Secretariat of the Convention on Biological Diversity

CBD Technical Series No. 79

# 79

# HOW SECTORS CAN CONTRIBUTE TO SUSTAINABLE USE AND CONSERVATION OF BIODIVERSITY

PBL Netherlands Environmental Assessment Agency

a place of mind THE UNIVERSITY OF BRITISH COLUMBIA

WAGENINGEN UR

TROPENBOS INTERNATIONAL

PBL Netherlands Environmental Assessment Agency

# HOW SECTORS CAN CONTRIBUTE TO SUSTAINABLE USE AND CONSERVATION OF BIODIVERSITY

CBD Technical Series No 79

**PBL Netherlands Environmental Assessment Agency**

**2014**

WAGENINGEN UR
For quality of life

a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

TROPENBOS INTERNATIONAL

**How sectors can contribute to sustainable use and conservation of biodiversity**
PBL Netherlands Environmental Assessment Agency
The Hague, 2014

CDB Technical Series No 79
PBL report number 01448
ISBN 92-9225-553-3
ISBN 92-9225-554-1

**Corresponding authors**
Marcel Kok (marcel.kok@pbl.nl)
Rob Alkemade (rob.alkemade@pbl.nl)

**Authors**
Marcel Kok, Rob Alkemade (eds), Michel Bakkenes, Eline Boelee (Water Health), Villy Christensen (UBC), Martha van Eerdt, Stefan van der Esch, Jan Janse (PBL), Sylvia Karlsson-Vinkhuyzen (WUR), Tom Kram, Tanya Lazarova, Vincent Linderhof (WUR), Paul Lucas, Maryia Mandryk, Johan Meijer, Mark van Oorschot, Louise Teh (UBC), Luc van Hoof (IMARES), Henk Westhoek, Roderick Zagt (Tropenbos International).

**Supervisor**
Keimpe Wieringa

**Contributors**
Sofia Argyropoulou, Ben Ten Brink, Antoine le Gal, Rudi van Kanten (Tropenbos International Suriname), Matthijs Kolpa, Natalia Lutti Hummel, Willem Ligtvoet, Ger Jan Piet (IMARES), Jan Jaap Poos (IMARES), Aad Smaal (IMARES), Nora Steurer, Machteld Schoolenberg, Jennifer van Kolck, Hans Vellema (Tropenbos International)

**English editing**
Serena Lyon and Annemieke Righart

**Graphics**
Johan Meijer, Sandy van Tol, Filip de Blois.



**Acknowledgements**
We would like to express our gratitude to sector representatives and experts who we interviewed in the preparation of the report and who participated in the project workshops. Joost Tersteeg and Henk Smit (Wing) were instrumental in organising this.

Reviews by the following people were greatly appreciated: Aslihan Arslan (FAO), Graeme Auld (Carleton University), David Coates (Wake Forest University), Linda Collette (FAO), David Cooper (sCBD), Willy Douma (Hivos), Chris Enthoven (WWF), Jasper Fiselier (RHDHV), Amy Fraenkel (sCBD), Robert Höft (sCBD), Steven Johnson (ITTO), Marion Karmann (FSC International), Marcel Klinge (Witteveen+Bos), Damiano Luchetti (FAO), Kieran Noonan-Mooney (sCBD), Jamie Pittock (The Australian National University), Claudia Ringler (IFPRI), Jessica Sanders (FAO), Henk van Schaik, Martjan Schelhaas (WUR), Junko Shimura (UNEP), Hans ter Steege (Naturalis), Jan Verhagen (WUR), Nico Visser (Ministry of Economic Affairs), Daan Wensing (IUCN).

Furthermore, this report benefitted from feedback received at meetings with the GBO-4 advisory board, FAO, the Secretariat of the CBD and the Dutch inter-ministerial advisory group for this report, as well as from inputs from many colleagues within PBL.

# Contents

# Foreword

Biodiversity is an important element of our natural capital. Ongoing loss of biodiversity as a result of a short-term focus has to be halted in view of long-term responsibilities and benefits. A focus on the sustainable use and conservation of biodiversity in primary sectors will help to realise this halt.

In 2010, PBL Netherlands Environmental Assessment Agency published its study 'Rethinking Global Biodiversity Strategies' in which we concluded that significant and lasting improvements in the downward biodiversity trend have to come from changes in human activities including agriculture, forestry, fishing and energy use. While traditional biodiversity policies that focus on conservation and protection measures would continue to be important, they need to be complemented with additional policies to address drivers and pressures of biodiversity loss. This study showed that ambitious, cross-sectoral strategies would half the rate of biodiversity loss by 2050, compared to what was projected without any new policies.

The importance of addressing underlying causes and reducing pressures is now reflected in the goals and targets in the Strategic Plan for Biodiversity 2011-2020, adopted in Nagoya, Japan in 2010. However, now that we are half way through the implementation of the Strategic Plan, it has become clear that addressing the underlying causes and pressures of biodiversity remains a key concern to keep the Strategic Plan on course.

To support the further implementation of the Strategic Plan this report shows first of all what key sectors can do to address the underlying drivers and pressures of biodiversity loss and contribute to its sustainable use. Secondly, this report presents actions and strategies for countries, the private sector, civil society and international organisations to support sectors to mainstream the sustainable use and conservation of biodiversity in their daily operations.

This study shows the potential that natural capital, biodiversity-friendly strategies and nature-based solutions offer for agriculture, forestry, fisheries and water management. It furthermore builds on the recognition that a numerous actors in sectors worldwide are starting to take action in favour of biodiversity. National governments will have to play an active role to ensure that these actions gain the necessary momentum to halt further biodiversity loss. Further implementation of this agenda will require new engagements between the biodiversity community and production sectors, as well as experimentation, sharing and learning about best practices in various regions of the world.

This study was conducted following a request of the Executive Secretary of the Convention on Biological Diversity, Mr Braulio Ferreira De Souza Dias, to the Dutch government, as a contribution to the fourth Global Biodiversity Outlook (GBO-4).

Professor Maarten Hajer

Director, PBL Netherlands Environmental Assessment Agency

# How sectors can contribute to the sustainable use and conservation of biodiversity

## Key messages

### Underlying causes of biodiversity loss need to be addressed…

The Strategic Plan for Biodiversity 2010–2020 provides an overarching framework on biodiversity for the entire United Nations system and all other partners engaged in biodiversity management and policy development. The parties have agreed to translate the Strategic Plan that includes the Aichi Biodiversity Targets for the 2010–2020 period into revised and updated national biodiversity strategies and action plans.

The mid-term evaluation of progress towards implementing the Strategic Plan shows that, if current trends continue, pressures on biodiversity will increase in the coming decade. Consequently, global biodiversity will decline further, despite the increase in responses by national governments and many public and private initiatives worldwide. Addressing the underlying causes of biodiversity loss is a key concern to keep the Strategic Plan on course.

### … this requires a focus on primary sectors

Developments in sectors such as agriculture, mining, wood production, water management and fisheries largely shape the world's current and future biodiversity, as they exert direct pressures on biodiversity. These sectors depend on biodiversity and ecosystems in various ways to provide food, fibre, wood, bio-energy, fish and clean water for the world's growing human population.

If current trends continue, demand for food, wood, water and energy is projected to increase 1.5–2 fold to match the rise in global population and increasing wealth, with negative consequences for biodiversity. Addressing these pressures therefore requires integrating biodiversity in the way in which food systems operate worldwide, how energy is produced, wood is extracted and produced, and fresh waters and oceans are managed.

### Large potential for more biodiversity-friendly production methods and nature-based solutions exists in these sectors

Loss of ecosystems and their functions harms primary production in different ways, incurring costs and necessitating changes to sector operations. These sectors are therefore increasingly assessing their vulnerability to changes in their natural resource base and looking for ways to limit their impact and exposure.

There is a large potential for more biodiversity-friendly production methods and nature-based solutions in these sectors. These considerations should become mainstream in the operations of the agriculture, energy, wood production, fisheries and water sectors. This requires these sectors to become more aware of the values of biodiversity and well-functioning ecosystems, as well as the immediate risks that a loss of the natural resource base constitutes to the supply chain, and for these considerations to be embedded in decisions in production chains, either by companies, through consumer demand or through government intervention.

### Realisation of this potential also contributes to broad set of sustainability goals

Scenario analysis shows the potential of future pathways to halt global terrestrial biodiversity loss by 2050 and to at least halve the rate of loss of all natural habitats, including forests, by

2020 (Aichi Target 5) and to expand protected areas to 17% of the terrestrial area (Aichi Target 11). At the same time, these pathways eradicate poverty and hunger, provide access to safe drinking water and modern sources of energy and limit the global mean temperature increase to two degrees Celsius in 2100 compared with pre-industrial levels. Achieving these targets simultaneously requires major and transformative change, but the analysis also shows that the 2050 Strategic Plan Vision is still within reach.

