Chapter 3

Mainstreaming biodiversity in agriculture, forestry and fisheries

This chapter examines biodiversity mainstreaming in the agriculture, forestry and fisheries sectors. It highlights the inter-linkages between biodiversity and each of these sectors and then the types of policy instruments that can be used to mainstream biodiversity considerations within them. Drawing on experiences from the 16 focus countries, various examples illustrate opportunities and remaining challenges.

Mainstreaming biodiversity across sectors is important, as sectors have particular interactions with biodiversity. Synergies and trade-offs regarding sustainable use of biodiversity need to be addressed in the context of these interactions. Moreover, most nationally important sectors have their own planning and policy processes, thus providing an important entry point for biodiversity mainstreaming (CBD, 2011).

Priority sectors for biodiversity mainstreaming are likely to differ across countries, depending on the key drivers of economic development and/or pressure on biodiversity loss. This chapter examines the inter-linkages between biodiversity, and the agriculture, forestry and fisheries sectors. While other sectors are of course also relevant for biodiversity mainstreaming, such as tourism, energy, manufacturing, infrastructure and extractive industries, they are beyond the scope of this analysis.

Mainstreaming biodiversity in agriculture, forestry and fisheries can take place at multiple interacting scales including international, national and subnational levels.[1] As impacts on biodiversity can also be cross-sectoral, co-ordination and policy coherence among sectors is also required. These issues are also recognised in Sustainable Development Goal (SDG) 2 on food security and sustainable agriculture, SDG 14 on life under water (where several targets relate directly or indirectly to the fisheries sector), and SDG 17 on partnerships, which include systemic issues such as policy coherence.

Cross-sectoral policies and measures to mainstream biodiversity across sectors include clear and secure land tenure (including communal land tenure), spatial planning (e.g. land-use and marine spatial planning), environmental impact assessments (EIAs) and strategic environmental assessments (SEAs). Integrated land-use and marine spatial planning are instruments that can help prevent loss of biodiversity-rich lands or marine areas. Many countries (and subnational regions) formulate such land-use spatial plans. Including specific biodiversity criteria in these plans can help ameliorate some of the pressure by reducing land-use conversion of biodiversity-rich areas and minimising impacts of production activities upon them. In South Africa, easily available spatial information on biodiversity priorities has made it possible for policy makers to make decisions that take these into account (Box 3.1). In France, the inclusion of biodiversity criteria in land-use plans remains a challenge, though progress has been made in combining biodiversity and land-use planning within a single ministry (in 2007) and via the creation of the green- and blue-belt networks. Cross-sectoral technical committees to formulate comprehensive land-use plans (e.g. in Ethiopia) and plans based on ecological and economic zoning (e.g. in Peru) are examples of approaches that are being taken to develop national land-use plans.[2]

International organisations also have an important role to play in supporting biodiversity mainstreaming efforts across sectors and to help ensure that messages are relayed across constituencies (beyond biodiversity). The institutional structures of these organisations can also help. For example, at the OECD, several working parties bring together multiple constituencies, such as the Joint Working Party on Agriculture and Environment, the Joint Working Party on Trade and Environment, and the Network on Environment and Development Co-operation. Engaging in horizontal biodiversity work across international organisations is also an important enabler of biodiversity mainstreaming. For example, the OECD convened a workshop in October 2017, "Biodiversity, Climate Change and Agriculture: Towards Coherent Approaches", bringing together the biodiversity, climate and agriculture communities to exchange practical experiences and share lessons. Similarly, the recently established Food and Agricultural Organization (FAO) Platform on Biodiversity Mainstreaming across Agricultural Sectors (i.e. agriculture, forestry and fisheries) can play an important role in supporting implementation on the ground. Inter-organisational efforts

are also key to ensure co-ordinated and consistent messages. One example of this is the *OECD-FAO Guidance for Responsible Agricultural Supply Chains* (OECD-FAO, 2016).

Box 3.1. **Integrating biodiversity into land-use planning in South Africa**

An online mapping system identifying biodiversity priority areas and actions at various spatial scales in South Africa provides a means of integrating biodiversity concerns into social and economic development. The maps are available to various stakeholders including policy makers. This is coupled with a system of targets to conserve a representative sample of ecosystems and species (including ecological processes for long-term survival of these).

At a more granular level, a series of projects in the Western Cape province provide an example of targeted inclusion of biodiversity in land-use plans. The provincial government and municipalities are jointly responsible for land-use planning in South Africa. The National Environmental Management Act (Act 107 of 1998) mandates inclusion of considerations for unique and threatened biodiversity of the region into these plans. The Putting Biodiversity Plans to Work project initiated by the Botanical Society of South Africa is aimed at supporting the municipal and provincial government planning departments in becoming conversant with existing scientific biodiversity plans. The South African National Biodiversity Institute (SANBI) worked with the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) to include biodiversity plans into the mandated provincial Spatial Development Framework. Lessons learned from these projects included that highly scientific plans developed by the academic community are often not easily integrated into municipal planning processes unless there is considerable "translation" into the language used by municipal planners. This was overcome by the provincial DEA&DP working together with SANBI (a SANBI biodiversity planning expert was seconded to the DEA&DP in 2008). The result was integration of biodiversity concerns into the department's own guidelines in order to standardise terminology and enable the department to take ownership of the plans for use and future revisions.

Sources: Manuel et al. (2016), "Key ingredients, challenges and lessons from biodiversity mainstreaming in South Africa: People, products, process", http://dx.doi.org/10.1787/5jlzgj1s4h5h-en; OECD (2013), *OECD Environmental Performance Reviews: South Africa 2013*, https://doi.org/10.1787/9789264180109-en.

3.1. Mainstreaming biodiversity in agriculture

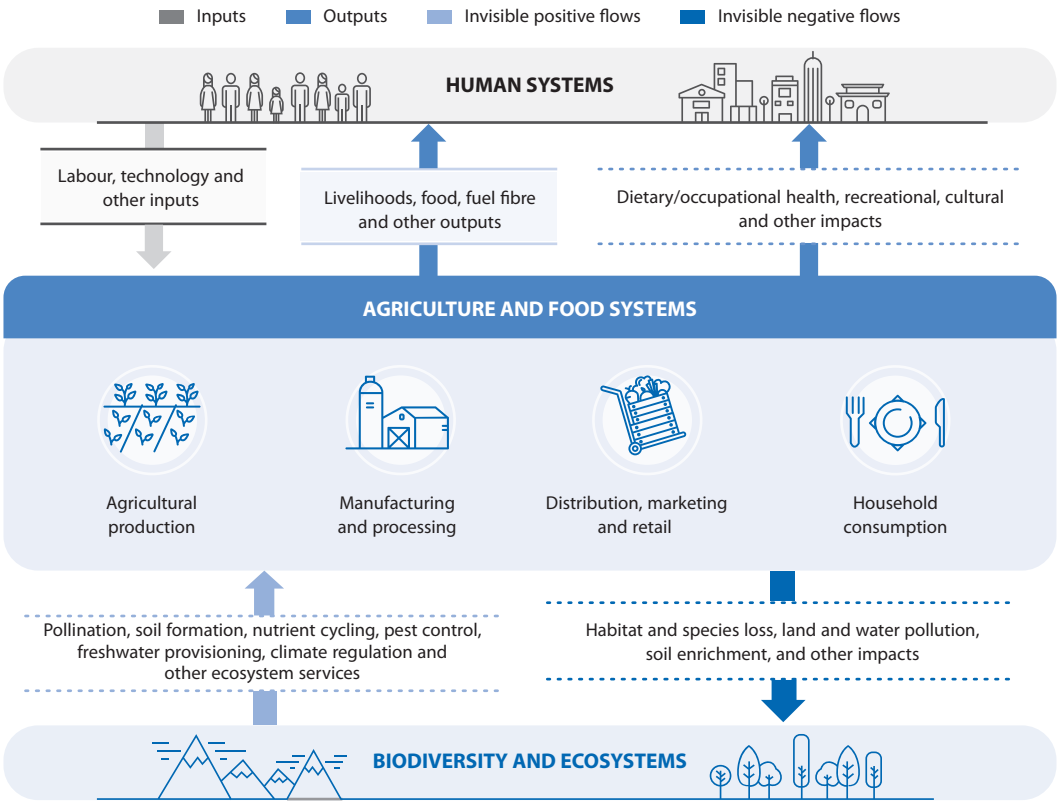
The biodiversity-agriculture nexus and its role in national and global economies

Agriculture is likely to be a priority sector for biodiversity mainstreaming in many countries around the world, as it is often a key pressure on biodiversity (OECD, 2012; IPBES, 2018).[3] Agriculture also provides a range of benefits including carbon storage, rural landscapes and resilience to natural disasters (such as flooding, landslides, fire and snow damage) (OECD, 2015d), as well as pollination and soil functionality. The agricultural sector is also central to economic growth and development in several countries and is key for food security – SDG 2 – especially in developing countries (Dethier and Effenberger, 2012; World Bank, 2008). Globally, over 37% of land area is under agricultural use (World Bank, 2015). The sector provides employment to 2.5 billion people (1 in 3 people in the world's active labour force) (FAO, 2012; WDR, 2008), with agriculture constituting the main source of employment in many developing and emerging economies (e.g. 47.2% in India; 46.7% in Viet Nam; and 31.5% in the People's Republic of China).[4] On average in low-income countries, agriculture employs 65% of the labour force and accounts for 29% of gross domestic product (GDP)[5] (Dethier and Effenberger, 2012). The contribution of

agriculture to total income and employment in OECD countries is relatively low; the share of agriculture in total GDP ranges from 0.3% to 9.2% (OECD, 2013a), and employment ranges from 1.1% to 21% (OECD, 2016f) (see Annex 3.A1). However, the sector continues to have a significant environmental impact given the high levels of input use and large land area under cultivation[6] (OECD, 2016a; OECD, 2013a).

Agricultural production both depends upon and impacts biodiversity (OECD, 2011). Figure 3.1 illustrates the interaction among agricultural production, human systems and biodiversity. Biodiversity provides essential services to agriculture including nutrient cycling, pollination, soil formation, genetic diversity, freshwater provisioning and climate regulation. The global economic value of pollinators to the agricultural sector, for example, has been estimated at between 235 billion United States dollars (USD) and USD 577 billion annually (IPBES, 2016). Similarly, the value of biological pest control and nitrogen mineralisation in 15 global cultivation regions is estimated to exceed USD 34 billion annually (Sandhu et al., 2015). In France, the value of ecosystem services provided by pastures has been estimated at 600 euros (EUR) per hectare per year (about USD 737) for permanent pastures and between EUR 1 100 and EUR 4 600 per hectare per year (about USD 1 353-5 653) for wet pastures (CGDD, 2013). Moreover, agricultural lands can provide habitats for species (e.g. birds, insects and rodents), especially low-intensity agro-systems[7] (OECD, 2008b).

Figure 3.1. **Visible and invisible flows from agriculture**



Source: Adapted from TEEB (2015), *TEEB for Agriculture and Food: An Interim Report*.

Agricultural expansion into natural and semi-natural lands (such as forests and grasslands) and unsustainable practices related to agricultural intensification (such as over-intensive use of agrochemicals, overgrazing and increased crop specialisation) are major causes of degradation worldwide (Maclaughlin and Mineau, 1995; OECD, 2013f). Around 70% of projected terrestrial biodiversity loss and 50% of freshwater biodiversity loss by 2050 are expected to take place due to drivers linked to agriculture (PBL, 2014).[8] The sector is estimated to have been the proximate driver for around 80% of global deforestation (Kissinger, Herold and Sy, 2012).

Certain agricultural practices can lead to degradation of soil and water resources, introduction of invasive species, and fragmentation of natural habitats (TEEB, 2015). Over half of the world's agricultural land (52%) is estimated to be moderately or severely degraded (ELD Initiative, 2015). Moreover, both land-use change and agricultural intensification focused on a few modern breeds are contributing to genetic erosion of crop and livestock varieties and their wild relatives (SCBD, 2016b; Flynn et al., 2009). In China, for example, the number of local rice varieties fell from 46 000 to around 1 000 between the 1950s and 2006, and wild rice varieties disappeared from 60-70% of their earlier spread (SCBD, 2010). The loss of genetic diversity, especially replacement of local, well-adapted crop breeds, increases the vulnerability to pests, diseases and environmental changes, including climate change (Ratnadass et al., 2012; Heal et al., 2004).

The sector also has a strong impact on water resources, accounting for an estimated 70% of global freshwater withdrawal and consumption (FAO, 2014a). Unsustainable agricultural practices are likely to lead to disruption of aquatic systems, siltation of water bodies and pollution of aquatic environments due to chemical fertilisers and pesticides. Around 60% of globally applied nitrogen fertilisers and 50% of phosphorus fertilisers are estimated to be in excess of the required amount (West et al., 2014). Nutrient run-off from fertilisers has led to 405 "dead zones" due to eutrophication around the world, covering 250 000 square kilometres of ocean area (UNDP, 2012). Agriculture also contributes to climate change, accounting for 22% of total greenhouse gas (GHG) emissions (14.5% of total global GHG emissions are from livestock farming) (Smith et al., 2014).

