: promoting understanding of the implications of biodiversity *5-0*
5. Procedures (tools) to help scientists communicate more effectively with the public (and with stakeholders) *2-0*
6. Market: consumer reactions to information on the impact of their behaviour on biodiversity *7-4*

**Research is needed on:**

Transforming the economic paradigm to reflect fully biodiversity and human values *(Vision theme 9)*

1. Clarifying the role of biodiversity in economics and clarify the value systems that are used to assess biodiversity across various disciplines, including but not limited to economics *19-1*
2. The communication challenge posed by the common acceptance of economic growth as paradigm (use the economic crisis as an opportunity for changing the paradigm, this should include understanding of the precautionary principle and uncertainty) *11-1*
3. Further developing methodologies for the analysis of economic values for biodiversity and on the limits of these methods *7-3*
4. How sectors can better take into account environmental externalities in their daily operations *2-0*
5. How businesses perform in different economic paradigms *1-5*

# appendixes

**Research is needed on:**

Values and behaviors appropriate to a more harmonious way of life *(Vision theme 10)*

1. Different value systems, including their fundamental principles, how value systems can change and on how people can get inspired and engaged, especially for biodi versity *20-0*
2. The effects of environmental and sustainability educa tion on values and behavior, and on obstacles for success ful implementation of existing advanced teaching methods *17-0*
3. The effectiveness of ways and methods to communicate the importance of biodiversity, including the assessment of different media, different types of information and different processes (e.g. experiential, participative dialogue) *11-0*
4. Effective "footprint" information for biodiversity friendly consumer decisions (e.g. information and scenarios on the effect of personal actions, credible measures and reliable labeling, and development of a "biodiversity footprint") *6-0*
5. Trade-offs at multiple scales, and for the development of decision making tools that can integrate very different kinds of impacts, knowledge (e.g. local, traditional, transdisciplinary) and values *8-0*

# Appendix 2

## Some research topics were further elaborated:

### GOVERNANCE

***Research on mainstreaming biodiversity into governance***

In most policy arenas dealing with pressures and drivers for biodiversity change is not regarded as an important and urgent issue. There are different potential reasons for this: economic power behind drivers and importance/legitimacy given to this power, conceptual fuzziness of biodiversity, fear of looking into the "hurricane's eye", different understandings of "humans in biosphere", different legal frameworks, etc.

It is not clear which role these different factors play and how they interact with each other. Identifying these barriers for mainstreaming biodiversity into governance is the first step to overcome them. A second step is to analyze the impact of different past and current attempts to mainstreaming biodiversity, such as MA, TEEB, IPBES. In a third step, pathways towards a more fruitful mainstreaming should be proposed.

Political scientists, legal scientists, economists, anthropologists, philosophers, ecologists should together undertake this research.

### SUSTAINABLE USE OF RESOURCES INCLUDING ENERGY

***Research to contribute to develop sustainable use of resources***

Two main aspects were emphasized:

1/ There is a need to explore Biodiversity index/indicators to be able to assess impacts on biodiversity of various production and activities

2/ Research should investigate integrated Life Cycle Analysis (LCA) methods that would not be summing up of positive and negative impacts, but would propose more integrative approaches

Both aspects will require a clear understanding and communication of the different levels of biodiversity to be able to develop indicators and life Cycle Analysis methods that take in consideration not just impact on species but also on other components of biodiversity and the various different timeframes (short term/long term impacts).

# appendixes

## FOOD PRODUCTION

***Research is needed to contribute to a more sustainable food production***

Participants discussed in more details research on co-cultivation systems that produce food and other services with an environmentally acceptable level of waste This topic could be address through four specific aspects:

- To identify and select local species and varieties for co-cultivation, based on species that are consumed and can reduce the level of waste
- To develop criteria to define an environmentally acceptable level of waste in food systems
- To improve reproduction and growth of the selected species during the process of domestication
- To design the corresponding food systems and test the viability of their functioning

Research could then be carried out in parallel studies of 3 different food systems based on co-cultivation:

- Associated food crops (organic agriculture, permaculture)
- Agroforestry (trees and crops, trees and animal husbandry)
- Aquaculture (herbivorous fish, fish and shells)