The pathways show that changes in the agro-food system can significantly contribute to halting biodiversity loss in 2050, through a combination of new agricultural practices that increase productivity as well as improvements in the sustainability of production, reduced food losses and waste and changing dietary patterns. Measures to improve forest management, combined with reduced wood consumption, will lower the increase in negative impacts of wood production. This combination of measures relating to both production and consumption is necessary to reduce or even eliminate dependency on wood that is derived from converting forests to other land use. Better land-use practices, including a more efficient use of agrochemicals, will improve the state of freshwater biodiversity and reduce pollution and its negative impacts on biodiversity, while better integrated land and water management can help restore watersheds and wetlands. In addition, considerably reducing the fisheries effort, eliminating illegal, unregulated and unreported fishing, unsustainable practices and destructive fishing gear and reducing by-catch will restore fish stocks and safeguard future yields.

## Mainstreaming biodiversity succeeds when aligned with the core values of actors in the production chain

Embedding biodiversity concerns within sectors (mainstreaming) is more likely to succeed if biodiversity is aligned with the core values and – economic – interests of primary producers and other actors in the value chain. This requires that sectors recognise the opportunities that biodiversity provides, such as improved availability of fish and wood, improved soils for agricultural production systems and cost-effective nature-based solutions in water management. This is what mainstreaming policies need to achieve.

A broad perspective on production sectors that includes subsistence and commercial activities, local, regional and international supply chains, as well as consumers, helps to identify the most promising opportunities to move primary producers in a biodiversity-friendly direction. These opportunities are usually best found when sectors are further regionally specified. In addition, efforts to integrate biodiversity can benefit from the many sustainability initiatives already being taken within sectors, although more attention to biodiversity is necessary in many of these initiatives. A focus on actors in supply chains such as processing companies and retailers – who hold key positions to influence both production and consumption – will make these efforts more effective.

## Key strategies to improve, speed-up and scale-up the integration of biodiversity within sectors are…

To effectively improve, speed-up and scale-up the integration of biodiversity within sectors, the following four strategies are suggested:

1. Apply integrated land, water and seascape approaches to reap benefits of ecosystem services across landscapes, inland water and marine environments, dealing with cross-sectoral issues, protecting interests of smallholders and improving current conservation efforts.

2. Strengthen biodiversity within emerging voluntary sustainability initiatives such as standard-setting and certification within international supply chains. To scale-up, it will be necessary to increase the awareness that biodiversity loss constitutes a risk to the supply chain, to increase the number of supply chains that apply biodiversity criteria, the market shares of certified products and the production areas certified in all world regions.

3. Strengthen the buyer's and consumer's perspective on biodiversity by raising awareness of the impacts of different products as well as the importance of biodiversity for food security and healthy diets. Increased adoption of less meat-intensive diets has health benefits and reduced food losses and waste has cost benefits; both would also reduce pressure on biodiversity.

4. Mobilise finance by improving the business case for biodiversity and green investments. This requires anchoring natural capital in companies' non-financial reporting to influence the decisions made by executives and investors and shift sectoral investment flows in a more biodiversity-friendly direction.

### Governmental policies important for the effective mainstreaming of biodiversity in sectors…

While these strategies require joint efforts from public and private actors, public policies will be essential to enable their implementation. The following policies will be important for the effective mainstreaming of biodiversity in sectors:

- Raise awareness of the potential and opportunities biodiversity provides. Experimentation and joint learning in diverse contexts will be important to improve understanding of the role biodiversity and natural capital play in sectors and businesses.
- Work towards improved valuation, accounting and reporting of biodiversity and ecosystem-related impacts, risks and performances of primary producers, companies and investment projects.
- Realise the full potential of the many emerging sustainability standards and certification systems by ensuring proper inclusion of biodiversity, making sure that these initiatives go beyond first movers and are applied in all world regions.
- Take an integrated approach to land-use planning that includes sectoral interests, smallholders and local communities, improve land tenure security for smallholders, and realise the bundling of payments for ecosystem services.
- Employ policies that align sector incentives with biodiversity conservation and sustainable use, such as regulation and green taxation to internalise the public good aspects of biodiversity and ecosystems, reform environmentally-harmful subsidies and support innovation and technology diffusion to make production systems more efficient with lower impacts.
- Leverage the power of consumer choice. Health and cost arguments may trump biodiversity arguments in areas such as reduced waste of food products and less meat-intensive diets, but biodiversity will also benefit.
- Provide a level playing field, including setting and reinforcing legal standards. Successful biodiversity policies furthermore require the involvement of ministries of economic development and finance and sectoral ministries.

## To conclude…

The CBD can play a leading role in mainstreaming biodiversity in sectors at the international level, by mainstreaming the spirit and substance of the Aichi targets into public and private governance of sectors; by ensuring the inclusion of biodiversity concerns in newly-emerging public and private partnerships on sustainability; and by working with sectoral bodies and other conventions to include biodiversity goals and actions in their activities.

The successful mainstreaming of biodiversity in production sectors will inherently become a diverse, dispersed and long-term process, requiring new engagements between the biodiversity community and production sectors, finding new ways to bring nature and economy together. As the practicalities of a shift towards more biodiversity-friendly production are not yet well-understood in sectors, much more experimentation, showcasing and sharing of experiences between diverse sector contexts around the world is required. The challenge will be to step-up, scale-up and speed-up action and to ensure a balance between public and private benefits.

# Main findings

## Pressures on and underlying causes of biodiversity loss need to be addressed

The mid-term evaluation of progress (SCBD, 2014) towards meeting the Strategic Plan for Biodiversity 2010–2020 shows that, with current socio-economic trends, pressures on biodiversity will continue to increase, and consequently biodiversity will continue to decline. This is despite the fact that society's responses to biodiversity loss are rapidly increasing. While there has been some progress, this will not be sufficient to achieve the Aichi Biodiversity Goals set for 2020. Improvement in and scaling-up of efforts is therefore required to keep the Strategic Plan to halt further biodiversity loss on course. In addition to improved nature conservation and species protection, the integration of biodiversity concerns across society (mainstreaming) needs to happen to be able to address the pressures on and the underlying causes of biodiversity loss and to promote sustainable use, as also suggested by the Aichi Biodiversity Targets.

## This requires a focus on primary sectors

Developments in sectors such as agriculture, energy production, mining, wood production, water management and fisheries largely shape the world's current and future biodiversity. These sectors depend on biodiversity and healthy ecosystems in various ways to provide food, fibre, wood, bio-energy, fish and clean water for the world's growing human population. If current trends continue, demand for food, wood, water and energy is projected to increase 1.5–2 fold to match the rise in global population and increasing wealth, with consequences for biodiversity. The main pressures driving global terrestrial biodiversity loss under current trends are shown in Figure MF 1, and further elaborated for food and wood production.

Food production is the economic sector with the largest negative impact on biodiversity, contributing 60–70% to date of total biodiversity loss in terms of the 'Mean Species Abundance' indicator (MSA)[1] in terrestrial ecosystems and about 50% of MSA in freshwater systems. The extraction of wood products is a main driver of degradation of biodiversity in forests, accounting for about 5–10% global MSA loss, while agricultural expansion is the main driver for deforestation. Mono-functional, technical (or 'grey') solutions, traditionally chosen in water management, have not only led to extensive alteration of water bodies and biodiversity loss of about 20% MSA in rivers and 15% in floodplain wetlands, but have also hampered multifunctional use. Fishing also directly impacts biodiversity and has widely altered marine ecosystems through persistent overfishing and the use of destructive fishing practices that directly damage or modify habitat structure with resulting impacts on both target and non-target species. Furthermore, effective climate policies will be necessary to halt biodiversity loss, while from a biodiversity perspective possible synergies and trade-offs between climate change adaptation and mitigation policies and biodiversity policies need to be taken into account.

[1] MSA is an indicator for intactness of ecosystems and is defined as the mean species abundance of originally occurring species relative to their abundance in undisturbed ecosystems.