Ecosystem degradation caused by environmentally harmful agricultural practices can in turn have negative impacts on agricultural productivity (OECD, 2013f). For instance, the cost of soil erosion in a watershed of the Ethiopian highlands for 2013 and 2014 was estimated at around 19% of per capita income (Ayele et al., 2015). Similarly, poor soil quality due to overuse of chemical nitrogen fertiliser in China has contributed to declining or stagnant annual growth rates of rice and maize production in most provinces[9] (Fan et al., 2012; Peng, Tang and Zou, 2009). In contrast, practices aimed at improved natural resource management can have a significant positive contribution to agricultural productivity and income. Investment in the construction of soil bunds in Ethiopia, for example, is estimated to have an internal rate of return as high as 17% (Tadesse, Tesfay and Gebreslase, 2016). Sandhu et al. (2015) estimate that if 10% of global arable area is converted to methods of sustainable intensification[10] such as organic agriculture, the total value of biological pest control and nitrogen mineralisation would exceed the combined global cost of current pesticide and fertiliser use.

Mainstreaming in practice: Aligning objectives and strategies and addressing enabling conditions

As indicated in Figure 2.1 (Chapter 2), countries should ideally have a clear understanding of the key pressures on biodiversity at the domestic level, and prioritise their mainstreaming efforts accordingly. If the agricultural sector is indeed a key (current and/or projected)

pressure, then a first entry point is to ensure that objectives to sustainably use biodiversity are mainstreamed into national agricultural strategies, policies and plans. In Uganda, for example, the National Agriculture Policy (2013) includes "sustainable use and management of agricultural resources" as one of the six main objectives. Activities under this objective include promotion of and support for sustainable land management and conservation agriculture. In India, both the National Development Plan (NDP) (2010-17) and the National Policy for Farmers (2007) include aims to protect and improve land, water and biodiversity resources in agriculture, with the objective of promoting sustainable increase in productivity.

As policy coherence is needed across all sectors, these objectives should also be mainstreamed in all other relevant strategies (see e.g. Figure 2.2). The National Mission on Sustainable Agriculture, a component of India's Climate Action Plan (2008), has been integrated into the NDP (2012-2017). Similarly the Growth and Transformation Plan II (2015-20) in Ethiopia, which integrates sectoral plans, aims to promote sustainable farming practices, enhanced conservation of indigenous biodiversity resources, and livelihood development related to natural resources (such as forestry, rehabilitated lands and water resources) in the context of agriculture. The National Climate Change Strategy (2013) in Mexico includes as a line of action the implementation of agricultural policies aimed at rationalised use of fertilisers, producing and applying bio-fertilisers and efficiently using nitrogenates. However, the objective in the NDP (2013-18) related to agriculture is limited to building productivity and competitiveness in the agriculture and fisheries sectors to ensure food security.[11]

To achieve the objectives set out in sector-related plans and policies, it is important that these be reflected in legislation and be backed by clear targets. Nepal's Agricultural Development Strategy (2014), for example, provides targets and indicators for the short, medium and long term (i.e. 5, 10 and 20 years, respectively) for various objectives, including "sustainability of agriculture".[12] The targets are to be achieved through measures such as maintaining forest cover, improved input use and agricultural practices, and land conservation and rehabilitation.[13] In France, the Law on the Future of Agriculture, Food and Forestry[14] provides support measures (information, training, research and funding) to facilitate the transition to sustainable methods of production.[15] The recently adopted Biodiversity Law[16] in France also includes elements relevant to agriculture such as the ban on the use of pesticides containing neonicotinoids, prohibition of patenting of products derived essentially from biological processes, and authorisation of free exchange of vegetable seeds belonging to the public domain between farmers to preserve agricultural biodiversity. Moreover, the Law on the Future for Agriculture, Food and Forestry aims to promote sustainable agriculture through promoting agroecology in France (Box 3.2).

Box 3.2. **Agroecology in France**

Launched in 2012 as part of the Produce Differently (Produisons Autrement) initiative, the aspiration to move towards agroecology has been included in the French Law of the Future for Agriculture, Food and Forestry with the aim of having a majority of the French farmers engaged in agroecology by 2025. The term is not closely defined in the law, though promoting crop diversity and biodiversity are included as guiding principles. In general the aim of agroecology in this context is to meet the combined production, environmental and social challenges of food security, conserving natural resources, responding to climate change issues, and combating poverty and rural exodus. The principles of agroecology include fostering positive biological interactions in the agricultural ecosystem (such as functional biodiversity in the form of hedges and grass strips and appropriate crop rotation to combat pests and infections) and completing

Box 3.2. **Agroecology in France** *(continued)*

bio and geochemical cycles such as water and nitrogen cycles (for example through developing synergies between livestock farming and crops to reduce dependence on chemical fertilisers while managing organic effluents) in order to increase farmers' resilience through increasing sustainability of production and diversifying sources of income. Initiatives under the banner include promotion of measures such as reduction in use of pesticide for crops and antibiotics for livestock, promoting agroforestry and organic farming, and promoting crop rotation and natural methods of crop protection. An action plan developed by a steering committee that brings together various stakeholders emphasises (among other things):

- agricultural training to more effectively include agroecology in teacher training and educational programmes for students
- mobilisation of research and development in order to develop and disseminate agroecological innovations
- involving stakeholders by recognising groups of farmers and other interested stakeholders under the 2014 law by setting up economic and environmental interest groups at the regional and local levels
- review of public support available for agriculture in order to incentivise commitment to agroecology
- development of a self-assessment tool to enable farmers to track and compare results in order to assess their practises.

Sources: MAAF (2016), *The Agroecology Project in France*; MAAF (2013), *Agroecology: Different Definitions, Common Principles*; MAAF (n.d.), "Agroecology In France", http://agriculture.gouv.fr/telecharger/58144?token=84c0ffff0caf34ea89f434e9745865a2.

Institutional arrangements can also help foster biodiversity mainstreaming. Examples include the integration of natural resource management (NRM) into agricultural institutions at various levels. In Ethiopia, for instance, the newly reorganised Ministry of Agriculture and Natural Resources has a specific division for NRM and NRM staff in all other divisions.[17] The aim is to work with communities to ensure that soil, water and biodiversity are sustainably managed in agricultural areas so as to maintain agricultural productivity. Similarly in Madagascar, each ministry (including the ministries for agriculture and livestock) contains an environment unit. Such institutional arrangements, including staff with the necessary technical expertise, can help to ensure that ecosystem service considerations are reflected in agricultural policies, programmes and activities. Experience from Ethiopia, Madagascar and Viet Nam shows that awareness and capacity for mainstreaming are needed at both the policy and the local implementation levels for mainstreaming to be successful. Capacity building for local governing and implementing bodies can aid successful uptake of mainstreaming measures and, in the case of agriculture, is required to engage farmers at the local level.

An important prerequisite for effective mainstreaming is to ensure clearly defined and secure tenure rights, in particular for agricultural land and forests. Unclear or insecure tenure remains a major barrier to long-term investment and encourages unsustainable practices in favour of higher production in the short term (SCBD, 2016; FAO, 2002). Tenure arrangements differ significantly across contexts. In Peru, for example, only 28.8% of farmers possess land titles while the remaining farmers rent or squat on communal lands, whereas in Viet Nam,

all land is owned by the state but land-use rights can be granted to farmers and corporations. There has been a continued effort to improve tenure security of agricultural land in Viet Nam over the years through a series of legislation, though certain institutional and legal issues remain to be resolved (Nguyen, 2012). The Sustainable Land Management Programme in Ethiopia targets tenure insecurity along with promoting better land management practices through community engagement. Over 100 000 landholding certificates (which give farmers user rights to land) have been distributed under the programme to enhance a sense of ownership and enable adoption of measures that reduce soil and water degradation. There has been a reported 10% increase in production of major crops and a 16% increase in household income in areas covered by the programme (World Bank, 2016). A study in northern Ethiopia estimates that land certification increased investment in land and productivity by 40% while also increasing incomes, especially of female-led households, and improved child nutrition (Holden and Otsuka, 2014). Tenure rights are therefore important for both investment in sustainable agriculture and promoting growth and equity.

Mainstreaming in practice: Making the most of the policy toolkit

Looking beyond sectoral strategies and institutional issues, a number of policy instruments are available to governments to mainstream biodiversity in agriculture and thus internalise the external costs of agriculture on the environment (Table 3.1 and Box 3.3). As the key pressures on biodiversity from agriculture vary across countries by both type and magnitude, different instruments are likely to be needed depending on the context, including socio-economic circumstances. In Viet Nam, for instance, the major driver of forest conversion to agriculture is the production of export-oriented products such as coffee and rubber (OECD, 2015a; To and Tran, 2014). In Ethiopia, conversion takes place largely at the level of the individual farmer for subsistence cultivation[18] (EBI, 2014). Similarly, input use and efficiency also differ greatly with serious implications for biodiversity. For example, fertiliser use in China amounts to 565.3 kilogrammes per hectare (kg/ha) of arable land and in France, 151 kg/ha of arable land, whereas in countries such as South Africa it is 60.6 kg/ha and in Madagascar it is 5.5 kg/ha of arable land[19] (World Bank, 2016). There will therefore be different priorities across countries regarding where mainstreaming efforts should be more urgently focused. Countries also vary in terms of their technical and institutional capacities to effectively implement different types of policy instruments (see OECD, 2013g, for a discussion of this).

Table 3.1. **Examples of policy instruments to mainstream biodiversity in agriculture**

Regulatory (command-and-control) approaches	Economic instruments	Information and other voluntary instruments	Other measures
Land-use/spatial planning tools and requirements (e.g. EIAs and SEAs)	Price-based instruments • Taxes (e.g. on groundwater extraction, pesticide and fertiliser use) • Charges/fees • Subsidies to promote biodiversity (e.g. target public investments in green technology)	Eco-labelling and certification (e.g. organic agriculture labelling schemes)	Trade measures (e.g. lower tariff and non-tariff barriers on food and agricultural products bearing in mind the potential environmental impact on biodiversity and sustainable resource use)
Strengthen rules and standards for water, soil quality and land management	Reform of environmentally harmful subsidies (decouple farm support from commodity production levels and prices)	Green public procurement	Research and development (e.g. increase public research on sustainable food and agricultural systems)

Table 3.1. **Policy instruments to mainstream biodiversity in agriculture** *(continued)*

Regulatory (command-and-control) approaches	Economic instruments	Information and other voluntary instruments	Other measures
Enact controls on excessive use of agrochemicals and fertilisers in production	Payments for ecosystem services (PES), payments for agri-environment and climate schemes	Voluntary approaches (e.g. negotiated agreements between businesses and government for nature protection or voluntary offset schemes)	Environmental education, training and advice (e.g. incorporate sustainable approaches in training, education and advice programmes throughout the entire food chain, including farmers)
Nature, biodiversity and environmental legislations (e.g. Natura 2000 areas in the European Union)	Biodiversity offsets/biobanking		Development assistance (e.g. increase official development assistance for environmentally sustainable initiatives in food and agriculture)
	Tradable permits (e.g. water rights and carbon emissions)		
	• Liability instruments • Non-compliance fines • Performance bonds		

Sources: Adapted from OECD (2013e), *Scaling-up Finance Mechanisms for Biodiversity*, http://dx.doi.org/10.1787/9789264193833-en; OECD (2011), *Food and Agriculture*, http://dx.doi.org/10.1787/9789264107250-en.

Box 3.3. **Policy instruments to promote sustainable agriculture**

Environmental policy should promote efficiency in the use of resources to increase production relative to inputs used and ensure that prices reflect the scarcity value of natural resources and the cost of environmental impacts. This means in particular: reducing environmentally harmful subsidies; enshrining the "polluter pays" principle within the legal and regulatory framework; obliging investors to internalise the costs of environmental degradation by making EIAs compulsory, issuing environmental permits and sanctioning environmentally damaging activities; providing incentives for the supply of environmental goods and services and encouraging participatory management of natural resources; and reducing pre- and post-harvest food loss and waste.

Source: OECD (2011), *Food and Agriculture*, http://dx.doi.org/10.1787/9789264107250-en.

A common regulatory measure implemented in the case of large-scale agricultural projects in many countries is mandatory EIAs (such as in France, Peru and the Philippines). The purpose of EIAs is to ensure that decision makers consider the environmental impacts when deciding whether or not to proceed with a planned project. Small-scale agriculture remains outside the ambit of EIA regulation in most cases. The EIAs of individual projects should be supplemented with legislation mandating SEAs of sectoral policies, plans and programmes in order to factor in landscape-level impacts.

Regulatory approaches can also be used to control input, sale and use. The Law on Environmental Protection (2014) in Viet Nam, for example, decrees that producers, distributors and users of pesticides, especially those that are "likely to spread or agglomerate in the environment" must be registered and assessed for meeting legal standards. Absolute

bans on certain agrochemicals (or other inputs) may be required in cases where drastic, irreversible impacts are evident, such as the ban on the veterinary drug diclofenac to prevent the extinction of vultures in South Asia (Cuthbert et al., 2015; BirdLife, 2013) (Box 3.4).

Box 3.4. **Ban on diclofenac to prevent vulture extinction in South Asia**

Until 1990, three species of Gyps vultures in South Asia were some of the most abundant large raptors globally. Vultures provide a vital ecosystem service by aiding disposal of livestock carcasses, the lack of which poses serious risks to human and livestock health. Between the early 1990s and 2007, the population of all three species of Gyps vultures fell by a drastic 97%, placing them on the Critically Endangered category on the Red List of the International Union for Conservation of Nature (IUCN). The subspecies of white-rumped vultures dropped by 99.9% (compared with 1992 populations), placing them on the brink of extinction.