## EDUCATION AND COMMUNICATION

***Research is needed to contribute to more appropriate education and a better communication on biodiversity***

- The relationships between values, educational methods, and biodiversity related behavior are a key factor to better understand in order to better communicate biodiversity issues. In this context an understanding of how education influences people behavior related to biodiversity is key, especially across different timescales: (both, effects of past education on recent behavior and to initiate research on long-term effects of recent education systems) , and also across cultures, systems and methods (including traditional, top-down and bottom-up ways).
- Research on the ways to train teachers and educators could also be developed.
- A key research topic in Education & Biodiversity is related to the effect of bringing students into biodiversity for classes, including indirect effects on other aspects (e.g., biodiversity education may have positive effects on social justice values).
- Another important research priority is the need to investigate the linguistics, philosophy and terminology aspects related to biodiversity, in order to clarify the message and engage the general public. Current debate on the issue of biodiversity

is sometimes confounded by the use of emotionally charged terms and/or jargon that hamper clear discourse. On the same lines and maybe as a case study, it would be interesting to investigate how the varying use of the term "biodiversity" (and associated terms) in the European Union over the past 20 years has affected policies and practices and vice versa.

➢ Regarding the economic values and paradigm, research should focus on the perception of (economic) growth and its link to well being. It could investigate alternative metrics for well-being as tools to better communicate the relationship of the economic paradigm and its effect on Nature.

## TRANSFORMING THE ECONOMIC PARADIGM

***A case study was proposed on transition societies -***

***Outline of research concept on transition society***

The research is to prepare the large-scale transition to a prosperous and sustainable human civilisation in an era of unprecedented threats to biodiversity, especially to humanity.

There is already some research on the political and social nature of transition. But there is little systemic research on its ecological inputs and effects or its integration into education, policies and decision-making, especially given that future ecosystems have no analogues today.

➢ The research needed would develop an analysis of the various processes leading to successful transition towards resilient societies embedded in thriving biodiversity. It would include a systematic review of existing transition projects, whether planned or not.

➢ What were the effects of transition upon local biodiversity, and how did biodiversity support human cultures under that transition?

➢ How did traditional knowledge contribute, how might it contribute more generally, and how might scientific knowledge help to potentiate traditional understandings?

➢ On the basis of this analysis, case studies would be developed to adapt solutions developed in experiences of transition and solve problems not yet solved in that region.

➢ The research will encourage more such local projects; and such projects would be encouraged to contribute the knowledge that they accumulated into the overall project.

➢ It would provide the stimulus for a cloud of thousands of participants, many of them in existing networks across the globe, to pool their expertise, experience and intelligence to assemble a viable, dynamic and innovative knowledge base that can be accessed by policy makers, scientists, practitioners, and all sectors of society, to

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help them make informed decisions, particularly concerning trade-offs.
➢ Outputs of the project would include a handbook of processes to reach adaptation strategies, and a compendium of how biodiversity provides solutions for society and of how society can collectively provide solutions for biodiversity. This would convince and help policy-makers, institutions and practitioners to implement genuinely adaptive strategies.

Potential outcomes:
➢ Biodiversity for solutions and solutions for biodiversity
➢ 2000 "cloud collaborators"
➢ Collective intelligence for collective action by citizens and policy makers
➢ Stories from the future, for the future
➢ Systematic review of existing projects
➢ Case studies of adaptations of existing projects to solve problems not yet solved in that region
➢ andbook of processes to reach adaptation strategies

## APPENDIX 3: ANSWERS TO QUESTION 2

### Related to research organization, education and research institutions

**Additional considerations and challenges regarding biodiversity research**
*There is a critical need to efficiently integrate different kinds of information in order to be proactive and to develop tools to take into account the dynamics of social-ecological systems.*

Some of the current challenges :
➢ Complex systems require a wide range of expertise, mobilizing large networks, through large projects. Engaging in this kind of work is not easy and there is insufficient funding and incentives to support it, but this is what we need to do!

➢ There is a need to change the way research is being conducted; move science out of the labs and institutes

➢ Research should listen more to society needs

➢ Research should involve stakeholders, citizens and local communities from the outset. Stakeholder involvement is a long-term process and different means and approaches are available (citizen science, conferences, public talks, surveys, etc.)