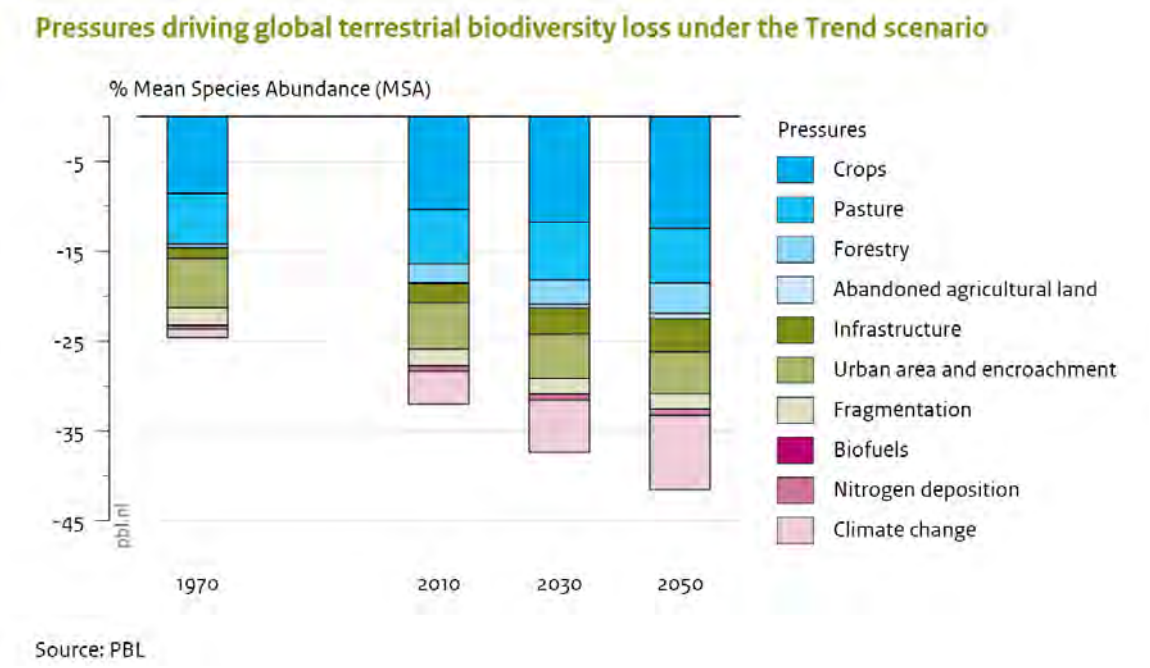


**Figure MF 1.** Pressures driving global terrestrial biodiversity loss.

## Biodiversity provides opportunities to help realise a broad set of sustainability goals

A large potential exists within sectors for 'biodiversity-friendly production' and 'nature-based solutions' that, while resulting in the conservation and sustainable use of biodiversity, also contributes to food security, improved health and improved access to clean water and sustainable energy for all. Realising this potential requires that the opportunities that biodiversity provides are recognised within sectors. This is what mainstreaming policies need to achieve.

Mainstreaming biodiversity (also referred to as integration of biodiversity) is defined in this study as the process of embedding biodiversity considerations into policies, strategies and practices of key public and private actors that impact on biodiversity, so that biodiversity is conserved and the services that biodiversity provides are sustainably used, both locally and globally. Mainstreaming biodiversity into sector-relevant decision-making processes can create a powerful and necessary complement to nature conservation and species protection including – for example – the proper management of forest reserves, natural world heritage sites, national parks, wetlands, including RAMSAR sites, and marine parks. If drivers of and pressures on biodiversity loss fail to be addressed, the state of biodiversity will decline further and current conservation efforts will become less effective and more costly.

Both public and private (business, civil society) actors are important for mainstreaming biodiversity in sectors, each with separate but interrelated roles and responsibilities. Mainstreaming biodiversity within sectors is more likely to succeed if biodiversity is aligned with the core values and – economic – interests of primary producers, other actors throughout supply chains, and consumers. Identifying these opportunities also requires regional specific analysis. The specific sub-sectors addressed and technological and behavioural options analysed in this report are summarised in Table MF 1. These are elaborated in the next sections, together with the potential that biodiversity provides and some indication of what sectors are already doing in favour of biodiversity. The barriers and levers that can be identified from these experiences are summarised in Table MF 2, after which the analysis turns to potential pathways to realise long-term goals.

**Table MF 1.** Main technical and behavioural options to contribute to the halt of biodiversity loss in each (sub)sector.

| Food production | Wood production | Water management | Fisheries |
|---|---|---|---|
| Crop production<br>Livestock | Woodworking (e.g. construction)<br>Paper and pulp production<br>Local fuel wood, charcoal and wood pellets | Cities and drinking water<br>Water for food<br>Hydropower<br>Flood protection | Marine fisheries<br>Aquaculture |
| Increase crop and grassland yield and feed efficiency<br><br>Reduce nutrient and pesticide losses and greenhouse gas emissions<br><br>Stimulate local farmland biodiversity<br><br>Stimulate improved land and water management<br><br>Reduce food losses and waste<br><br>Lower consumption of meat, dairy and fish | Responsible management incl. reduced impact logging<br><br>Plantations in suitable areas while managing High Conservation Values<br><br>Reduce wood consumption by increasing wood processing efficiency, re-use and recycling<br><br>Technological innovation in use of residual and 'low quality' (soft) woods<br><br>Fuel-efficient cookstoves and alternative energy sources for cooking | Apply ecosystem-based integrated water resources management<br><br>Improve treatment, recycling and reuse of waste water<br><br>Implement restoration<br><br>Reduce water demand in sectors through design<br><br>Implement sustainable dam management<br><br>Preserve wetlands for water retention and filtration | Implement ecosystem-based fisheries management (EBFM) & co-management arrangements<br><br>Implement gear restrictions<br><br>Set up Marine Protected Areas (MPAs)<br><br>Put restrictions on discards<br><br>Adopt mitigating measures at farm level<br><br>Integrated Multi-Trophic Aquaculture (IMTA) |

**Table MF 2.** Barriers to mainstreaming and levers for change based on the sector analyses in this report.

| Barriers to mainstreaming | Levers for change |
|---|---|
| Lack of awareness of the problems and lack of sense of urgency amongst actors.<br><br>'Mainstreaming overload': the large number of issues that compete for attention.<br><br>Lack of operationalisation of the concepts of biodiversity and ecosystem services.<br><br>Lack of knowledge of and capacities for opportunities and solutions.<br><br>Short-term interests dominate, lack of economic incentives and lack of financial resources to invest.<br><br>Lack of knowledge on the actual on-ground impact of tools/initiatives.<br><br>Lack of integrated approaches at all levels of private and public decision-making. | Normative agreement (united vision) on importance of biodiversity for economic sectors slowly emerging.<br><br>Increasing attention for resource availability, sustainable sourcing, nature-based solutions and license to produce amongst producers.<br><br>New partnerships between NGOs and businesses throughout supply chains.<br><br>Emerging business and biodiversity initiatives in the supply chain to learn from; pioneers may give a push to the market.<br><br>Sustainability reporting is increasing.<br><br>Increasing awareness among consumers of environmental problems.<br><br>Emergence of innovative market-based instruments. |

## Food production and biodiversity

Agriculture faces the challenge of producing 30–70% more food by 2050 while at the same time improving food security. The actual figure depends on the degree to which food losses and waste can be reduced, as well as on future diets. The sector has an extensive impact on ecosystems and their biodiversity, but is also dependent on ecosystems in providing essential goods and services.

Food production can be regarded as a provisioning ecosystem service that crucially depends on a number of supporting and regulating services. Biodiversity plays an essential role in pest control, pollination and soil fertility, although in current agricultural systems some of these services are, partly, replaced by external inputs such as pesticides or fertilizers. Furthermore, the diversity of crop, livestock and fish varieties (agro-biodiversity) and their wild relatives is of long-term interest for maintaining viable and resilient crop varieties and livestock breeds. Regarding food security and healthy diets, biodiversity also provides nutritional benefits such as essential vitamins and micro-nutrients.

At the same time, the agriculture sector is one of the main factors contributing to biodiversity loss globally. The main impact of the sector on terrestrial biodiversity is through land use, through the conversion of natural lands into agricultural lands. Other impacts of the sector are through encroachment, the introduction of exotic species and the contribution to climate change due to greenhouse gas emissions from livestock. Furthermore, nutrient losses and nitrogen and pesticide emissions cause major stresses to the functioning of ecosystems and biodiversity. The agriculture sector also has major impacts on aquatic biodiversity through nutrient and pesticide leaching, soil erosion and consequent sedimentation and the introduction of exotic species.

There are a number of options for the agriculture sector to reduce its impact on biodiversity. Firstly options that reduce the demand of food by reducing food losses and waste and shifting diets towards a moderate level of meat consumption. Secondly by a sustainable increase in crop yields (especially in low-income countries) that could significantly contribute to reducing the expansion of agricultural land. Thirdly in regions with high yields in monocultures, where local farmland biodiversity is typically low, an option is the introduction and restoration of semi-natural landscape elements. If sensibly done, this will increase biodiversity while only marginally affecting crop yields. Simultaneously increasing grassland livestock productivity and improving the sustainable use of these grasslands are important for the sustainable development of the livestock sector.

There are many ongoing initiatives by various actors in the food sector that take biodiversity into consideration. Some focus more on the local impacts of agriculture on biodiversity, while others aim more to reduce the global pressure on the food system (e.g. reducing food waste and increasing crop yields). Examples are farmers certifying their production and companies participating in pre-competitive initiatives to assist farmers around the globe to implement good management practices to raise yields (or maintain current high yield levels in richer countries) while reducing the pressure on biodiversity. Some important pressures can be addressed by regulation (e.g. reduced nutrient losses and pesticide emissions) while others (such as the maintenance or reintroduction of landscape elements) typically require positive incentives. Changing consumer practices to reduce food waste and promote sustainable dietary patterns can be addressed by a combination of governments, NGOs and private actors such as retailing companies and restaurants.