The cause of decline was established to be an anti-inflammatory veterinary drug, diclofenac. The drug, toxic for vultures, was transferred to the birds while feeding on carrion from medicated animals. Veterinary use of diclofenac was banned in India, Nepal and Pakistan in 2007 and in Bangladesh in 2010 along with promotion of the alternative drug, meloxicam. As a result, the rate of decline in Gyps vulture populations slowed down in the region, and the proportion of vulture carcasses with fatal levels of diclofenac in India fell by about half within four years of the ban.

Continued diclofenac-related mortality in vultures in India is attributed to illegal use of diclofenac sold in pharmacies for human use. Consequently, based on the recommendation of the Ministry of Environment, Forest and Climate Change, the Ministry of Health and Family Welfare banned the sale of multi-dose vials of diclofenac for human use in 2015.

Despite the catastrophic experience in South Asia, the use of products for veterinary use containing diclofenac was approved in Spain (which is home to more than 95% of Europe's vulture population) in 2013, followed by Italy, Estonia, Latvia and the Czech Republic, leading to concerns about a similar collapse of scavenger bird populations in Europe.

Sources: Cuthbert et al. (2015), "Continuing mortality of vultures in India associated with illegal veterinary use of diclofenac and a potential threat from nimesulide"; BirdLife (2013), "Vultures are under threat from the veterinary drug diclofenac", www.birdlife.org/datazone/sowb/casestudy/156; Green et al. (2016), "Potential threat to Eurasian griffon vultures in Spain from veterinary use of the drug diclofenac"; MoEFCC (2015), "Environment Ministry recommends ban on multidose vial of diclofenac to save vultures", http://pib.nic.in/newsite/PrintRelease.aspx?relid=127003.

Economic instruments to help reflect costs of environmental and human impacts and thus mainstream biodiversity in agriculture include taxes (e.g. on groundwater extraction and on fertiliser and pesticide use), charges and fees. These instruments, based on the "polluter pays" approach, have not been widely adopted, however, despite their ability to provide correct signals to producers and consumers, as well as to raise revenue. Notable examples in the context of pesticide taxes include Viet Nam and France (OECD, 2016c). In Viet Nam, certain pesticides and herbicides are covered under the environmental protection tax, introduced in 2012. Fees are levied on water pollution from pesticides in Australia (under the load-based licensing scheme) and in France (under water effluent charges from non-point sources of emission). Revenue generated from these taxes and fees could be reinvested to promote and enable sustainable agricultural practices (Jakobsson, 2014).[20]

Effective mainstreaming of biodiversity in agriculture will also require significantly enhanced efforts to identify and reform environmentally harmful government support to agriculture. In most countries around the world, governments provide substantial support to farmers via a variety of payments. These can be potentially environmentally harmful, neutral or beneficial.[21] Few countries have undertaken national studies to assess the impacts of support payments on the environment and biodiversity more specifically. Notable exceptions include France and Germany (Sainteny et al., 2012; German Environment Agency, 2014).[22] In France, the Grenelle I Act mandated that a report on environmental impact of public budgetary or fiscal assistance be compiled in order to provide the basis for reviewing harmful subsidies (OECD, 2016d). In most countries, however, measures are yet to be taken to identify and reform environmentally harmful incentives in agriculture. The Fifth National Reports of Nepal and the Philippines (both released in 2014), for example, highlighted that no progress had been made on the review of incentives harmful to biodiversity. The Secretariat of the Convention on Biological Diversity (SCBD) reported no significant overall progress on the removal of harmful subsidies globally, despite increasing recognition of the need to do so (SCBD, 2014). All countries should ideally conduct a national assessment of the types of agricultural support in place to identify incentives to be removed or reformed.

Examples of support measures potentially harmful for biodiversity include value-added tax (VAT) exemption on agrochemicals and electricity subsidies in Mexico (OECD, 2013c) and the waiver of irrigation service fees and the reduced costs for the domestic fertiliser industry due to subsidies for coal, natural gas and electricity in Viet Nam (OECD, 2015a). Such measures undermine rationalised use of input by farmers; for example, fertiliser use in Viet Nam has gone up by 517% in the last 25 years to almost twice the average levels for Southeast Asia, and it is estimated that two-thirds of this enters the freshwater system (MONRE, 2014). In France, support measures encourage the use of diesel (especially for road freight and farming), contributing to reduced air quality (OECD, 2016d).[23] Box 3.5 provides examples of environmentally harmful subsidies in the case of Brazil.

Box 3.5. **Environmentally harmful farm input support in Brazil**

In Brazil (as in many other countries), key agricultural inputs such as water, pesticides and fertilisers are implicitly subsidised. Water abstraction is not charged for in many regions. Fertilisers and pesticides are exempt from some federal and state taxes, which has increased their use and related impact on human health, ecosystems, and water and soil quality. Brazil is one of the world's largest consumers of fertilisers (after China, India and the United States), and fertiliser use is particularly high in the south and southeast regions where large-scale farming prevails, especially for certain crops such as soya. Several widely used pesticides are considered dangerous or highly dangerous for the environment and detrimental to pollinators, and the use of non-authorised pesticides is high.

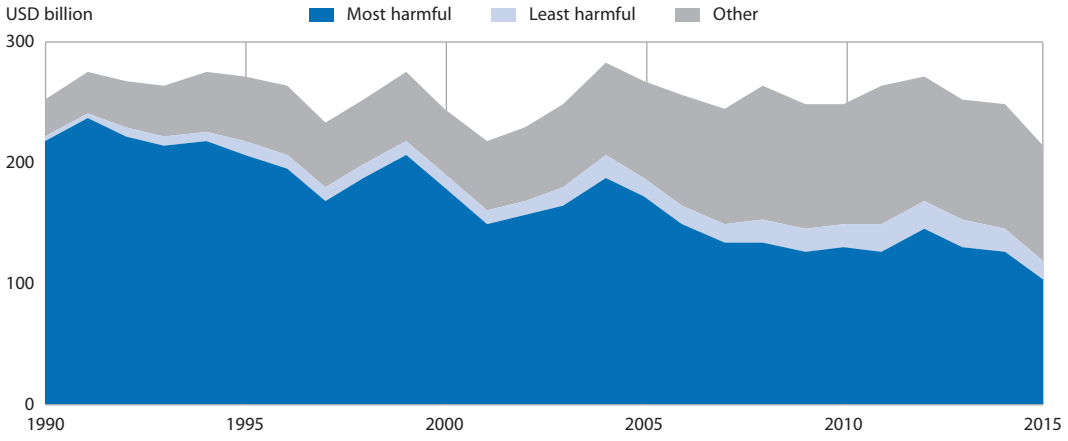
Sources: OECD (2015b), *OECD Environmental Performance Reviews: Brazil 2015*, http://dx.doi.org/10.1787/9789264240094-en; MMA (2015), *Fifth National Report to the Convention on Biological Diversity*, www.cbd.int/doc/world/br/br-nr-05-en.pdf; Jardim and Caldas (2012), "Brazilian monitoring programs for pesticide residues in food – Results from 2001 to 2010", http://dx.doi.org/10.1016/j.foodcont.2011.11.001.

Agricultural support, once in place, often proves difficult to remove given the backing it enjoys from beneficiaries who are a part of rural vote banks and political pressure groups (Bruvoll, Skjelvik and Vennemo, 2011; Wiggins and Brooks, 2010; OECD, 2007).

However, there are examples of successful reform such as in China, where the government reintroduced a 13% VAT in 2015 on all imported and domestic fertilisers in order to curb excessive use and promote sustainable agricultural development (Hersey and Kovacs, 2015). Organic fertilisers remain exempt from the VAT. The objective of the Chinese government is to reduce the annual growth of chemical fertiliser use to below 1% for the 2015-19 period and to achieve zero growth by 2020 for major agricultural crops under the zero-growth action plan for chemical fertilisers and pesticides. For pesticides, the plan envisages a reduction in average use per unit of land to achieve zero growth in their total use by 2020 (OECD, 2016a). In Australia, the potentially most distorting forms of agricultural support[24] were removed in the early 2000s; the remaining support programmes in the country are targeted to risk management, environmental conservation and provision of general services (OECD, 2016a).

Government support to farmers in terms of the OECD Producer Support Estimate (PSE)[25] can be classified according to its potential impact on the environment. While measures such as market price support, payments based on commodity output (without imposing environmental constraints on farming practices) and payments based on variable input use (without imposing environmental constraints) are potentially most harmful for the environment, support considered potentially the most beneficial includes measures that impose environmental constraints and decoupled support payments based on non-commodity criteria, such as support for farming practices beneficial to biodiversity[26] (OECD, 2013f). On average, the potentially most environmentally harmful government supports to farmers have declined in OECD countries since 1990 and accounted for USD 130 billion per year, or 52% of total support, in 2012-14. Notwithstanding concerted efforts to decouple support from commodity output and prices, the potentially most environmentally beneficial support accounts for only 8% in the OECD area (Figure 3.2.).

Figure 3.2. **OECD agricultural support to farmers by potential environmental impact**



Note: It should be emphasised that neither the total PSE nor its composition in terms of different categories of policies can be interpreted as indicating the actual impact of policy on production and markets. The actual impacts (ex post) will depend on many factors that determine the aggregate degree of responsiveness of farmers to policy changes, including any constraint of production. For example, while it is true that market price support mechanisms and payments based on output are potentially the most harmful for the environment, whether they actually are harmful depends on a host of other factors, including whether production quotas are attached to them and whether they incorporate strong cross-compliance requirements, or are constrained by agri-environmental regulations independent of the support payments (OECD, 2013).

Source: OECD Secretariat calculations based on OECD (2016f), producer and consumer support database.

Environmentally motivated subsidies and PES can be used to encourage more sustainable agricultural practices. In eight provinces in China, for example, a subsidy is provided for grassland ecology conservation. A higher subsidy is paid for banning of grazing and a lower amount for maintaining a balance between herd and grass supply. This is coupled with training of herdsmen to allow a shift to other jobs (MEP, 2014). In France, subsidies are provided under the agri-environmental measures (AEMs) under the EU CAP for environmentally sound practices including those focused on biodiversity. Additionally, since 2015, over 30% of the direct subsidies available to farmers under the EU CAP are subject to conditionality of fulfilling environmental criteria.[27] Direct or contractual aid is provided for the voluntary implementations of AEMs, whereby farmers receive subsidies in exchange for adhering to one or more environmentally friendly agricultural practices for at least five years. In its rural development programming process for 2007-13, France introduced "regionalised" AEMs to focus resources on areas with priority challenges, including biodiversity (OECD, 2016d).[28] It must be noted that EU CAP 2014-20 measures are regarded as insufficient in terms of providing any major improvements in biodiversity, and member states will need to design national and regional plans to ensure long-term provisions of ecosystems related to agriculture (Pe'er et al., 2014; Poux, 2013). Moreover, support measures under the EU CAP (Pillar I) also continue to provide incentives for production which may increase pressure on natural resources. Policy coherence would require a review of all measures affecting the performance of the agricultural sector together with an assessment of local environmental conditions (OECD, 2017b).

PES schemes have been adopted in a number of countries worldwide to incentivise sustainable agricultural practices. In China, for instance, PES has been used to target soil erosion through increasing forest cover in erosion-prone agricultural areas through the Sloping Land Conversion Program. Initiated in the late 1990s, the programme is the world's largest PES programme under which payments are provided to farmers in two watershed areas for converting erosion-prone farmland to forests. By the end of 2012, 9.26 million hectares (ha) of sloping agricultural land had been reforested by 32 million households in 25 provinces under the programme (Liu and Henningsen, 2016). PES can be used to encourage biodiversity-friendly practices on land owned by a variety of stakeholders. The Land Stewardship Programme in South Africa is a PES programme aimed at landowners in biodiversity-rich areas. This programme makes it possible to expand protected areas at one-tenth the cost that would be needed to purchase the land and also protects the rights and interests of landowners, as compared with the protected areas model (OECD, 2013d). Private-sector actors have also used PES schemes to preserve ecosystem services necessary for production. An example of a PES scheme set up by a private company is that of the Vittel valley in northern France, where a bottled water company (Nestle Waters) set up a PES scheme to encourage farmers to shift to practices that would check the increasing nitrate rates in the water. This entailed signing long-term contracts with producers (18-30 years) to reduce fertiliser use, animal waste and manure and adapting improved technologies in order to reduce the risk to the company's production. In countries where PES schemes are not common, initiating pilots can provide an opportunity to understand specific challenges and contextualise PES programmes. One finding of pilot PES programmes initiated by the Peruvian government was that the lack of legislation recognising PES schemes discouraged local governments from allocating funds to such schemes (FAO, 2013a). Consequently, after six years of discussion, a broad legal framework regarding PES was passed in Peru in 2015.[29]

Apart from reducing pressure on biodiversity by reducing land under agriculture and changing input use practices, agri-environmental payments including PES can also be used for conservation of agro-biodiversity. Many countries have ex-situ conservation programmes for crops (mostly through gene banks) such as in Ethiopia, China, India and Nepal (EBI, 2014;

MEP, 2014; MoEFCC, 2014; MFSC, 2014).[30] In-situ conservation of local varieties, including on-farm conservation or protected areas for native plants, is less widespread. On-farm conservation has the added benefit of allowing the plant to continue to evolve through both natural and human selection in the production system at all levels (landscape, ecosystems and inter-species). Moreover, this method allows farmers better control over plant genetic resources than gene banks and provides opportunities for promoting an appreciation for crop/livestock diversity among farmers, preserving traditional knowledge and implementing benefit sharing (Sthapit, Padulosi and Mal, 2009). However, in most cases the yield and income from conserved varieties is lower than from improved varieties. Therefore incentives need to be developed to encourage farmers to cultivate them in identified areas. PES schemes can be used to promote varieties with low market potential and compensate for lower yield. Such schemes would need few partners and would be easy to monitor, as the service provided (crop variety) is not difficult to measure. Moreover, the schemes can be targeted to genetic hotspots and regional agroecosystems (GIZ, 2014; Narloch, Drucker and Pascual, 2011). A PES scheme aiming at conservation of quinoa varieties by smallholding farmers in Peru showed that such support could provide the missing incentive for conserving on-farm biodiversity and can be both pro-poor and low-cost (FAO, 2013a). PES schemes for agro-biodiversity would need to be supplemented by value chain development for traditional varieties.