➢ Research should share its results and make them accessible to different audiences (i.e translating science for citizens)

➢ Research is responsible to ensure that its results are transferred to society

➢ Research should link better scientific knowledge on global change together with the knowledge of local communities on ecosystems and landscapes to develop adaptation strategies

➢ Scientists should not just walk away with the result of their work; they should ensure reporting back

➢ The expertise is available but should be mobilised efficiently

➢ Interdisciplinarity is not a goal, it is a means. There are some good examples of interdisciplinary projects (i.e. in restoration, Biolog, Bioplex); now we should strive to go a step further and change the scale of this research

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➢ Need top down, structured research programmes supported by important operational tools, with long term funding

➢ Need to organise research around a goal or structured questions, which can attract and gather scientists (e.g. management of social-ecological systems)

➢ Need to rely on infrastructure and tools to structure this big research effort on complex systems (models, databanks, monitoring networks, etc.), in particular tools to integrate and mobilize different kinds of information:
– Importance of sharing information and improving access to publications and data
– Make use of existing networks (monitoring and site networks such as LTER, MAB); >Monitor biodiversity as part of ecosystems
– Tools such as GIS also help to bring together information from different disciplines and are useful in communicating the results to stakeholders and society.
– Make use of new technologies (internet, wikis, etc.) and possibly create a clearing-house for researchers on biodiversity, network of networks on knowledge and information

➢ Change the management of scientific careers: create incentives to work together (not only publish in major journals), to share data, etc.

➢ Find innovative ways to collaborate and knock on new doors for funding (private sector, Lifeweb, etc.)

**THE CHALLENGE OF INTERDISCIPLINARY RESEARCH**

***A main discussion topic was on how we can improve/promote the communication/ cooperation between biodiversity and non-natural sciences researchers on the issues raised here?***

➢ Interdisciplinary research: a tool or a goal in itself? Find the most effective way to target a research question – management, admin and coordination required is an important constraint and consumes a relatively large fraction of research resources

➢ Building ID- capable consortia takes time and resources: adeq. means for that needed: networking projects – science-science interfaces

➢ Evaluation of IDR projects: are there experts who are sufficiently ID to effectively evaluate IDR projects?

➢ Management of IDR projects is far more demanding than for TransDR or regular projects

➢ Output and evaluation of expertise: journals are mono-focus ; how to influence intergov processes? What is the reward to do IDR as it is difficult to get this stuff published

➢ Additional constraints: side requirements/conditions (gender balance, geography,....)

➢ Connecting the right expertise: problem to overcome the cultural barriers between different research communities (different scales, methodologies, accepting fuzziness, ability to generalize,...)

**How could we achieve that this interdisciplinary research will be done?**

➢ Apply existing knowledge and methods specifically to biodiversity

➢ Build new (interdisciplinary) research clusters / units / institutions

➢ Build national and international research networks

➢ Find appropriate research methods (transdisciplinary) to address the issue

➢ Understand and feed into Bologna process to reform educational programmes and make them more interdisciplinary

➢ Understand (and potentially try to influence) teaching curricula at all levels

➢ Training programs for scientists, educators and administrators to discuss value issues and discover their own values

➢ Potential changes of current epistemological approaches need to be investigated (e.g., heterodox streams such as feminism )

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**WHO MIGHT FUND THIS RESEARCH?**

- National funding programs
- Local programs for local projects
- (Environmental) NGOs
- Foundations (incl. corporate and private philanthropy)
- European commission (FP8)
- Universities and research institutions
- Religious & spiritual institutions (think about budhism)
- Media (public or private)

**CONCLUSIONS:**

The expertise is probably available but bringing it together in an efficient interdisciplinary work is difficult. Some science/science interfaces are needed to bring institutions and working groups together; establish centers of excellence on cross-cutting issues.

Many scientists do not know how to conduct IDR so there is a need to develop appropriate education programs, including policy, within individual curriculum elements.

Finance is probably available but not appropriate or suitable; funding agencies should help support building the networks (building trust, etc – see above).

Time is needed to construct IDR networks and one-go calls are not efficient to do so, consortia need evolution time.

The reward system in scientific world should also be adapted (journals not suited for IDR).

## For References

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[1] Belgian Biodiversity Platform (Brussels, Belgium)
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