## Wood production and biodiversity

The wood production sector is, similarly to the agricultural sector, both dependent on ecosystems and their goods and services and a major contributor to forest biodiversity loss. The demand for wood-based products such as timber, wood fuel, pulp and paper will increase in the future. There will also be an increase in demand for wood-based bio-energy, driven by greenhouse gas emission reduction targets. The main ecosystems for the required resources are forests. The wood production sector is therefore highly dependent on forests and their production capacity. The gradual depletion of virgin forests from which wood can be 'mined', combined with the dependence of the wood production sector on forests, has increased awareness about sustainable production methods. A diversity of tree species is essential to provide a variety of different forest products for different end-uses – from timber to paper and fuel. Sustainable production methods keep the harvest intensity within the forest regrowth potential. Sustainably managed forest ecosystems also provide services for agriculture and water management and other sectors.

While the direct impact of the wood production sector on deforestation and the conversion of natural forests is relatively limited, compared to agriculture, the sector's major direct impacts on forest biodiversity degradation arise from the selective extraction of trees, wood fuel collection, and from establishing wood plantations. On the other hand, the sector has a very significant but indirect impact on land use change as a precursor to other human activities in previously inaccessible areas, leading to the eventual conversion of forests to cropland and pastures, leading to biodiversity loss. $CO_2$ emissions from deforestation and forest degradation (and energy use during harvest and processing) also contribute to biodiversity loss, as well as the use of pesticides, water pollution and the fragmentation of forests by infrastructure.

Options to reduce biodiversity loss while maintaining wood production are: to concentrate production in high-yield plantations established preferably in degraded and low-biodiversity areas while managing high conservation values, to implement sustainable forest management in natural and semi-natural forests, and to increase processing efficiency (by re-using and recycling wood products). High biodiversity values are contained in forests (globally more than half of all terrestrial species) and both primary and well-managed forests are important for conserving this biodiversity. Therefore, any option that reduces incentives to convert forests rather than manage them for timber and other products and services is beneficial for biodiversity conservation. Which option has the most potential is different per region, and depends on the present biodiversity status, the applied production methods, and the availability of land and finances for plantation establishment.

Globally, numerous initiatives have been taken up by different actors to reduce the impact of the sector on biodiversity. Examples of these are the growing uptake of certification schemes for sustainable production standards like FSC, Rain Forest Alliance and PEFC by primary producers, governments combating illegal logging and trade through the establishment of policies such as the EU Forest Law Enforcement, Governance and Trade (FLEGT) action plan, the US Lacey Act, Australia's Illegal Logging Prohibition Act, and NGOs stimulating the demand for certified and legal wood products, such as WWF's Global Forest Trade Network. More attention is also required for the supply of wood fuel, especially where it is collected and harvested informally, supplying local populations with energy sources.

## Water management and biodiversity

Many production sectors depend on good quality water (e.g. for drinking water), as well as an adequate water supply (agriculture, industry) and regulation (hydropower generation, flood protection, navigation). The increasing demands of most sectors challenge the water

management sector in many parts of the world as it is increasingly difficult to meet all water quantity and quality requirements simultaneously. In addition, climate change is expected to further aggravate most of these water quantity and quality issues.

In water management, biodiversity and well-functioning ecosystems are essential for the provision of clean water. Natural elements and upstream forests in catchment areas and natural river, lake and wetland systems regulate and purify water flows, allow adequate water provision for the different users and decrease the vulnerability to climate change. On the other hand, the water management sector has major impacts on freshwater biodiversity through the loss of aquatic habitats caused by conversions and water works, flow modification and loss of connectivity, as well as pollution.

In many cases, water management goals can be achieved by naturally functioning ecosystems and nature-based solutions, thereby creating synergy with biodiversity protection. For this reason, ecosystem-based Integrated Water Resources Management (IWRM), including the regulation of water demand and pollution, is the preferred approach if biodiversity goals are to be achieved. Biodiversity-friendly and nature-based solutions are possible in the fields of land-use management (such as forest and wetland conservation and sustainable agricultural practices in source areas of drinking water, resulting in a reduced outflow of nutrients), the improved treatment, recycling and reuse of wastewater, integrated river basin management and flood protection (preservation of wetlands for water retention and filtration, balance of various demands, restoration of fish migration, floodplain extension as natural flood protection), lake management (restoration of connectivity between lakes and wetlands, natural shorelines), stream restoration (re-meandering, creation of riparian zones), reduced water demand in agriculture, cities and industry, and hydropower generation (adapted design, sustainable dam management).

The water sector has already taken steps in the direction of reducing its impact on biodiversity. Examples are the implementation of PES (Payments for Ecosystem Services) to protect upstream watersheds and the adoption of water allocation policies for water-scarce areas by governments, usually as part of IWRM.

### Fisheries, aquaculture and biodiversity

The fisheries sector faces the challenge of an increasing global demand for seafood, which is projected to grow from around 150 million tons in 2010 to over 210 million tons in 2050. Oceans, and the biodiversity they support, provide important goods and services for humans. Marine fisheries and aquaculture provide important provisioning services, namely seafood, that support the food security and welfare of millions of people worldwide, while fish populations provide regulating services through their role in regulating food web dynamics and nutrient balances. Fishing can also be considered a cultural service, as it plays an integral role in coastal cultures and traditions.

Fishing directly impacts biodiversity through the removal of fish and damage or modification to marine habitats, which in some cases has driven populations to such low levels that it has resulted in the local extinction of marine species. Aquaculture production, on the other hand, has an impact on biodiversity through its use of and impact on forage fish species, the introduction of invasive alien species, pollution and land use.

There are various options for the fisheries sector to reduce its impact on biodiversity. These include the implementation of ecosystem-based fisheries management (EBFM), eliminating or diverting subsidies that contribute to overcapacity and overfishing, reducing Illegal Unregulated and Unreported (IUU) fishing, gear restrictions, creating marine protected areas,

the use of economic incentives, co-management arrangements involving fishers and governments and/or NGOs, and sustainability certification and labelling. Options for aquaculture are the implementation of mitigating measures with regard to environmental impacts at the farm level, the development of monitoring and assessment programmes, the implementation of Integrated Multi-Trophic Aquaculture (IMTA) and voluntary certification.

There are currently a number of ongoing initiatives in the fisheries and aquaculture sectors that aim to reduce the impact of the sector on biodiversity. These vary from the implementation of certification schemes by primary producers to the adoption of EBFM through policies such as the EU Common Fisheries Policy, and the establishment of multi-lateral fisheries management conventions by governments, such as the UN Law of the Sea Convention. Paired with the increase in demand for fish and fish produce is also an expansion in incentives to producers to produce in a more sustainable and low-impact way. These incentives come from the market, with an increased demand for sustainably-produced seafood carrying a food safety and sustainability label. They also come from society at large, which demands that the producers obtain a societal 'license to produce'. It is also increasingly embedded in the marine management systems that pair ecosystem and biodiversity concerns with management measures and a governance system that allows producers to actively take part in the management of the resource.

### Pathways towards halting biodiversity loss and realising 2050 Vision

To contribute to the realisation of the Biodiversity 2050 Vision of the Strategic Plan and the Aichi 2020 Biodiversity Targets, a broad set of options is available in sectors (see Table MF 1). A number of those options are already being taken up around the globe, as is indicated above and will be shown in more detail in the sectoral chapters. Current efforts are however not sufficient to realise the 2050 Vision and available options need to be adopted much more widely.

To identify the potential and required efforts for realising the Biodiversity 2050 Vision, three different pathways (combinations of bio-physical and behavioural options) to step-up and scale-up sector efforts towards biodiversity-friendly production methods were analysed. This was done by applying a model-based back-casting approach (see Chapter 2 and Annex 1 for details).

The suggested pathways emphasize different solutions and strategies, either 'global technology', 'decentralised solutions' or 'consumption change'. The Global Technology pathway elaborates large-scale technologically-optimal solutions, such as intensified production on relatively smaller areas, a reliance on market-based approaches and assumes a high level of international coordination. The Decentralised Solutions pathway focuses on regional solutions such as more sustainable and biodiversity friendly use of land over more extended areas and agriculture that is interwoven with natural corridors. The Consumption Change pathway prioritises changes in human consumption patterns, most notably by limiting meat intake per capita, by ambitious efforts to reduce waste in the food production and consumption chain and by increased recycling and re-use of wood and paper. These pathways should not be interpreted as blueprints. Rather they are used here to identify potentials of different technical and behavioural options, trade-offs and synergies to halt biodiversity loss, using a model-based analysis. The analysis only focusses the on food and wood production.

The analysis is designed to show what is needed to achieve a halt to global terrestrial biodiversity loss by 2050, while at least halving the rate of loss of all natural habitats by 2020 (Aichi Target 5) and expanding protected areas to 17% of the terrestrial area (Aichi Target 11). At the same time, these pathways realise a much broader set of sustainability objectives

including eradication of poverty, feeding the world, supplying clean water and energy and limiting the global temperature increase to two degrees Celsius in 2100. These pathways result in preventing more than half of the loss of biodiversity that is projected to take place in the coming 35 years, i.e. a MSA of 64% by 2050. The pathways towards 2050 are depicted in Figure MF 2, while the reductions in loss of nature areas and protected areas in the pathways are presented in Figure MF 3.