Information and other voluntary instruments also have a role to play in mainstreaming biodiversity in agriculture. Certification for sustainable agriculture, for example, has grown rapidly, especially for tropical agroforestry crops, accounting for 38% of global coffee production, 22% for cocoa, 15% for palm oil and 12% for tea (Potts et al., 2014). While it still makes up a small proportion of total production for most agricultural produce (SCBD, 2014), environmental labelling and information schemes for food and agricultural products have grown more rapidly than for other product types (OECD, 2016g). There is some evidence that certain agricultural certification schemes can contribute to the protection and enhancement of biodiversity compared with conventional agriculture. For instance, in the case of the Rainforest Alliance (SAN Standards), it was found that certified shade forest coffee in Ethiopia was less likely to be deforested than uncertified shade forest coffee (which are as likely to be deforested as forests without coffee) (Takahashi and Todo, 2013). Similarly in Brazil, certified coffee farms provided greater deforestation control and habitat connectivity (Hardt et al., 2015). In Colombia, certified coffee farms were found to increase tree cover along with increasing habitat connectivity (Rueda, Thomas and Lambin, 2015).

However, challenges regarding the effectiveness of standards and certification schemes remain. Most agricultural standards focus on farm operations, not biodiversity outcomes. Monitoring regarding the impact of certified farms on biodiversity is also rare, and collection of impact data remains a challenge (Potts et al., 2014). As the implementation of standards varies across certified farms, certification does not automatically imply high standards of conservation and sustainable use of biodiversity. For instance, agrochemical management in coffee and cocoa farms certified by the Rainforest Alliance shows high levels of non-conformity with the standard (Milder and Newsom, 2015). Moreover, the global demand for certified products has not kept pace with the production, leading to oversupply; only about one-third to half of the standard compliant production is sold as standard compliant (Potts et al., 2014). One of the reasons for this lack of demand has been low awareness of certification and its implications among consumers.[31] Thus, support for awareness-raising (for producers and consumers) and monitoring and training (for producers and auditors) is required to improve the effectiveness of certification schemes (Global Nature Fund and Bodensee-Stiftung, 2014; Potts et al., 2014; UNEP-WCMC, 2011). Governments also have a role to play through financial assistance for smallholding farmers who may find it difficult to bear

the costs of certification,[32] green procurement programmes, tax incentives for purchasing certified products and mixed regulatory regimes (for instance, making certification mandatory for cultivation in high-value biodiversity areas) (OECD, 2013g).

Many governments are providing technical, financial and capacity-building support to promote organic agriculture.[33] Over half the parties to the Convention on Biological Diversity (CBD) have reported the development of an organic farming sector (SCBD, 2016b). Despite the steady growth in land area under organic farms globally,[34] it remains small in terms of share of total production (SCBD, 2014). Moreover, few parties have assessed the contribution of organic farming to production efficiency so far, especially in terms of land requirement (SCBD, 2016b). In India the government is attempting to foster the development of organic farming through the National Project on Organic Farming under the Ministry of Agriculture. The project aims to enable the spread of organic farming, including through low-cost certification systems, support for research and market development, technical capacity building for stakeholders, awareness building, and publicity.[35] Though it remains a niche market, the area under organic agriculture in India rose from 42 000 ha in 2003-04 to 1 050 000 ha in 2009-10 (MoEFCC, 2014). Similarly, the French government is supporting the growth of organic farming in the country through the Ambition Bio 2017 programme, which aims to double the areas under organic farming by providing financial aid for converting to organic farming, marketing, and research and development (Minagri, 2015, cited in OECD, 2016d). Currently, the demand for organic produce in the country is higher than supply (30% of organic produce consumed in France is imported), representing an opportunity for more producers to shift to organic production.

Green public procurement (GPP) can help promote markets for sustainably produced agricultural products; however, its implementation in the sector remains limited. Governments purchase food and other agricultural products for public distribution systems, schools, hospitals, prisons and the military, among other uses. Many countries have national legal frameworks on GPP in place (such as Brazil, China and Viet Nam, and most OECD countries). Applying GPP criteria especially for commodities which contribute to large-scale deforestation (such as palm oil, coffee and tea) and where certification is reliable and widespread would be one way to contribute to the demand for sustainably produced agricultural goods[36] (Brack, 2015).

Community engagement, training and capacity building for farmers are required to create awareness and enable adoption of improved technologies and practices. This is especially the case for smallholder farmers accounting for a majority of global production (TEEB, 2015). In Ethiopia, large-scale soil and water management through community watershed development has shown positive results and is being scaled up as a priority in the current plan period (GIZ, 2015). An example of a community-government-private sector partnership in Australia is provided in Box 3.6.

Box 3.6. **Landcare: A community approach to sustainable land management**

In Australia, government and communities have worked in partnership under the Landcare approach since 1989 to promote sustainable farming and land management. Community members come together to define and manage local environmental issues specific to their context. A number of activities are undertaken under this approach, including information collection and dissemination, trainings, workshops, demonstrations and trials. The communities and government work together to plan, promote and undertake sustainable land, water and vegetation management practices suitable to regional contexts. Currently 93% of farmers in the country are covered by Landcare.

Box 3.6. **Landcare: A community approach to sustainable land management**
(continued)

The programme receives grants from the Australian government (between 2008 and 2013, 2 billion Australian dollars was invested in the programme). Moreover, farmers receive tax deductions for undertaking Landcare. Landcare Australia Limited* is a non-profit organisation that promotes Landcare and helps raise funds by working with business partners to improve their own economic, environmental and social outcomes. The business sponsors in turn provide funding, research and development, and expertise for Landcare.

* https://landcareaustralia.org.au/.

Source: OECD (2013f), *Policy Instruments to Support Green Growth in Agriculture*, http://dx.doi.org/10.1787/9789264203525-en.

3.2. Mainstreaming biodiversity in forestry

The biodiversity-forestry nexus and its role in economic development

Mainstreaming biodiversity objectives into the sustainable management of forests that are designated for different purposes[37] is critical to reducing global pressures on valuable forest biodiversity exerted by land-use change, over-exploitation and degradation. The need to sustainably manage forests is well recognised and explicitly reflected in SDG 15 and its Target 15.2, to halt deforestation by 2020, and Target 15.b, to mobilise resources for sustainable forest management (UNGA, 2015).

Importance of forests for the environment, economy and livelihoods

Forests, particularly in the tropics, provide habitats to more than 75% of global terrestrial species. They also offer a variety of ecosystem services vital for human well-being and livelihoods, such as soil erosion prevention, pollination, water cycling and resilience to changing environmental conditions (FAO, 2016c). Forests are important carbon sinks that absorb nearly a third of the global annual anthropogenic carbon dioxide emissions and are essential to global climate change mitigation efforts (Bellassen and Luyssaert, 2014).

As a productive sector, forestry[38] can make a considerable contribution to the economy. The formal forestry sector is estimated to contribute more than USD 600 billion or 0.9% of the world's GDP and to provide employment to 13.2 million people (FAO, 2014b). Furthermore, the informal sector that includes forestry-related activities not reflected in the official statistics, e.g. wood fuel and charcoal production, employs an additional 41 million people,[39] and raises the total income generated from the sector to nearly USD 730 billion (1.1% of global GDP). It is notable that in low-income economies, the forestry sector constitutes a significantly higher average of 1.4% of GDP, compared with 0.1% in high-income countries (FAO, 2014b). The contribution of the informal forestry sector to GDP and employment also varies significantly across countries, representing in some of the countries reviewed more than a half of the overall income generated from forest activities (Annex 3.A2).

Forests are also essential for sustaining wider human development and livelihoods, meeting daily food, energy, shelter and health needs of millions of people worldwide. Overall, 1.6 billion people worldwide depend on forest resources to some extent, while

1 billion out of 1.2 billion of the extremely poor rely on forests for most of their livelihoods. This includes, among others, food, shelter, fuel and medicine (Chao, 2012). Based on FAO (2014b) estimates, 2.4 billion people cook with wood fuel, and 1.3 billion people use forest products for shelter. For instance, in Madagascar, the population dependent on wood fuel for cooking is as high as 98.5%, and in Myanmar, it is 88.4%, while in Uganda half of the population relies on forests for shelter (FAO, 2014b).

Changes in forest cover and impacts of planted forests on biodiversity

Despite the benefits provided by forests, global forest cover continues to decline, albeit at a slowing rate (FAO, 2016b). Global net loss in forest cover was 9.9 million ha per year in 1980-90, declining to 7 million ha per year in 1990-2000,[40] to 4 million ha in 2000-10, and finally reaching an annual rate of 3.3 million ha between 2010 and 2015 (FAO, 1995; 2016b).

When it comes to assessing the state of natural habitats, the dynamics in biodiversity-rich natural forest should be explored (FAO, 2016b). Net annual loss in natural forest constituted 10.6 million ha per year between 1990 and 2000, and 6.5 million ha per year between 2010 and 2015 (FAO, 2016a). While the loss of natural forest has slowed down, the decline is projected to continue, driven among others by further expansion of agricultural frontier,[41] particularly in the tropics (FAO, 2016b). Given the important role of natural forests in providing ecosystem services, evidence suggests that a significant economic cost may be incurred in case of policy inaction over the continued forest loss. In an estimation of stock values of different forest ecosystem services, Chiabai et al. (2011) conclude that carbon stocks are on average of the highest value, followed by provisioning services (food, fuel, wood and non-wood products), and passive and recreational use. In terms of the carbon stocks, Mirzabaev et al. (2015) estimate the global cost of the loss of tropical and rainforests in the range of USD 43 billion to USD 63 billion.

At the same time, area under planted forest is set to increase, in an effort to reverse the deforestation trend and meet the increasing demand for forest products and services (FAO, 2016a; 2016b). Planted forest area increased by more than 105 million ha[42] between 1990 and 2015, accounting for around 7% of global forest cover (FAO, 2016a). Forests may be planted for a number of purposes, including wood production,[43] water and soil protection, and carbon sequestration. An example of a large national afforestation programme is Viet Nam's Five Million Hectare Reforestation Programme (5MHRP), which aimed to increase the country's forest cover from 28% to 43% by 2010, by planting new forests and protecting existing ones (Huong, Zeller and Hoanh, 2014). While the programme is considered successful overall in terms of reversing forest loss, concerns have been raised about the impact of the large-scale afforestation on biodiversity (McElwee, 2009) (Box 3.7).

A number of key factors may determine the effectiveness of planted forests to minimise the impact on biodiversity (Bremer and Farley, 2010; Hartley, 2002). These include the integration of mixed and indigenous tree species; afforestation of previously degraded land, as opposed to replacing natural ecosystems; and ability to serve as wildlife corridors. Approaches to managing forests, both natural and planted, in a sustainable manner are discussed below.

Box 3.7. **Viet Nam's efforts to reverse deforestation: Five Million Hectare Reforestation Programme**

Viet Nam's 5MHRP is considered a successful government intervention to address deforestation. The objective of the programme, approved in 1998 and set to run until 2010, was to increase the country's overall forest cover to 43% by planting 5 million ha of new forest and protecting 9.3 million ha of existing forest. Based on the evaluation, during programme implementation the forest cover increased from 32% in 1998 to 39.5% in 2010. The target for total area of planted and regenerated forest was achieved by 93.5%. The programme was successful also in mobilising a budget totalling USD 1.4 billion (31.9 billion dong) from a combination of sources, including central and local government budgets, credit loans, and international donors and investors.

However, criticism of the programme points to the prioritisation of forest plantations over natural regeneration, which may in some cases have resulted in a replacement of native biodiverse, albeit degraded, forests by exotic monoculture plantations. Among other challenges faced by the programme are the limited state funding and the high interest rate on loans for investment in forest restoration. Moreover, land allocation and land-use planning have not met the envisaged requirements.

Sources: Huong, Zeller and Hoanh (2014), "The 'Five Million Hectare Reforestation Program' in Vietnam: An Analysis of its Implementation and Transaction Costs"; MARD (2011), "The 5MHRP Assessment Report"; McElwee, P. (2009), Reforesting "bare hills" in Vietnam: Social and environmental consequences of the 5 million hectare reforestation program".

Mainstreaming biodiversity in forestry in practice

Policy instruments to mainstream biodiversity in the forestry sector include instruments that integrate biodiversity considerations into the management practices of production forests and those that promote forest conservation and restoration. An overview of policy instruments to support biodiversity mainstreaming into the forestry sector is presented in Table 3.2.