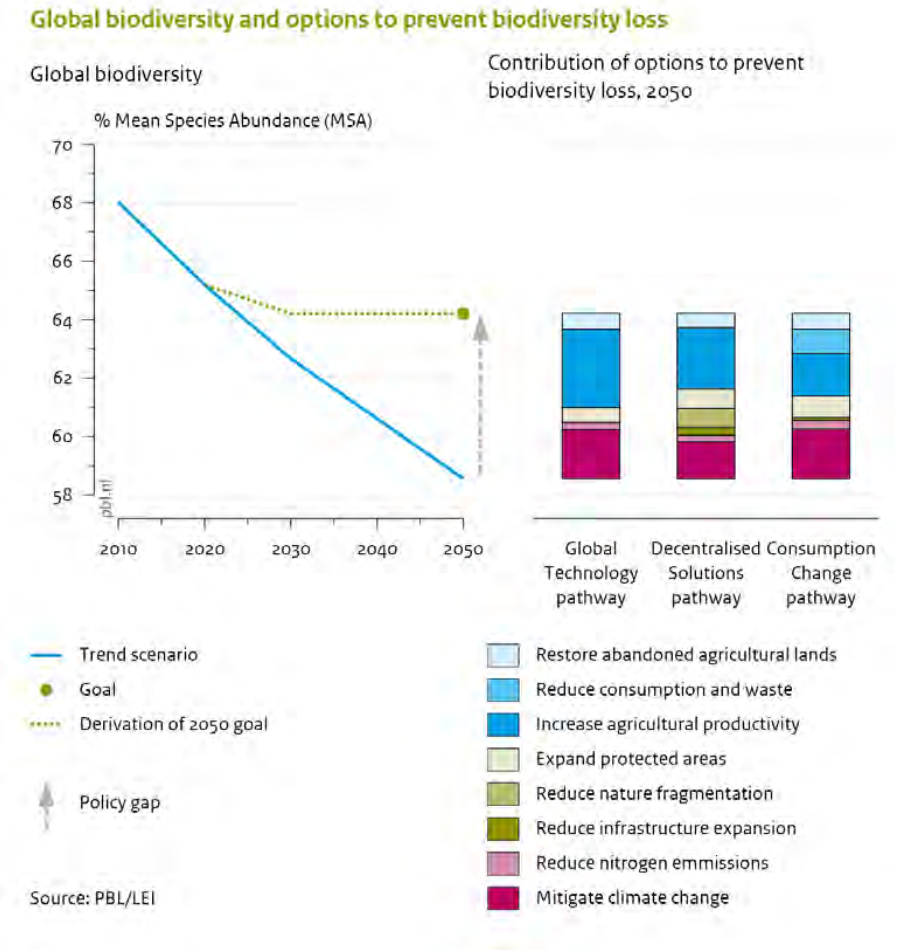


**Figure MF 2.** Options to prevent global terrestrial biodiversity loss in three pathways (Updated from PBL, 2012 for this report).

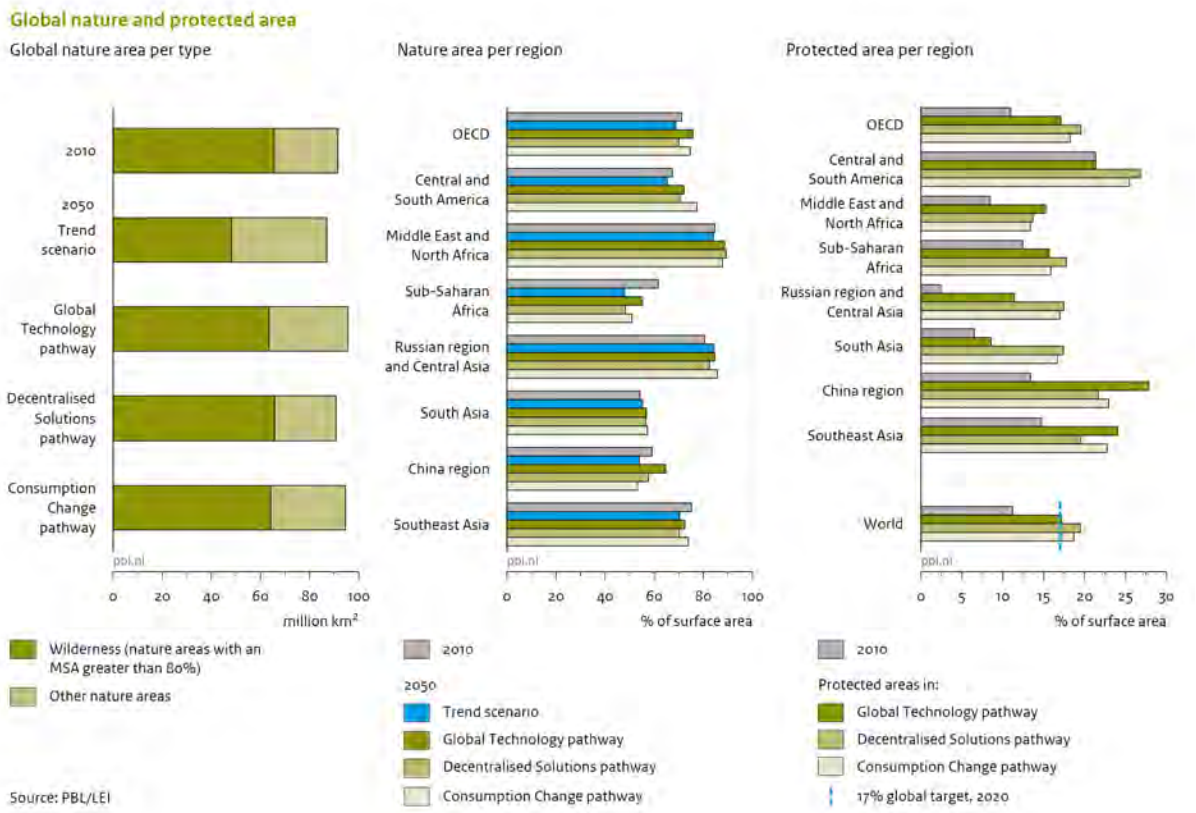


**Figure MF 3.** Global nature area and protected areas under Trend scenario and pathways. The pathways will considerably reduce the loss of nature areas, and of wilderness in particular. The different allocations of protected areas in the pathways causes differences in the efforts that would have to be undertaken in regions to achieve the Aichi Target on the expansion of protected areas to 17% of terrestrial and inland biomes in ecologically-representative systems (Updated from PBL, 2012 for this report).

## Pathway analysis for food and wood production

For *agriculture,* the scenario analyses show sufficient potential to contribute to halting further biodiversity loss in 2050 in all three pathways (see Figure MF4, left panel). However, substantial efforts will be needed to fulfil the conditions underlying these pathways. In the developed regions of the world, where population growth is limited, the options within the food production sector is by far the most important to reduce biodiversity loss in all three pathways both on the land and in freshwater systems. In these regions, agricultural productivity is already high, and realising the necessary improvement under the *Global Technology* pathway of annual yield increases of the same magnitude as reached in the past 20 years (1.3%) will be challenging, especially if compared to the FAO projection of an annual 0.67% increase for the 2006–2050 period. The opportunities for developing countries to reach the productivity assumptions in the pathways are much better, but innovative solutions will be needed to reach this productivity growth if there are to be no negative effects on biodiversity and the environment (this is referred to as sustainable intensification). In *Decentralised Solutions*, productivity increase will come from ecological solutions. In the currently intensively-managed landscapes of the United States and Europe, remnants of biodiversity are relatively scarce, putting ecological solutions at risk. This pathway therefore requires a profound change in these intensive farming systems, so that time and investments will be needed to improve degraded ecosystem services (this is referred to as ecologisation). In Figure MF 5 trajectories of agricultural intensification and ecologisation are depicted.

Moreover, the current globalized system challenges the resilience of agro-ecosystems by spreading invasive pests and diseases. Evidence for compatibility between an agricultural production goal and reduced pest problems by conservation of biological enemy density is still scarce. Improved knowledge is needed for the design of new agricultural systems that combine ecological resilience with efficient technologies. This is important because most of the currently-known ecological solutions are labour-intensive, which people increasingly want to avoid. Diminishing the impacts on biodiversity by changing consumption is especially promising in the affluent world. Consumption towards a reduced intake of animal products is not only helpful for biodiversity protection, by the reduced demand for land, but will also contribute to human health.


**Figure MF 4.** Improvement in biodiversity in the pathways for the sectors food (left panel) and wood production (right panel) in comparison to trend (in MSA percent points).