Brazil, for example, saw a reduction of more than 70% in the deforestation rate in the Amazon between 2005 and 2013 (Nepstad et al., 2014). Central to the efforts to reduce deforestation have been the measures to address the underlying factors, such as the lack of clear land rights, resulting in rural conflicts and forest clearing as a way to define ownership, and enforceability of legal instruments to protect forests (OECD, 2015b) (Box 3.12). More generally, at the national level, forest policies are increasingly integrating the concept of sustainable forest management (SFM),[44] which promotes a balance between environmental, social and economic values and uses of forest resources (FAO, 2016b). The FAO has developed a number of indicators to measure countries' progress towards SFM, one of which is the creation of an enabling policy and legal framework (FAO, 2016a).[45]

Another indicator under SFM is the adoption of forest management plans (FMP) and related criteria. The vast majority of countries in the last decade have developed FMPs, accounting for a total of 2.1 billion ha of the world's forests, or roughly half of the total forest area. Of the overall area under FMPs, half is dedicated to production, and the other half to conservation (FAO, 2016a). Among the focus countries of this study, FMPs have been adopted by most countries,[46] all of which have included SFM indicators such as soil and water management, community engagement, and delineation of forests with high conservation value. France, for instance, has a long history of managing both public

and private forests through a variety of mandatory and voluntary instruments (Box 3.8). Several FMPs have also incorporated information on the subdivision by conservation and production uses of the forests under management (FAO, 2015) (Figure 3.3).

Table 3.2. **Examples of policy instruments to mainstream biodiversity in forestry**

Regulatory instruments	Economic instruments	Information/Voluntary instruments
Restrictions on use and access (e.g. protected areas, set-aside of native vegetation areas)	Taxes, charges and fees	Eco-labelling and certification (e.g. sustainable forest/timber certification)
Permits and quotas (e.g. concessions for SFM and timber logging)	PES and subsidies for reforestation	Green public procurement for timber
FMPs	Reform of environmentally harmful subsidies (e.g. subsidies for commodities driving forest loss such as timber, agricultural products)	
	Biodiversity offsets	
	Tradable development rights	

Sources: Adapted from OECD (2013g), *Scaling-up Finance Mechanisms for Biodiversity*, http://dx.doi.org/10.1787/9789264193833-en; OECD (2013c), *OECD Environmental Performance Reviews: Mexico 2013*, http://dx.doi.org/10.1787/9789264180109-en.

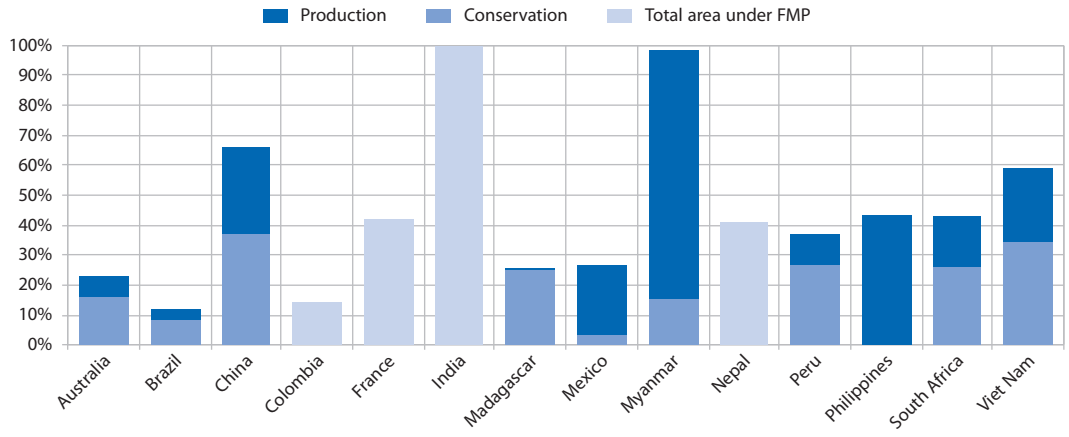
Box 3.8. **Long history of forest management in France**

The history of forest management in France dates back to the creation of the first forestry code in 1669 – *l'aménagement forestier* (forestry management). In 1827, forestry regime (*régime forestier*) was introduced, and it has largely pre-determined the management of public forests up until the present time. All public forests are subject to strict management rules and are governed by FMPs, developed through detailed studies, and approved by the forest owner and the National Forestry Office. FMPs are considered an important instrument to promote sustainable management of public forests and include, among others, considerations related to biodiversity and habitat conservation.

Three-quarters of the forests in France, however, are privately owned. Depending on their size, private forests are governed by either a mandatory or a voluntary arrangement. Owners of private forests that exceed 25 ha have a legal obligation to develop a simplified management plan (*plan simple de gestion*) (PSG). The PSG, which is valid for 10 to 20 years, provides an overview of the current state of the forest; its past management; and environmental, economic and social challenges. The PSG also determines the objectives for future management of the forest, including an annual plan for timber logging. Private owners of forests that are between 10 ha and 25 ha can develop the PSG on a voluntary basis. Small-scale forest owners can also subscribe to a code of good forestry practices, which grants access to government subsidies, or to a forest management standard regulation (*règlement type de gestion*) (RTG). The document formulated under the RTG provides recommendations on the management of the forest concerned, including species composition and solutions to major environmental challenges.

Sources: Deuffic et al. (2015), *Forest Land Ownership Change in France*; ONF (2017), *Gérer les forêts*; Tissot and Kohler (2013), *Integration of Nature Protection in Forest Policy in France*.

Figure 3.3. **Forest area under forest management plans in selected countries**



Note: Data for Ethiopia and Uganda were not available in FAO (2015).

Source: Authors, based on data retrieved from FAO (2015), *Global Forest Resources Assessment 2015*, www.fao.org/3/a-i4808e.pdf.

Protected areas

Protected areas[47] (PAs) are the cornerstone of conservation, including forest biodiversity. Over the past 25 years, there has been a significant expansion of forest protected areas,[48] from 7.7% in 1990 (12% of tropical forests) to 16.3% in 2015 (26.3% of tropical forests) (FAO, 2016a). Regarding the actual effectiveness of PAs as a forest conservation tool, existing empirical evaluations point to their positive, albeit modest, impact on reducing deforestation (Miteva et al., 2012). The successful management of PAs faces several challenges, particularly in countries with significant development pressures and increasing competition for land resources. Critical factors determining the effectiveness of PAs include, among others, effective administration, adequate human capacity and financial resources, and law enforcement (Leverington et al., 2010). In Madagascar, for instance, the World Bank's two-decade-long, three-phase loan programme has yielded a positive impact in terms of slowing deforestation to 0.6% within protected areas, as opposed to 1.6% outside the protected areas. This difference is particularly evident in the highland forests, where forest loss in protected areas is one-third to one-half the rate recorded in unprotected zones (IEG, 2013). Over the past decade, Madagascar has more than tripled its PA network, which now represents around 11.9% of the national territory (Government of Madagascar, 2015).[49] While a big achievement on its own, effectively sustaining the expanded PA network in the future is contingent on the availability of sufficient financial and human resources and capacity (Rakotomanana, Jenkins and Ratsimbazafy, 2013).

The long-term sustainability of PAs is also dependent on the approach used in engaging with local forest users and with indigenous communities. While there is still a significant debate related to the relative effectiveness of different PA types,[50] there has been a gradual realisation that conservation success often depends on connecting the priorities of biodiversity and forest conservation with socio-economic interests of local communities. According to the existing evidence, engaging local and indigenous communities in forest management may be equally effective – or more effective – in reducing deforestation and maintaining forest cover than strict forest conservation (Porter-Bolland et al., 2012; Nelson and Chomitz, 2009).

Aligning PA management with the interests of local communities is especially important in areas which have been traditionally managed by local people. In South America, for example, nearly 30% of national protected areas coincide, to a certain extent, with areas where indigenous people have historically lived (Cisneros and McBreen, 2010). Limiting the access to natural resources and prohibiting human activities may come at the cost of local livelihoods and well-being, and often trigger discontent and conflict, which undermine the effectiveness of PAs (Andrade and Rhodes, 2012). Involving indigenous peoples in managing their ancestral lands and assigning them land rights may result in a more cost-effective and less conflictual implementation of conservation projects (Sobrevila, 2008).

Community forest management

The recognition of the need to better engage communities in PA management has led to formalised participatory approaches to forestry. Community forest management[51] or community-based forestry (CBF) has become a widespread policy tool. Participatory models vary by the degree of empowerment based on the tenure rights involved, ranging from participatory conservation and joint forest management to community forestry with limited or full devolution, and finally to private ownership (Gilmour, 2016).

CBF usually aims to contribute to a variety of policy objectives, including improved forest condition, by way of better forest management and reduced deforestation, and improved local livelihoods of those dependent on forestry. The evidence on the effectiveness of community forestry models in achieving these objectives points to considerable potential to improve the state of forests, and reduce risks of wildfire and illegal logging. A meta-analysis of 40 PAs and 33 community forests across different tropical forests found that overall, community forests presented lower and less variable deforestation rates than PAs

Box 3.9. **Community forestry reform in Nepal**

Nepal's CBF policy reform dates back to 1987, when the First National Community Forestry Workshop was organised. The workshop led to a formulation of the Master Plan for the Forestry Sector 1988, and the initiation of a gradual handover of public forest to community groups. The reform sought to encourage restoration and conservation of degraded forests. The community groups holding ten-year extendable concessions are free to use and sell all forest products for their own benefit. The policy uptake has been impressive, reaching a national scale, with around 23% of forests in Nepal being managed by 18 000 registered Forest User Groups, involving 1.6 million households.

An example of the effectiveness of CBF in Nepal is the Dolakha District where despite a high average annual population growth rate of 2.3% between 1990 and 2010, forests managed by communities were restored at an annual rate of 2%. Moreover, during this twenty-year period, sparse forest was converted into dense forest between 1.1% and 3.4% per year, and non-forest areas saw a conversion into forest at a rate between 1.1% and 2%. CBF was also linked to a decline in slash-and-burn agriculture practices and wildfires. Evidence of considerable improvements in forest condition is available also for other regions of Nepal.

Sources: Gilmour (2016), *Forty Years of Community-Based Forestry: A Review of Its Extent and Effectiveness,* www.fao.org/3/a-i5415e.pdf; Kanel, Poudyal and Baral (2005), "Nepal community forestry 2005"; Niraula et al. (2013), "Measuring impacts of community forestry program through repeat photography and satellite remote sensing in the Dolakha district of Nepal"; Pandey and Paudyall (2015), *Protecting Forests, Improving Livelihoods – Community Forestry in Nepal*, Fern, September.

(Porter-Bolland et al., 2012). The tenure reforms in Viet Nam and China that saw a large-scale transfer of public land from state collectives to households, totalling millions of hectares, have led to significant gains in forest cover and natural capital (Gilmour, 2016). Nepal is another example of a successful handover of state forests to communities, in an effort to improve conservation and restoration of degraded forests (Box 3.9).

Engaging indigenous peoples in consultations regarding government decisions that may have an impact on their communities and the land where they live is equally important. There are several examples of social conflicts sparked by the infringement of indigenous peoples' rights in implementing legal and administrative measures. For instance, Peru, in an effort to adapt the country's legal framework to the requirements of the Peru Trade Promotion Agreement with the United States, issued a number of legislative decrees in 2008 (Greenspan, 2011). These decrees invoked an active protest by indigenous peoples' groups and civil society. It was argued that among other implications, some of the decrees would subject 45 million ha of forest to the risk of conversion for various uses, including agriculture. The conflict that spiralled into a violent clash leading to casualties was eventually resolved by the revocation of the controversial decrees and introduction of prior consultation legislation (EIA, 2012) (Box 3.10.).

Box 3.10. **Indigenous peoples in the management of the Peruvian Amazon**

In 2008, the administration of the President Garcia issued 99 legislative decrees, commonly referred to as the Law of the Jungle, some of which would affect the use of ancestral lands and managing the Peruvian Amazon. This sparked a prolonged indigenous strike. The decrees were signed under the special powers delegated to the government by the congress to implement the 2006 Peru Trade Promotion Act with the United States, and did not involve prior consultations with the indigenous communities. According to legal experts and indigenous organisations, including AIDESEP (Asociación Interétnica de Desarrollo de la Selva Peruana – Interethnic Association for the Development of the Rainforest), at least nine of the decrees were in breach of the government's obligation under the Indigenous and Tribal Peoples Convention (International Labour Organization [ILO] Convention 169) to consult indigenous communities. Moreover, under the Peruvian Constitution, indigenous communities have the right to consultations and participation in decision-making processes affecting their territories.

Some of the decrees were of particular controversy. For instance, DL 1090, the Forestry and Wildlife Law, amended the definition of forest patrimony, reducing the forest area under the Forestry Heritage protection system, effectively releasing 45 million ha or 60% of Peruvian forests for potential forest concessions. DL 1015 and 1073 were criticised for promoting private investment in the indigenous lands, facilitating the fragmentation in the ownership of communally owned territories. The two decrees permitted indigenous communities to decide on the sale of their land with a simple majority vote, instead of the previous two-thirds requirement. Finally, DL 1064 eliminated the prerequisite for extractives companies to seek an agreement from landowners prior to initiating operations on their territory.