For *wood production*, global wood demand will be lower in all pathways compared with the Trend scenario due to a lower demand for wood fuel, substitution from other sources, increased re-use and recycling and the use of residual wood for generating bio-energy. Wood is produced more efficiently in all pathways using highly-productive wood plantations, that reduce the land use. Further degradation in semi-natural forests, where wood is harvested by selective logging is reduced by applying less damaging harvesting techniques, usually referred to as reduced impact logging. In itself, these solutions offer a large potential to reduce biodiversity loss. Nevertheless, the potential result of these options in the Pathways are blurred by interactions with other sectors An important difference between scenarios is the area of land deforested for agricultural use. As agricultural expansion comes to a halt in Global Technology and Consumption Change pathways (and not in Decentralised Solutions),

deforestation does no longer provide a source of wood products. A larger area for permanent forestry is therefore required to satisfy global wood demand in these pathways. More sustainable wood production in semi-natural forests may lead to lower yields and will required a larger area. As a result, the forest area under management for wood production in the Global Technology pathway will be 30% higher compared with the Trend scenario by 2050. In the Decentralised Solutions pathway, deforestation still occurs as increases in agricultural productivity are lower than in the other pathways. This interaction puts more emphasis on balancing the remaining forest land to different uses, either plantation establishment, biodiversity protection, and sustainable forestry, and combinations.

In two of the three pathways, however, a net loss of biodiversity is still projected as a result of these interacting effects (see Figure MF 4, right panel). The effects of changes that are due to shifts in the relative shares of the different forest management systems (each with their specific biodiversity value) are comparatively small, and do not present a major influence on the mean global biodiversity value of production forests.

Establishing plantations leads to additional loss of forest biodiversity in all pathways, as these low biodiversity value systems usually replace areas with higher biodiversity values. If plantations can be established on degraded or abandoned agricultural lands and if high conservation value forest remnants within plantation landscapes are set aside and managed for biodiversity, part of this loss can be mitigated.

These scenario analyses show that there are crucial interactions between the agriculture and forestry sectors that must be taken into account when designing robust and integrated sustainable future pathways that meet the biodiversity targets in different ways. There are also effects of reduced climate change. Part of the positive biodiversity effects of global greenhouse gas mitigation can be attributed to the wood production sector, through carbon sequestration in forest and by reducing the use of wood fuels. This positive effect on biodiversity loss concerns all the worldwide affected biomes (grasslands and shrubs), and not only the forested ones that are in use for wood production.

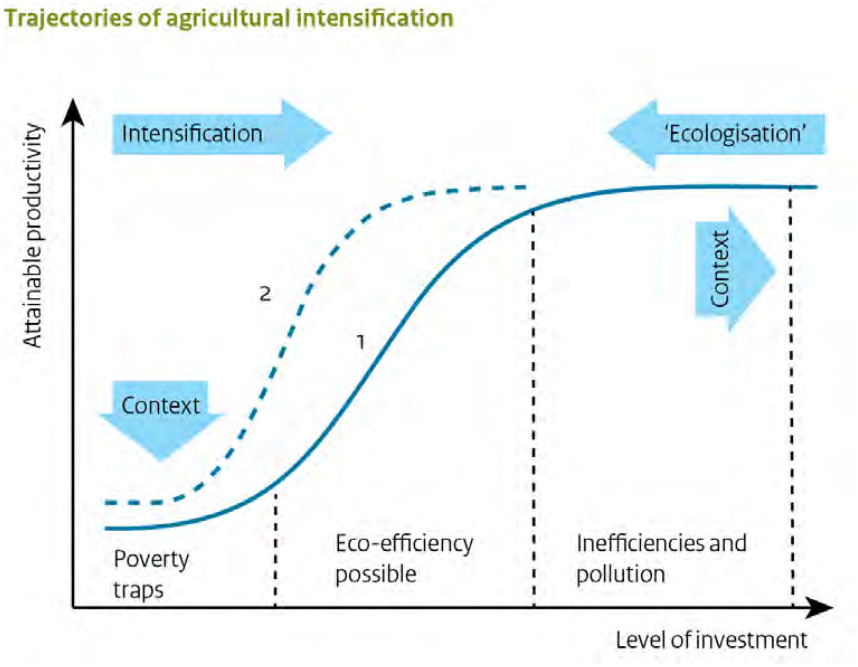


**Figure MF 5.** Attainable agricultural productivity per hectare of land or person as a function of the level of resource investment (capital, labour) (after Tittonell, 2013). Investments in

research would allow a move from trajectory 1 to trajectory 2. The demographic and socio-political context in low-income countries makes it difficult for smallholders to escape from the poverty trap. In high income countries, farmers continue to invest in inputs in order to reduce production costs, pushing them further in the direction of inefficiency and pollution.

### Need for cross-sectoral approaches

As there are clear linkages between the sectors presented here, this also implies that the long-term solutions need to be looked at in coherence to consciously deal with trade-offs and to capture possible synergies. Agriculture is an important factor contributing to biodiversity loss in forests, water bodies (e.g. through outflow of nutrients and high water demands) and coastal ecosystems. As explained above halting deforestation is associated with a reduced supply of unsustainable wood that must be compensated elsewhere. Projected climate change will have major impacts on biodiversity in the coming decades, showing the importance of effective climate policies for the protection of biodiversity. Mitigating climate change through the increased use of bio-energy or hydropower may result in an expansion in agricultural lands and larger numbers of hydropower dams, further fragmenting rivers. Both have negative impacts on biodiversity. The use of bio-energy is therefore relatively limited in the pathways, as they are designed to meet both climate change and biodiversity objectives. While not covered in the model analysis, international trade and the scale of supply chains will expand, implying transportation of goods over longer distances, contributing to accelerated invasion of alien species, pests and pathogens over larger scales. In transport and trade activities in all sectors, the application of appropriate measures to prevent the spread of invasive alien species, pests and diseases is therefore necessary.

### Priority actions per sector

Based on the scenario analysis, and taking the barriers and levers for change to mainstream biodiversity into account, priority actions per sector for the four sectors covered in this report are suggested in Table MF 3. These options will contribute to biodiversity conservation and a more sustainable use of natural resources and are identified with keeping long-term sustainability objectives in mind. Strategies for implementation and necessary government policies are addressed later in this chapter.

### Actors who hold key positions in supply chains have influence to realise major changes

Various actors in different parts of the supply chain (such as processors, traders, retailers, investors and banks) are in key positions to create demand for more sustainably-produced, biodiversity-friendly consumption goods (where supply chains become narrow, see Figure MF 6). A relatively small number of actors provide a lever for change and may be able to realise major changes throughout the supply chain. In several sub-sectors, a concentration of actors offers levers for mainstreaming. It is more difficult to reach parts of sectors with a high level of actor fragmentation, including more informal and subsistence activities (as is the case in wood for local and domestic consumption). Decisions taken by primary producers are influenced by key actors throughout supply chains, including consumers and other end-users. Building partnerships between public and private actors to explore the potential for mainstreaming biodiversity much improves the perspective on levers of change. Within food supply chains, retailers, restaurants and catering businesses could play a major role in this shift towards more biodiversity-friendly agriculture.

**Table MF 3.** Priority actions for sectors to contribute to biodiversity protection and more sustainable use of natural resources.

| Sector | Priority actions |
|---|---|
| **Food production** | Sustainable intensification of agriculture in regions with low crop yields (higher crop yields, higher feed efficiency for livestock):<br>- develop appropriate knowledge and techniques;<br>- create clear and fair market conditions;<br>- seed companies should diversify their breeding programmes;<br>- adopt sustainability initiatives (certification schemes, PES, etc.);<br>- design innovative financial arrangements directed towards the 'missing middle'.<br><br>'Ecologise' intensively-farmed areas:<br>- reduce emissions from farmed land and livestock, such as nutrient losses, greenhouse gas emissions and pesticides;<br>- preserve agro-biodiversity;<br>- reduce water use;<br>- system change from monoculture towards alternative cropping rotations or cropping systems;<br>- implement innovative techniques and precision farming;<br>- align agricultural and biodiversity policies;<br>- apply taxes and remove harmful subsidies;<br>- implement and enforce existing regulations and stimulate transparency and good practices.<br><br>Reduce food waste and change diets:<br>- reduce portion size, improve packaging;<br>- influencing consumer choice by retailers(choice editing);<br>- reformulate products and develop alternatives to meat;<br>- promote dietary shifts;<br>- raise awareness;<br>- public procurement;<br>- promote healthy and sustainable diets in education. |
| **Wood production** | Implement sustainable forest management:<br>- stimulate certification of sustainably forest management, especially in the tropics;<br>- avoid wood production activities in primary and old growth forests;<br>- limit and, if needed, carefully plan and manage expansion of road networks into previously inaccessible forest areas.<br><br>Strengthen business case for responsible wood production:<br>- create local, national and international demand for sustainable wood products;<br>- halt illegal logging;<br>- increase value of standing forest to forest managers by creating markets for environmental services provided by forests.<br><br>Sustainable expansion and intensification of plantations:<br>- steer plantation establishment towards degraded and abandoned lands;<br>- manage High Conservation Values as part of larger-scale plantation landscapes.<br><br>Reduce impact of processing industries:<br>- Reduce wood resource use<br>- improve re-use and recycling efficiency;<br>- responsible siting of high impact industries like paper and pulp factories. |