While the government made some efforts to amend the decrees, these were deemed insufficient, with the unrest gradually escalating, leading to road and river blockages by indigenous groups across the Amazon and the declaration of a state of emergency. The conflict reached its peak on 5 June 2009 in the province of Bagua, where in a violent confrontation between police and protesters, 33 people were killed. In response to the bloodshed, the Law of the Jungle was repealed, and the legislation to introduce mechanisms for prior consultation with indigenous peoples was adopted.

Box 3.10. **Indigenous peoples in the management of the Peruvian Amazon** *(continued)*

An important milestone for engaging indigenous peoples in sustainable forest management in Peru was the adoption of the Forestry and Wildlife Law in 2011. The law was preceded by a consultation process – the Forestry Law Platform – which brought together the representatives of civil society, indigenous organisations, academia, government and professional organisations. However, as it was the first such experience of prior consultation for both the government and stakeholders, several deficiencies in the process remained. For instance, there was no clarity on the criteria used by the government to decide which stakeholder inputs to include in the law.

The new Forestry and Wildlife Law determines key principles for inclusive access to, and a sustainable use of, forest resources by all people. It also adopts an ecosystem-based approach to forest and wildlife management. Importantly, Article 3 makes it mandatory to conduct consultations with indigenous peoples prior to developing new legislation that may affect their territories and rights. In 2015, bylaws referred to as Productive Forests for Life were adopted to guide the enforcement of the Forestry and Wildlife Law. The regulations pay significant attention to forest management by the indigenous peoples, and promote forestry businesses by local and indigenous communities.

In addition, the Peruvian Congress unanimously approved in 2011 the Law on the Right of Consultation of Indigenous Peoples (29785), in recognition of Convention 169 of the ILO on indigenous and tribal peoples. Peru has been signatory to the convention since 1993, but had not implemented it at the national statutory level. The Consultation Law requires the government to consult indigenous peoples to secure their agreement before implementing administrative and legal measures, or development projects that may affect their ancestral territories.

Provided effective enforcement, the Consultation Law could be a useful instrument to reduce social conflicts. The successful implementation is contingent on addressing a number of gaps, as identified in the report by the UN Special Rapporteur on the Rights of Indigenous Peoples. These include, among others, improving government capacity, ensuring that consultations take place before the issuance of mining concessions, and involving indigenous peoples throughout the life cycle of projects.

Sources: EIA (2012), "The laundering machine: How fraud and corruption in Peru's concession system are destroying the future of its forests"; EIA (2009), "Peru's forest sector: Ready for the new international landscape?"; FIDH (2009), *Peru – Bagua: Bloodshed in the Context of Amazon Protest – Urgent Need for Good Faith Dialogue*; Greenspan (2014), "Protestors and UN report test Peru's new indigenous peoples' consultation law"; Rénique (2009), "Law of the Jungle in Peru: Indigenous Amazonian uprising against neoliberalism'; Rodriguez-Ferrand, G. (2011), "Peru: New law granting right of consultation to indigenous peoples"; UNHRC (2014), *Report of the Special Rapporteur on the rights of indigenous peoples, Addendum: The situation of indigenous peoples' rights in Peru with regard to the extractive industries*; WWF (2015), "Peru's Forestry and Wildlife bylaws finally promulgated".

Sustainable management of production forests

The development of forestry as a commercial productive sector is often associated with degradation and depletion of forest resources, and a negative impact on biodiversity (OECD, 2012). However, while 60% of forest degradation can be traced to timber extraction and logging[52] (Hosonuma et al., 2012), production forests need not necessarily compromise biodiversity, provided they strike a balance between environmental and economic objectives (Carnus et al., 2006; Brockerhoff et al., 2008). Although any type of forestry activity is likely to have some impact on forest biodiversity, these may vary significantly depending on forest management approaches adopted (Chaudhary et al., 2016). In a meta-analysis of 287 studies, Chaudhary et al. (2016) explore the impact of different forestry techniques

on local forest biodiversity. The analysis concludes that, based on local species richness loss, the approaches may be ranked from best to worse, as follows: selection and retention systems; reduced impact logging; conventional selective logging; clear-cutting; agroforestry; timber plantations; and fuelwood plantations.

Payment for ecosystem services

PES has become a commonly used instrument to promote conservation and sustainable use, by seeking to overcome market failures associated with public good characteristics of ecosystem services (OECD, 2010). PES schemes provide financial incentives to landowners to protect the provision of ecosystems services on their land.[53] PES programmes may focus on securing the provision of one or a bundle of ecosystem services, depending on their main objective (Wunder, 2006). Global income generated by PES programmes seems to have increased over time, with an average of nearly USD 2 billion reached between 2005 and 2010. China and the United States account for the majority of the overall PES income, followed by Mexico and Costa Rica (FAO, 2014b).

While PES programmes vary in design and financing modalities, government-funded PES schemes prevail. One example is Viet Nam's Payment for Forest Environmental Services (PFES) programme – the first nationwide PES in Asia (Box 3.11). However, public PES programmes may suffer from funding uncertainty, given that financing often comes from tax revenues, e.g. water tax in Mexico or fuel tax in Costa Rica, which are susceptible to macroeconomic volatility (Blackman and Woodward, 2010). In order to improve funding stability, some government-financed PES programmes pool finance from both the government and other sources. For instance, one of the first national PES programmes in the world launched in Costa Rica in the 1990s, funded to a large extent through a fuel tax, but also a combination of water tax, loans from the World Bank and KfW, and contributions from agreements with private companies, e.g. hydroelectric companies Energía Global, Platanar and CNFL (Compañía Nacional de Fuerza y Luz – National Power and Light Company) (OECD, 2013e; Porras et al., 2013; Wunder, Engel and Pagiola, 2008).

Box 3.11. **Viet Nam's Payment for Forest Environmental Services**

As part of efforts to increase forest cover to 43%, a nationwide PFES programme was launched in 2004. PFES seeks to preserve biodiversity by way of improving the quality and quantity of the country's forest resources, and to reduce the financial burden imposed on the government by seeking alternative financing sources for forest protection and management. An elaborate legal framework, comprising 20 instruments including decrees, prime ministerial decisions and circulars, has been established to support and govern the programme implementation. However, while this legal framework is considered one of the PFES's key successes, it is important to ensure that its complexity does not undermine compliance and enforceability.

Among the achievements of PFES is also the level of funding mobilised by the programme predominantly through payments from hydropower companies. In its design, PFES resembles an electricity user fee or tax, since the level of payment is determined and payments are collected by the government, without voluntary participation from sellers and buyers. As of December 2015, 40 provinces had established provincial forest protection and development funds that had cumulatively collected approximately USD 238 million. Up to 90% of this funding will be allocated to the forest owners and non-owners to manage, restore and protect around 5.4 million ha of forest per year (accounting for 38% of the total current national forest area), contributing to the reforestation commitment.

Box 3.11. **Viet Nam's Payment for Forest Environmental Services**
(continued)

The PFES also contributed to creating jobs for more than 348 000 households, and 5 734 household groups and communities. In an effort to improve quality and transparency of data collection and analysis, Viet Nam has developed a database specifically for PFES aimed at strengthening capacity of stakeholders responsible for programme implementation.

However, PFES has also faced a number of challenges, including a varying, but on average low, disbursement rate of 46% across provinces. There seems to be a lack of documented records of land tenure at the provincial level. This undermines the ability of PFES to meet the conditionality criterion of disbursing payments only upon the delivery of services that distinguishes PES schemes from ordinary government expenditure programmes. Without clear information on forest ownership, it is difficult to associate forest condition with a specific landowner and their responsibility to protect it. PFES also lacks guidelines to inform disbursement decision making.

Sources: Pham et al. (2013), "Payments for forest environmental services in Vietnam: From policy to practice", VNFF (2016), Assessment of the PFES Policy for the period of 2011-2015; VNFF (2015), "Lessons and experiences from the implementation of the PFES in Viet Nam".

Another concern often raised in relation to the effectiveness of PES is the extent to which these programmes are or should be compatible with development objectives, e.g. poverty reduction. While the knowledge base is limited, the available evidence from low- and middle-income countries points to little complementarity between conservation and poverty reduction in PES programmes (Samii et al., 2014). There is a policy trap in that poor households are less likely to participate in PES programmes than the better off. Among the possible barriers are high transaction costs (e.g. complexity of application process), lack of access to start-up capital and insecure land tenure with land title being an eligibility requirement. While some conclude that PES programmes should aim to remove these barriers and support the poor in their participation (OECD, 2013b), it has also been argued that seeking to pursue multiple side objectives may undermine the effectiveness of PES to achieve its primary goal of conservation (Wunder, Engel and Pagiola, 2008).

Reducing emissions from deforestation and forest degradation

Although payments for forest carbon remain limited (3% of PES income in 2005-10) (FAO, 2014b), programmes for reducing emissions from deforestation and forest degradation (REDD+) that draw on the conditionality criterion of PES schemes have a significant potential to mobilise results-based finance in developing countries.

While REDD+ is about avoided emissions and enhancement of carbon stocks (i.e. carbon sequestration), which is one of the ecosystem services provided by forests, it may also generate broader co-benefits for biodiversity (Karousakis, 2009), though it can also pose risks – if, for example, mixed forest is converted to fast-growing mono-plantations (which tend to be lower in species diversity).

Biodiversity offsets

Biodiversity offsets[54] are a policy instrument intended to mitigate the impacts of a development activity, based on the assumption that sufficient habitat can be protected, enhanced and established elsewhere and ensure that development activities yield no net loss, and preferably, a net gain of biodiversity (Gibbons and Lindenmayer, 2007).[55] Biodiversity offsets are based on the "polluter pays" approach, in that developers incur an extra cost to mitigate the adverse residual impacts of their activities, and a number of features must be considered in their design and implementation in order for them to be effective (OECD, 2016b).

The Business and Biodiversity Offset Programme has developed a set of criteria and indicators to guide the implementation of biodiversity offsets and evaluate their performance. These principles include adherence to the mitigation hierarchy, i.e. that offsetting is a last resort and should be employed only after appropriate measures have been taken to avoid, minimise and rehabilitate biodiversity on-site. It is also acknowledged that there are limits to what can be offset, referring to cases of irreplaceable or highly vulnerable biodiversity (BBOP, 2012). Clearly defining these limits is thus of fundamental importance for the use of voluntary and mandatory biodiversity offsets (OECD, 2016b). For instance, the South African provinces of KwaZulu-Natal (EKZNW, 2009) and Western Cape (DEADP, 2010) have developed guidelines specifying upper limits for biodiversity offsets.

Key design and implementation features that need to be considered for biodiversity offset programmes to be effective include the need to establish thresholds for which impacts can or cannot be offset; determining ecological equivalence for biodiversity loss and the proposed offsets; and developing robust monitoring, reporting and verification systems to evaluate progress towards offset activities (OECD, 2016b). In 2016, the IUCN developed the first global policy on biodiversity offsets (IUCN, 2016). The policy addresses the design, implementation and governance of biodiversity offsets in the context of the mitigation hierarchy, and also includes consideration of those circumstances where the use of biodiversity offsets might not be appropriate. In collaboration with The Biodiversity Consultancy, IUCN launched a global biodiversity offset policy database in 2017 – the Global Inventory on Biodiversity Offset Policies, containing national environmental laws and legislation with regard to offsets provisions from 198 countries.

Biodiversity offsets can be applied in a variety of sectors, from the extractives industries to agriculture. Examples in the context of forestry are the Environmental Compensation for Land-Use Changes in Forested Areas Programme (CUSTF)[56] in Mexico and the offset scheme under the Forest Code in Brazil (Box 3.12).

Box 3.12. **Biodiversity offset schemes in Mexico and Brazil**

CUSTF in Mexico

Mexico's CUSTF programme came into effect in 2005, following the adoption of the General Law on Sustainable Forestry Development. CUSTF is a compensation programme which obliges developers requesting authorisation of land-use change for an activity causing a negative impact on biodiversity in forested areas to pay an in-lieu fee into the Mexican Forest Fund, managed by the National Forestry Commission (Comisión Nacional Forestal) (CONAFOR). Compensation activities are then conducted through agreements between CONAFOR and the landowners of affected forest areas. This enables CONAFOR to achieve economies of scale by pooling compensation finance and implementing compensation activities throughout the country. These activities seek to restore degraded land and soils, and vegetation of affected forest areas.

Box 3.12. **Biodiversity offset schemes in Mexico and Brazil** *(continued)*

However, one of the challenges faced by CUSTF relates to CONAFOR's primary role of matching supply and demand for compensation projects. Up until 2016, the programme had not managed to achieve its fund disbursement target, due to an insufficient number of applications for compensation projects submitted. Another important limitation is the programme's ability to conduct robust monitoring, reporting and verification of projects and to assess their ability to measure the equivalence of the compensation activities to the land-use change envisaged by an intervention.