| | |
|---|---|
| | Include informal and small-scale producers:<br>- provide positive regulatory and fiscal incentives that improve practices of informal and small-scale producers, especially access to resources;<br>- Provide alternatives for wood based energy sources<br>- Expand the working of Voluntary Partnership Agreements by including and integrating domestic markets;<br>- integrate trees for local use of timber and wood fuel into agricultural systems. |
| **Water management** | Strengthen and expand the potential for ecological approaches in IWRM, including environmental flows.<br><br>Improve water management in cities and villages:<br>- protect biodiversity-rich watersheds and wetlands upstream;<br>- improve treatment and recycling of urban and industrial wastewater, reduce pollution.<br><br>Reduce impact of agriculture:<br>- reduce water use in agriculture;<br>- reduce pollution from agriculture;<br>- shift away from animal production, which requires a lot of water.<br><br>Make hydropower more sustainable:<br>- implement sustainable dam management;<br>- implement initiatives such as Payments for Ecosystem Services;<br>- implement hi-tech infrastructure and regulatory installations at large dams.<br><br>Improve flood protection:<br>- restore natural streams;<br>- use green infrastructure;<br>- implement ecologically-based water management solutions. |
| **Fisheries and aquaculture** | Fisheries:<br>- develop and implement modified or alternative fishing gear;<br>- reduce by-catch;<br>- establish communication systems to report observations of by-catch hotspots;<br>- eliminate destructive fishing gear;<br>- establish Marine Protected Areas;<br>- establish management systems based on 'credit system', which could incentivise fishing operations with lowest biodiversity loss;<br>- promote adoption of certification schemes;<br>- provide incentives for fishing communities to engage in fisheries and marine conservation;<br>- improve regional cooperation in fisheries management;<br>- eliminate Illegal Unregulated and Unreported (IUU) fishing;<br>- make international standards, such as the FAO Code of Conduct for Responsible Fisheries, mandatory.<br><br>Aquaculture:<br>- reduce pressures on wild fisheries;<br>- produce and consume low food chain products such as molluscs, seaweed and omnivorous/herbivorous fish preferentially over species that use more fish meal/oil in their production;<br>- move away from use of wild juveniles in cases where wild populations are impacted;<br>- reduce dependence on alien species;<br>- particularly for shellfish culture, shellfish restoration could be beneficial for both biodiversity and aquaculture. |

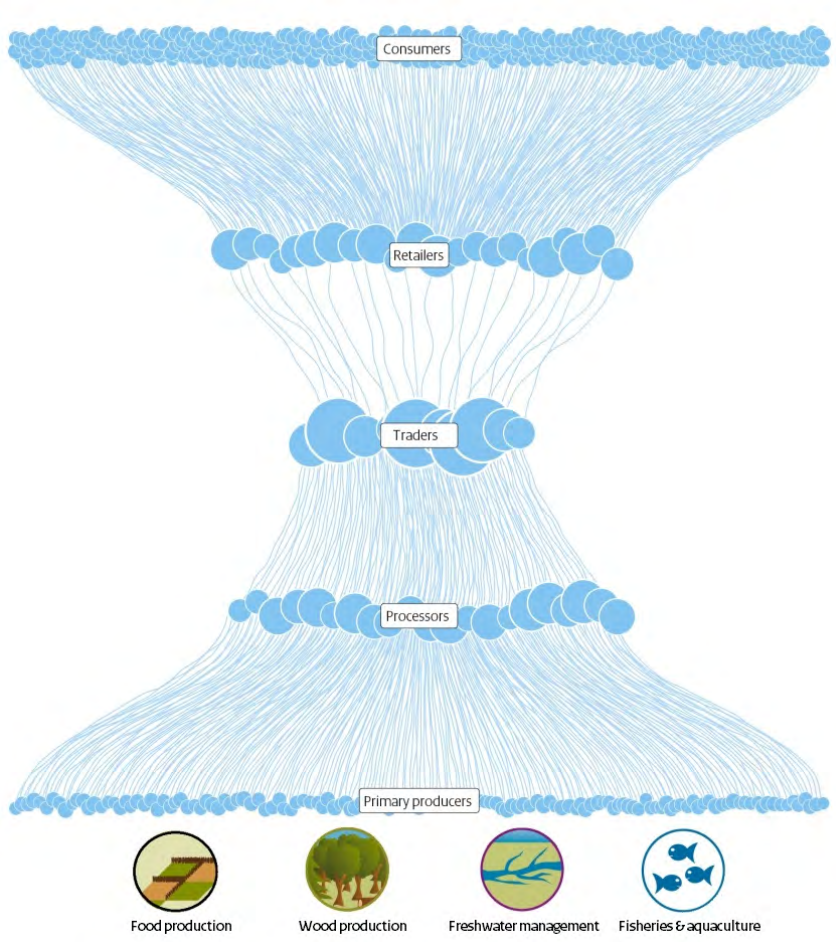


**Figure MF 6.** Supply chain perspective on sectors.

### Strategies to step-up, scale-up and speed-up efforts to mainstream biodiversity

If biodiversity considerations are to be sufficiently embedded into sectoral policies, strategies and practices, an intensified collective effort is needed by governments, the private sector and civil society. Table MF 3 summarises the priority actions suggested in this report, which provide a rich portfolio of possible actions to take. Their relative relevance will depend on local circumstances. To be able to effectively and efficiently implement relevant actions, an integrated perspective can be helpful to effectively step-up (improve, scale-up and speed-up) efforts to mainstream biodiversity and help move sectors in a more biodiversity-friendly direction. Four building blocks for such an integrated perspective are suggested below; the specific role of governments in them is summarised in Table MF 4.

*1) Apply integrated land, water and seascape development approaches*. Integrated planning approaches can help balance sustainable production within sectors with the interests of smallholders and other stakeholders, and are better able to deal with cross-sectoral issues and anchor conservation efforts in the area. The land-sparing (intensification, mono-functional land use) versus land-sharing (multi-functional land use) debate can be taken up in land-use planning, illustrated in the Global Technology and Decentralized Solutions pathways. Figure MF 7 shows the effects of mono-functional and multi-functional landscapes on biodiversity and the regional differentiation of these pathways, and hence the need to find regionally optimal solutions, in which only in the green areas in Figure MF7 a choice between sharing and sparing strategies is possible to realise positive biodiversity effects. This can be made explicit in integrated landscape approaches, but requires improved spatial planning (land-use planning,

land tenure, integrated water resource management, integration of local actors in decision-making) within countries. Creating level playing fields for all stakeholders – ranging from multinational corporations to indigenous populations – in a landscape remains an important role for governments. To increase the effectiveness of programmes like PES and REDD on a landscape level, the bundling of these financial incentives should be considered. The landscape level seems to be the most appropriate level for tackling the drivers of continuing degradation of natural resources and setting up viable long-term restoration projects in public-private partnerships.

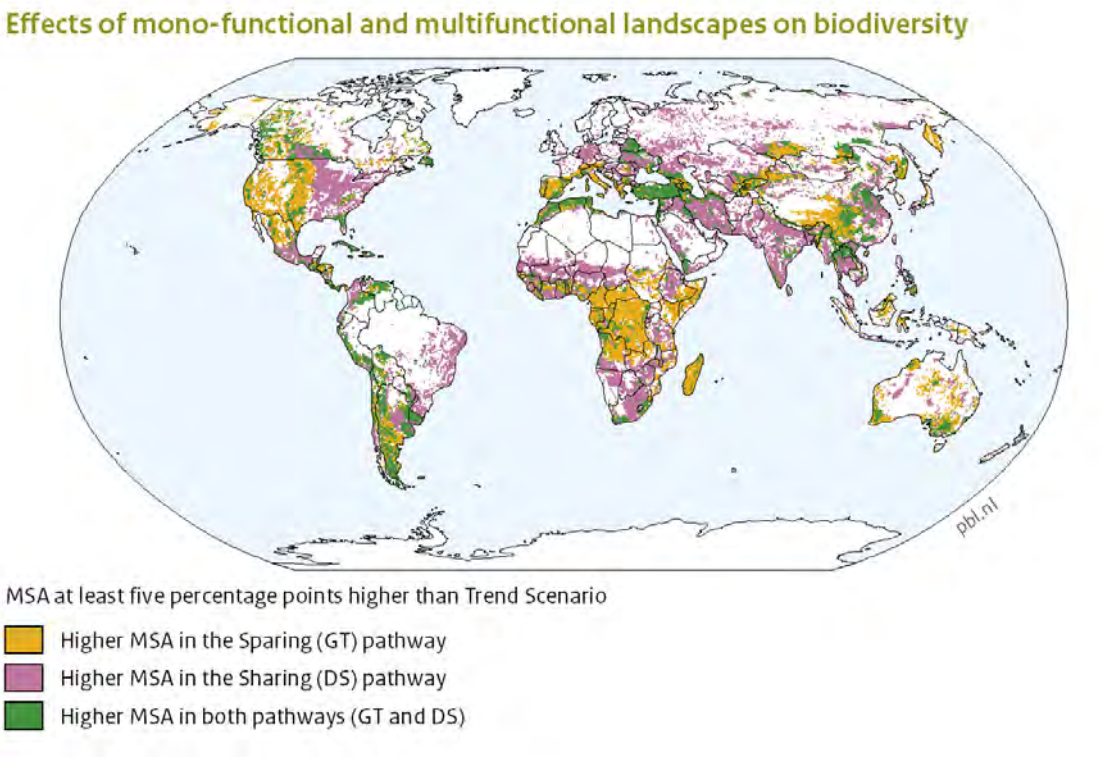


**Figure MF 7.** Effects of mono-functional and multifunctional landscapes on biodiversity, represented as Mean Species Abundance (MSA) of the original species.

*2) Better integration of biodiversity in voluntary sustainability initiatives along supply chains to* benefit from their increasing momentum worldwide. These initiatives include standards and certification, corporate social responsibility, and public and private procurement policies to support primary producers to move in a more sustainable direction. An important issue for biodiversity policy is if and how the biodiversity benefits of these initiatives could be improved. As most (visible) progress is taking place in the certification of supply chains, possible improvements are suggested in Figure MF 8. This is done using the 'I-O-O-I evaluation framework', which connects stepwise the biodiversity criteria of certification schemes (input), through selling/buying certified products (output) and changed behaviour by farmers (outcome), to the actual long-term impacts on biodiversity (impact). To scale-up, it will be necessary to increase the number of supply chains that apply biodiversity criteria, the market shares of certified products and the production areas certified in all world regions.

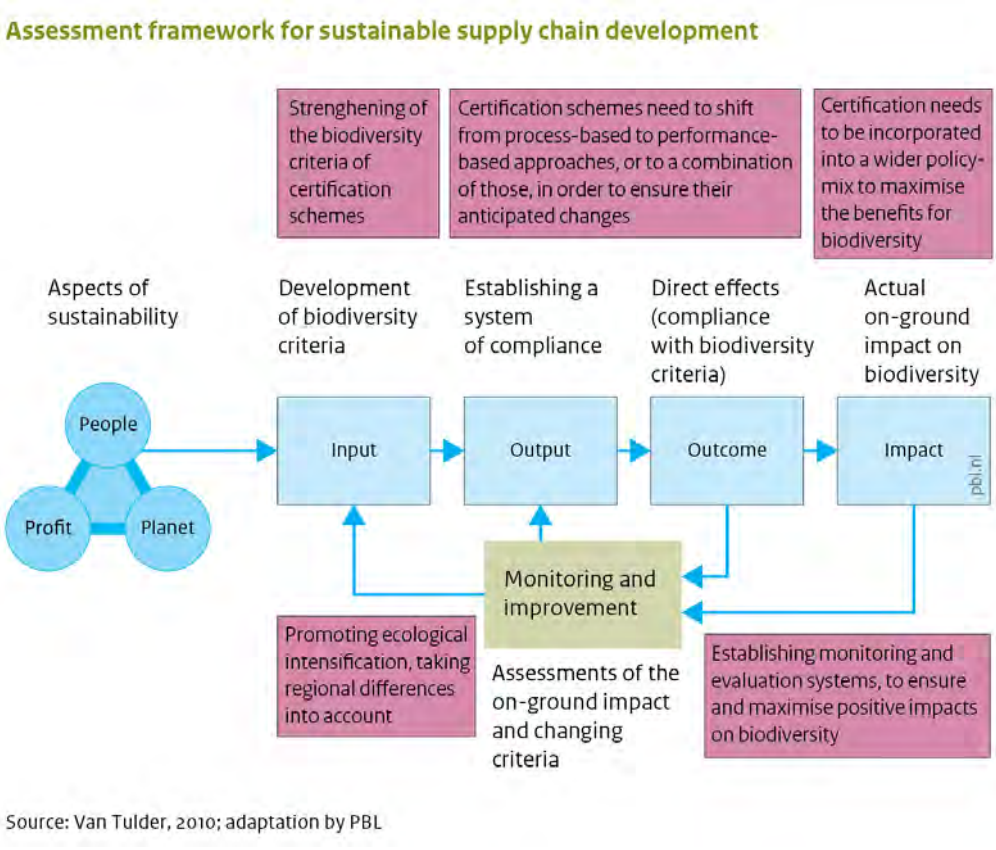


**Figure MF 8.** Entry points for maximising the positive impact of certification schemes (general framework based on van Tulder (2010; adapted by PBL, 2014). These recommendations are also helpful to identify entry points for improvements in other types of voluntary initiatives.

*3) Further develop a consumption perspective on biodiversity* by raising awareness of the potential of biodiversity for food security and healthy, sustainable diets, as well as of detrimental effects of consumption patterns on natural resources and biodiversity. Through reducing food losses and waste and shifting diets towards a moderate level of meat consumption, impacts of the food system on biodiversity can be significantly reduced. Consumer demand for certified products also needs to play a role here. The focus should not only be on consumers, but on all actors in the food system that influence food choices, such as the media, retailers, catering training institutions, hotels and restaurants, public procurement, and on showing how production conditions and consumer choices are linked.

*4) Shift current and future investment flows into key sectors towards more biodiversity-friendly alternatives.* Annual investment flows into biodiversity-related sectors are large relative to dedicated biodiversity financing. Much of the financing of these sectors is of public or private domestic origin, with a smaller part from foreign direct investment and development assistance. These flows will increase in the future, especially in developing countries. Biodiversity needs to be mainstreamed into these public and private, foreign and domestic investment flows. Governments can move indirectly by increasing the information base through national-level natural capital accounting and company-level non-financial reporting. Governments can also move directly by using financial mechanisms that tip the balance of decision-makers in companies and local governments towards greener investment choices. The integrated nature of such solutions makes the government capacity to monitor and evaluate these policies crucial.

**Table MF 4.** Government policies for four strategies.

| Landscape | Supply chain | Consumption | Finance |
|---|---|---|---|
| Improve spatial planning to include all stakeholders.<br><br>Create institutional capacity and co-management schemes.<br><br>Ensure land tenure for smallholders and local communities.<br><br>Combine different incentive schemes for ecosystem services.<br><br>Monitor impacts.<br><br>Integrate farm-level initiatives with further upscaling. | Capacity-building.<br><br>Prioritise national/international supply chains, commodities and regions where largest impacts are and where actions are required.<br><br>Create (local) markets for sustainable produce, including the use of public procurement.<br><br>Stimulate certification and labelling<br><br>Focus on laggards.<br><br>Improve extension services.<br><br>Monitor impacts. | Raise awareness through information and education campaigns.<br><br>Health policies.<br><br>Public procurement.<br><br>Develop instruments to push back food waste. | Increase non-financial reporting on biodiversity by companies.<br><br>Engage with financial sector initiatives.<br><br>Redirect investment flows in biodiversity-related sectors.<br><br>Assess and use the relative strengths of domestic and foreign public and private investment flows. |

## Government policies at the international level

The strategies identified above require the joint effort of private and public actors, but governments will have to provide an enabling and regulatory environment through adequate public policies to get these strategies realised. Specific domestic policies in relation to the four strategies are summarised in Table MF 4. In addition, governments can act in the international arena to further develop a sectoral mainstreaming agenda:

- help realise shared visions and a sense of urgency for biodiversity-inclusive solutions to make biodiversity-friendly production a part of the 'new normalcy' of sustainable production and consumption in all relevant sectors;
- ensure coherent global norms to monitor and preserve the global public good aspects of biodiversity. This can be done through related Multilateral Environmental Agreements and the proposed Sustainable Development Goals and ensuring that biodiversity is taken into account in with other policy domains like trade, finance, development cooperation and climate adaptation and mitigation;
- further develop partnerships with business and include biodiversity in already existing UN partnerships with business such as the Global Compact, the Global Reporting Initiative and the UN Forum on Sustainability Standards;
- support programmes for the uptake of Natural Capital Accounting systems in national governments (like the System of Environmental-Economic Accounts adopted by the UN Statistics Commission and the World Bank's WAVES partnership) and in the business world;
- support the inclusion of biodiversity in the further development of private norms, reporting and review mechanisms (e.g. ISEAL or ISO for certification).

The CBD can play a leading role in mainstreaming biodiversity at the international level:

- mainstreaming the spirit and substance of the Aichi targets into public and private governance of sectors;
- ensuring the inclusion of biodiversity concerns in newly-emerging public and private partnerships on sustainability;
- working with sectoral bodies and other conventions to include biodiversity goals and actions in their activities;
- creating ownership and leadership amongst key players in public and private governance for biodiversity. Natural Capital Accounting in Central Statistics Offices and companies could play an important role in this.

## To conclude…

The successful mainstreaming of biodiversity in production sectors will inherently become a diverse, dispersed and long-term process, requiring new engagements between the biodiversity community and production sectors, finding new ways to bring nature and economy together. As the practicalities of a shift towards more biodiversity-friendly production are not yet well-understood in sectors, much more experimentation, showcasing and sharing of experiences between diverse sector contexts around the world is required. Furthermore, the mainstreaming of biodiversity into sectors needs to be seen as part of a broad policy agenda of biodiversity conservation and the promotion of the sustainable use of biodiversity and natural resources. Governments need to play an enabling and regulatory role to involve the relevant private and societal actors. The challenge will be to step-up, scale-up and speed-up action and to ensure a balance between public and private benefits.