Offsets under the Forest Code in Brazil

In 2012, Brazil adopted a new Forest Code that has introduced a number of changes to legal instruments used to protect forested areas. Under the previous 1965 code, landowners were required to preserve a certain proportion, depending on the region, of native vegetation on their land – legal reserve. The new code has preserved the legal reserve requirements, which vary from 20% to 80% depending on biome. Given that compliance has historically been limited, the new Forest Code aims to improve enforceability, by way of using high-resolution satellite imaging and mandatory registration of all rural properties in cadastre, including information on legal reserve. The new Forest Code complements the use of legal reserve with tradable forest quotas – Environmental Reserve Quotas issued for each hectare in excess of legal reserve requirements. Landowners who did not meet legal reserve requirements prior to 2008 can purchase an Environmental Reserve Quota within the same biome to compensate for the deforested area on their land. Forest reserve quotas had already been previously used in Brazil in the past, with trades limited to the same watershed. As a result, Environmental Reserve Quotas have created a larger market for forest reserve surplus (May et al., 2015). However, the new code has also been criticised for reducing the total forest area to be restored by 58%, affecting particularly the Amazon, Atlantic Forest and Cerrado.

Sources: OECD (2016b), *Biodiversity Offsets: Effective Design and Implementation,* https://doi.org/10.1787/9789264222519-en; OECD (2015b), *Environmental Performance Reviews: Brazil 2015*, https://doi.org/10.1787/9789264240094-en; Soares-Filho, B. et al. (2014), "Cracking Brazil's forest code".

Reform of environmentally harmful incentives

Along with the economic instruments that promote forest and biodiversity conservation, there might be forestry-related financial incentives in place that support activities which contribute to forest degradation and fragmentation, and thus undermine the effectiveness of the former. These include subsidies for the commercial forestry sector that reduce the price of forest resources below the social marginal cost, leading to intensive production and consumption patterns that are not sustainable and cause overexploitation.[57] While these subsidies may yield a positive impact for the development of the forestry sector in the short term, they often result in inefficiencies, allowing firms to operate profitably at low productivity levels (McFarland, Whitley and Kissinger, 2015).

One example of a forestry incentive that is harmful for biodiversity conservation is subsidies that support monoculture plantations in order to boost domestic industrial sectors. As in the case of Indonesia, these may include support to timber plantations for pulp and paper production (Box 3.13.), and palm oil plantations (McFarland, Whitley and Kissinger, 2015). Given that monoculture planted forests tend to sustain lower levels of biodiversity, the decisions to subsidise the expansion of these plantations should be carefully weighed against their potential harmful environmental impacts. Reforming and gradually phasing

out subsidies for plantations posing a high risk to natural ecosystems is an important instrument for biodiversity conservation (OECD, 2008a).

Box 3.13. **Direct and indirect subsidies for monoculture plantations in Indonesia**

Indonesia's total exports of timber, pulp, paper and wood products amounted to USD 10 billion in 2012, while the estimates of forestry subsidies point to an annual total value of USD 5.7 billion. Timber is sourced mostly from natural forest, while plantations of softwoods on previously deforested land supply the paper and pulp industries.

According to a recent stocktaking exercise, there are ten government subsidies promoting timber consumption and production, with a clear emphasis on the development of industrial timber plantations. This is in line with the government priority to develop the forestry sector, as outlined in the Road Map for the Revitalization of the Forest Industry adopted in 2007. Forestry is also identified as a key sector in green growth strategy as part of the Masterplan for Acceleration and Expansion of Indonesia's Economic Development, which seeks to expand industrial plantations to alleviate pressures on natural forest.

Over the past years, Indonesia has seen a dramatic rise in pulp, and also palm oil, plantations, which has invoked criticism that the expansion has occurred in standing biodiverse forests and in traditional territories occupied by local communities dependent on forest for their livelihoods.

It is also argued that the expansion in plantations is unlikely to meet the demand for timber, driven by the ambition to significantly increase the size of the paper and pulp industry. In the first phase of the Road Map (2007-14), the Ministry of Forestry expected industrial timber plantations to have produced 46% more than has reportedly been used by the industry.

Besides the formal subsidies, timber companies may benefit from additional indirect support in a form of reduced royalty payments as a result of lower index prices used to calculate the payments dues, and uncollected forestry taxes and fees (USD 240 million in 2009). Illegal logging also contributes to forgone government revenues. Based on estimates for 2014, the industry consumed 30% more wood than had been legally produced, as reported by the Ministry of Forestry. It is estimated that between 2006 and 2011, losses in government revenues from forest mismanagement and illegal logging totalled USD 7 billion.

Sources: Forest Trends (2015), "Indonesia's legal timber supply gap and implications for expansion of milling capacity"; Human Rights Watch (2013), "The dark side of green growth: Human rights impacts of weak governance in Indonesia's forestry sector", McFarland, W., S. Whitley and G. Kissinger (2015), "Subsidies to key commodities driving forest loss: Implications for private climate finance".

Forest management certification and green public procurement

Independent third-party voluntary forest certification schemes also play an important role in promoting sustainable forest management (FAO, 2016a). As a policy instrument, these schemes enable consumers and businesses to make an informed decision regarding the origin of the forest products they purchase. Certification may also incentivise suppliers and producers to source their intermediate products from sustainably managed forests. The demand for certified products is a clear signal to governments, particularly in developing countries, of the benefits in adopting sustainable agricultural and forestry practices and gaining access to international markets for sustainable forest products (Box 3.14).

Box 3.14. **Forest Stewardship Council certification for sustainable use of forest resources**

The Forest Stewardship Council (FSC) has developed a set of core principles applied to forest managers seeking management certification. These often address, for instance, the establishment of legal tenure rights and upholding of indigenous peoples' rights to ownership and use of land. The requirement to develop FMPs tends to lead to improved productivity and variety of forest products. FSC also offers Chain of Custody certification to manufacturers, processors and traders of forest products, verifying FSC-certified material and products along the production chain.

FSC certification has had an important impact on smallholder foresters and farmers. For instance, Patneshwari Agri Cooperative Ltd., run by farmers, obtained the first FSC group certification for small or low-intensity managed forest in India for its roundwood. The certification has supported farmers in achieving sustainable agroforestry practices, in order to restore their degraded farmland, create wildlife corridors and improve soil quality. Another example of FSC's positive impact is improved access to international markets for non-timber forest products in Nepal. This was achieved through an introduction of FSC certification by the Asia Network for Sustainable Agriculture and Bioresources and the creation of a partnership among industry, government, non-governmental organisations and communities – the Private Public Alliance (PPA) on the Certification and Sustainable Marketing of Non-timber Forest Products. The objective of the PPA, funded by the United States Agency for International Development (USAID), was to connect domestic and foreign buyers of non-timber product with Nepali producers. Among the outcomes reported under the PPA are improved income and employment of producers of non-timber forest products in Nepal, particularly in remote rural areas.

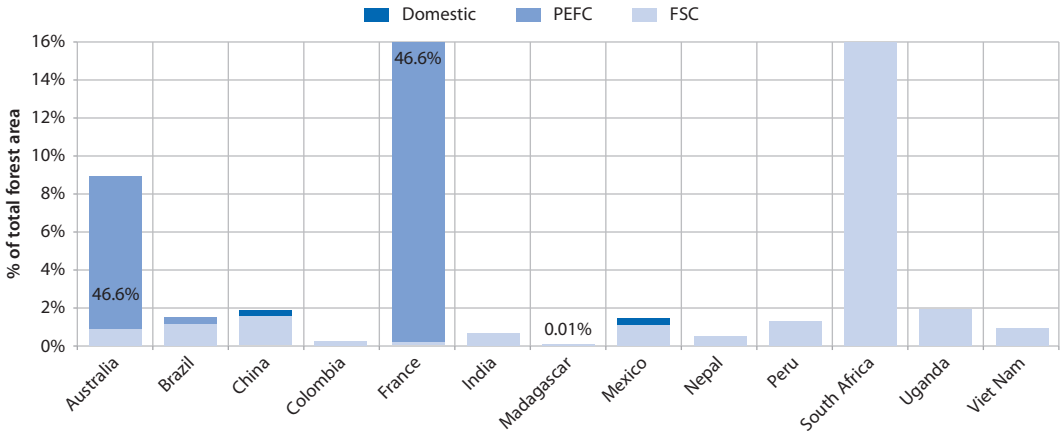
In Peru, in the context of the policy agenda to develop the forestry sector, one of the promising initiatives is the emergence of green public procurement practices in public infrastructure projects at the national and regional levels. As a pilot project, in 2014 the Co-operation Fund for Social Development acquired, on behalf of the Ministry of Education, school furniture made of FSC-certified timber supplied by indigenous communities in Ucayali and forest concessions in Madre de Dios regions. There are plans to expand this initiative to include the Ministries of Production and Housing. Given the growth of the construction sector, green public procurement could create a potentially large domestic market for certified timber and support the expansion of the currently largely underdeveloped commercial forest sector.

Sources: ANSAB (2005), *Nepal NTFP Alliance: Final Report*; FSC (2018), Forest Stewardship Council International, website, https://ic.fsc.org/en; FSC (2013), "Patneshwari Agri Cooperative Ltd. in India", FSC (2011), *Celebrating Success: Stories of FSC Certification;* WWF (2014), "Peruvian government takes first steps towards responsible procurement of wood products".

There are two major international certification schemes, launched in the 1990s – the Programme for the Endorsement of Forest Certification (PEFC) and the FSC. While different in their respective certification processes, the schemes share the objective of promoting sustainable growing and harvesting of timber.[58] By certifying a "chain of custody" in the supply chains, these schemes provide assurance to buyers that the wood is sourced legally from sustainable forests and processed accordingly (PEFC, 2016). The forest area under the two programmes expanded dramatically over the past years, from 14 million ha in 2000 to 438 million ha in 2014 (FAO, 2016b). As of 2013, public forests in 61 countries were certified by FSC and in 30 countries by PEFC, mostly in Europe and North America, and the governments of 20 predominantly developed countries had adopted green public procurement policies for wood and non-wood products from certified sources (FAO, 2014b). Among the

focus countries of this study, 14 countries have acquired FSC or PEFC certification for their forests (Figure 3.4). China and Mexico also have domestic certification schemes in place – the China Forest Certification Scheme and Mexico's National Certification of Sustainable Forest Management and Preventive Technical Audit (FAO, 2016a). However, subnational data on forest certification remain scarce (Kraxner et al., 2017).

Figure 3.4. **Forest area under certification schemes in selected countries**



Note: France has 46.6% of forest area under FSC and PEFC management. For scaling reasons, the graph only partly features this exceptionally high share compared with other countries featured.

Source: Authors, based on data retrieved from FAO (2016b), *Global Forest Resources Assessment 2015: How Are the World's Forests Changing?*, www.fao.org/3/a-i4793e.pdf.

The demand for sustainably harvested timber is also illustrated by the European Union's efforts to eradicate trade in illegal timber on the EU market. These include the EU Timber Regulation,[59] adopted in 2010, which bans the use of illegal timber in EU wood-based industries, and the Forest Law Enforcement, Governance and Trade Action Plan (FLEGT), adopted in 2003, which aims to promote legal timber imports into the European Union. One of the main activities under FLEGT is the issuing of timber licences to timber-exporting countries that have ratified a Voluntary Partnership Agreement (VPA) with the European Union (EU FLEGT, 2016). To obtain a FLEGT licence, countries must introduce measures specified in a VPA, including timber legality assurance systems, and ensure that timber exports comply with their laws and regulations. To date, VPAs are being implemented or negotiated by 15 tropical countries. Viet Nam is currently in the negotiation stage (FLEGT Licensed Timber, 2016).

3.3. Mainstreaming biodiversity in fisheries

The biodiversity-fisheries nexus and its role in economic development

The fisheries sector contributes to development and growth in many countries, playing an important role in food security and nutrition, poverty reduction, employment, and trade (OECD/FAO, 2015). About 2.6 billion people rely on oceans for their protein intake, and the livelihoods of 10-12% of the world's population are assured by the fisheries and aquaculture sector (FAO, 2014c). In 2014, 56.6 million people were engaged in the primary sector of capture fisheries and aquaculture (FAO, 2016a).[60]

Fisheries trade is especially important for developing nations, in some cases accounting for more than half of the total value of traded commodities (FAO, 2014c). In other countries and regions, such as the European Union, the United States and Japan, there is high dependency on fisheries imports to satisfy domestic consumption.[61] In 2014, the combined imports of these countries represented 63% by value and 59% by quantity of world imports of fish and fisheries products. The European Union is by far the largest single market for fish imports, valued at USD 54 billion in 2014 (USD 28 billion if trade within the European Union is excluded), up 6% from 2013 (FAO, 2016).

At the same time, fisheries and aquaculture depend directly on the natural environment for their productive capacity. Despite this, overfishing as well as destructive fishing techniques have contributed to deteriorating a growing number of fish stocks. Based on the FAO's analysis of assessed stocks, the share of fish stocks within biologically sustainable levels has been steadily declining, from 90% in 1974 to about 69% in 2013. Thus, 31% of fish stocks were estimated to be overfished. Of all the stocks assessed in 2013, 58% were fully fished and about 10% underfished (FAO, 2016).

Inefficient and ineffective management that results in excessive capacity[62] and illegal, unreported and unregulated (IUU) fishing are the main causes of overfishing and use of environmentally destructive fishing techniques.

IUU fishing alone is estimated to account for up to 26 million tonnes of fish a year, or more than 15% of the world's total annual capture fisheries output (FAO, 2016). IUU fishing undermines governments' capacity to manage fish stocks sustainably, adding pressure on resources that are not accounted for in management plans, while making use of fishing techniques that are detrimental to resources and ecosystems and targeting species that need to be protected (OECD, 2018). IUU fishing often leads to damaged coral reefs and destructive by-catch of endangered species (Liddick, 2014).

Environmentally destructive fishing techniques include bottom trawling and dredging that have adverse impacts on vulnerable marine ecosystems, and non-selective fishing. The use of poison and explosives (also called blast or dynamite fishing[63]3), and ghost fishing as a result of abandoned, lost or otherwise discarded fishing gear[64] are also harmful. Use of bottom trawling and dredging accounts for about 25% of world fish catch,[65] and catch from trawls is an important element in food security in much of the world. The use of poison to kill or stun fish still occurs in certain regions, in both fresh and marine water, including coastal lagoons and coral reefs (Slowfish, 2018). Cyanide fishing, for example, is used on the already devastated reefs of the Philippines. According to MacFadyen et al. (2009), an estimated 640 000 tons of abandoned nets are spread across the world's oceans, comprising up to a staggering 10% of oceanic litter. In addition, globally at least 8 percent of fish are being thrown back into the sea, and hence not utilised by humans (i.e. by-catch) (FAO, 2016a).

Reducing waste in the fisheries sector is also relevant to improving the efficiency of resource use. The global value of waste attributable to the fisheries sector is estimated to be in the order of USD 100 billion per year, and USD 45 billion if economic waste attributable to overfishing is excluded (OECD, 2015).

The challenges in the fishing sector are therefore many and pressing. Numerous international goals and targets have been established in response, with initiatives under way that aim to address these challenges. A few these are highlighted in Box 3.15.

Box 3.15. **Examples of international goals, targets and initiatives relevant to sustainable oceans and fisheries**

SDG, notably Goal 14 to conserve and sustainably use the ocean, seas and marine resources for sustainable development. Targets include:

- **14.1** By 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution.
- **14.4** By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible …
- **14.6** By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies …
- **14.b** Provide access for small-scale artisanal fishers to marine resources and markets.

CBD Aichi Target 6: By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

The **United Nations Convention on the Law of the Sea**, which entered into force in 1994, lays out the legal regime for the world's oceans and seas, and establishes a framework for ocean governance, specifying the rights and responsibilities of maritime countries with respect to their duty to use living resources sustainably while protecting and preserving the marine environment.

FAO Code of Conduct for Responsible Fisheries. Developed in 1995, the Code of Conduct consists of a collection of principles, goals and elements for action. The code is voluntary and includes provisions for reducing the negative impacts of fishing activities on marine ecosystems, and for monitoring and reporting on implementation (via a biennial self-assessment survey). More than 170 members of the FAO adopted the code in 1995.

Mainstreaming biodiversity in fisheries in practice

At a national level, the way governments organise themselves to make decisions and manage fisheries and environment issues can have an impact on how efficiently resources are used, how effectively objectives can be reached and the health of the marine environment. There are a number of governance models in place, with regard to both the environment and the fishery sector, from highly centralised to highly decentralised. An efficient decision-making process involves keeping some responsibilities centralised while devolving others to subsidiary bodies better suited to them. Overall, good institutions tend to reflect three characteristics: good availability of information, transparency in the decision-making process, and accountability in decisions made and on enforcement measures taken (OECD, 2015a).

Inter-ministerial (or multisectoral) commissions can provide the platform to bring relevant stakeholders together, to develop strategies and plans that take into account the various dimensions. A number of countries have some forms of these in place (e.g. the Multisectoral Commission for Management of the Marine Environment in Peru [Box 3.17]). China established a high-level co-ordinating body, the National Ocean Committee, bringing

together leadership from multiple ministries to formulate China's ocean development strategy (OECD, 2015b), and India established the National Fisheries Development Board in August 2014 to enable a more integrated fisheries governance system. The board is intended to promote the fisheries sector and co-ordinate activities related to fisheries undertaken by different ministries or departments in the central government and state or union territory governments (OECD, 2015b).

With regard to information availability, in Australia, a Marine Biodiversity Decline Working Group[66] was established to prepare the report "A National Approach to Address Marine Biodiversity Decline" for the Natural Resources Management Ministerial Council. The 2008 report identified threats and causes of marine biodiversity decline, identified high-level gaps in information, and proposed key policy directions and priority actions for responses to the threats. Australia has also been undertaking comprehensive assessments of the state of Australian fish stocks with reports released in 2012, 2014 and 2016. These types of national assessments are very relevant to biodiversity mainstreaming, and could be undertaken at regular intervals to evaluate progress and identify areas for further improvements. Mexico, for example, has recently undergone a series of sector assessments, including for fisheries, which review the existing public policies in place and identify opportunities for biodiversity mainstreaming. One element of this is the creation and strengthening of information systems needed to monitor and evaluate strategic lines of biodiversity mainstreaming, including baselines and indicators. The need for comprehensive assessments in this regard was only recently mandated in Viet Nam, for example, in its new law on fisheries (effective from 2019).

At the domestic government level, a number of policy instruments are available to mainstream biodiversity in fisheries (Table 3.3.).

Table 3.3. **Examples of policy instruments to mainstream biodiversity in fisheries**

Regulatory instruments	Economic instruments	Information/Voluntary instruments
Restrictions or prohibitions on access and/or use: Total allowable catch (TAC) Bans on fishing of particular species (e.g. Convention on International Trade in Endangered Species of Wild Flora and Fauna [CITES]) Restrictions on gear types (e.g. fish net size, bottom trawling) Mandatory gear selectivity (e.g. turtle excluders) Temporal restrictions Bans or restrictions on harvest of prey species Restrictions on the use of fish aggregating devices Marine protected areas (MPAs) Discard bans	*Price-based instruments* • Taxes • Charges/fees • Subsidies to promote biodiversity (e.g. positive environmental outcomes, green technologies)	Eco-labelling and certification (e.g. Marine Stewardship Council [MSC], other)
Single- and multi-species fish management plans	Fleet reduction schemes (fishery buy-backs)	Green public procurement
Zoning of aquaculture operations Environmental permit requirements for aquaculture operations	PES	Voluntary approaches (e.g. negotiated agreements between businesses and government)
Planning tools and requirements (e.g. EIAs and SEAs)	Reform of potentially environmentally harmful subsidies (e.g. fuel tax concessions)	
Marine spatial planning	Tradable permits (i.e. individual transferable quotas [ITQs])	
	Fines on illegal fishing and environmental damages	

Source: Adapted from OECD (2013g), *Scaling-up Finance Mechanisms for Biodiversity*, http://dx.doi.org/10.1787/9789264193833-en.

An evaluation of countries' implementation towards the FAO Code of Conduct provides a partial overview of the current state of some elements relevant to biodiversity mainstreaming in the fisheries sector, as well as some of the implementation challenges (Box 3.16.). The Environmental Performance Index, developed by Yale University, has also developed fisheries scores, by country, combining information on coastal shelf fishing pressure and fish stock data.[67]

Box 3.16. **Progress in the implementation of the Code of Conduct for Fisheries**

With the exception of two members in Latin America and the Caribbean, all FAO members reported that they had fishery management plans in place in 2014. Moreover, 76% of the members reported that they have started to implement the ecosystem approach to fisheries, the majority of which have established ecological, socio-economic and governance objectives and have identified issues to be addressed by management actions. Sixty percent of members implementing the ecosystem approach have also established monitoring and evaluation mechanisms. Members reported that they have obtained reliable estimates on stock status for a total of 1 828 stocks exploited in their national fisheries, equivalent to 41-50% of the main national stocks.

Sixty-three percent of members reported that by-catch and discards occur in major fisheries, and more than half of the members report that they contribute to unsustainability. Over 50% of members have formal monitoring schemes for by-catch and discards in place and/or have implemented management measures to minimise by-catch and discards, some of which also address the protection of juveniles and/or ghost fishing.

Eighty-seven percent of responding members reported that they faced some constraints in implementing the code. These constraints and their solutions to the implementation remained similar. The top constraints were related to insufficient financial resources (58%), human resources (42%), incomplete policy and/or legal frameworks (35%), inadequate scientific research, statistics and information access (31%), and lack of awareness and information about the code (27%). The top-ranking solutions proposed by members were access to more financial means (56%), more training and awareness (38%), access to more human resources (35%), alignment of policy and legal frameworks with the code (34%), improvement of research, statistics and access to information (28%), and improvement of institutional structures and collaboration (25%).

Source: FAO (2014c), *State of the World Fisheries and Aquaculture*; FAO (2014c), "Progress in the implementation of the code of conduct" COFI/2014/Inf.15/Rev.1 Available at www.fao.org/3/a-mk051e.pdf.

Examples of success include Australia, which ended overfishing in the fisheries managed by the Government of the Commonwealth of Australia in 2014 (though there are only a few), and Mexico, which succeeded in restoring its abalone stock (FAO, 2016). Examples of the fisheries management policy in Peru are highlighted in Box 3.17.

Box 3.17. **Fisheries management in Peru**

The fisheries sector in Peru is one of the mainstays of the national economy. Peru has one of the most productive seas in the world, with the biggest single-species fishery, for the Peruvian anchovy. Anchovies account for 86% of the catch, most of which has traditionally been destined to fishmeal and fish oil. Fish products currently represent about 7% of total exports and constitute the second-largest source of foreign income, after mining. The key pressures on marine ecosystems in Peru include overfishing, by-catch, environmentally harmful fishing methods, pollution, infrastructure development and climate change.

Box 3.17. **Fisheries management in Peru** *(continued)*

The General Law on Fisheries regulates fisheries in Peru. It defines fisheries under the following framework: a) purpose of extraction (i.e. commercial, research, recreational or subsistence); b) scale (i.e. artisanal, small-scale or large-scale); c) geographical area; and d) destination of the end product (i.e. direct or indirect human consumption). The Ministry of Production (PRODUCE) is responsible for all fisheries and aquaculture activities in Peru, and oversees the formulation, approval and supervision of all policies. As part of the law, PRODUCE can create Reglamentos de Ordenamiento Pesquero (ROPs), or Fisheries Management Regulations, which are management instruments that can establish a suite of potential restrictions on a fishery, such as access regimes, fishing seasons, TAC, fishing gear requirements, minimum size requirements and designated fishing areas. According to a 2014 study, however, there are only nine ROPs in place, covering seven species. Of the 72 most important commercial species in Peru, 35% are not subject to any management regulations, 35% are subject to a minimum catch size regulation, 20% are subject to two management measures (minimum size and gear restrictions), and just 10% (7 species) have more than these two management measures in place. A lack of management measures and enforcement commonly precipitates fishing practices that are unsustainable and environmentally damaging (e.g. dynamite fishing is still commonly reported in some regions of Peru).

An individual vessel quota (IVQ) system for the Peruvian anchovy (where transfer of quota is allowed) was introduced by PRODUCE in 2009, and has resulted in a significant reduction of overcapacity and a more than doubling in the length of the fishing season. OECD-ECLAC finds, however, that for most of the remaining fish species, no catch quotas have been set and the protection of marine and inland aquatic species is "clearly inadequate" as there are no lists of threatened species, no conservation plans, no specific measures to minimise illegal fishing, and no control over environmentally harmful fishing methods. Certified aquaculture is beginning to appear in Peru (e.g. via the Aquaculture Stewardship Council) but still constitutes only a very small proportion of total aquaculture production in Peru (Potts et al., 2014).

Moreover, OECD (2017) found that despite better inter-agency co-ordination, fisheries policy is still a sectoral rather than an ecosystem approach, as responsibilities for the ocean are divided among many agencies that have little representation in the only nominal co-ordinating body, the Multisectoral Commission for Management of the Marine Environment.

Sources: OECD-ECLAC (2017), *Environmental Performance Review of Peru*; David and Lucile Packard Foundation (2014), Young and Lankester (2013), *Catch shares in action: Peruvian anchoveta northern-central stock individual vessel quota program*; Potts et al. (2014), *The State of Sustainability Initiatives Review 2014: Standards and the Green Economy*, http://unctad.org/meetings/en/Contribution/ditc-ted-oceans-ssi-blue-economy-2016.pdf.

The TAC can be described as a catch limit set for a particular fishery, generally for a year or a fishing season. If set correctly with accountability measures, TAC can prevent fish stocks from being overfished. However it is generally pointed out that setting a TAC without additional appropriate management measures tends to cause a race to harvest the fish. Individual quotas (IQs) assign the right to harvest a set portion of the TAC to individual fishermen or vessel owners, which removes the need to race to fish. ITQs, a kind of IQ which can be sold to others, are introduced to be expected as a mechanism to allow quotas to pass to more efficient operators and reduce the existing overcapacity of the fleet through consolidation. Examples of ITQs in the countries examined here include for abalone in Tasmania, Australia, as well as finfish species and rock lobster species in Australia; for abalone and a number of finfish species in South Africa; and for anchovy in Peru (see Box 3.17).

Territorial use rights for fisheries are a spatial form of property rights in which individuals or a collective group of fishers are granted exclusive access to harvest resources within a geographically defined area (Christy, 1982), and help to align fishers incentives with sustainability. Examples of their use include fisheries in Brazil, Chile, Mexico and the Philippines (Afflerback et al., 2014).

The coverage of MPAs, which can help protect marine biodiversity, including from overfishing and habitat degradation from harmful fishing practices, also varies significantly among countries reviewed. Coverage ranges from 1% of the exclusive economic zone in India, 2% in Brazil and Mexico, 3% in Indonesia, 11% in South Africa, and 40% in Australia (OECD, 2016). In Madagascar, the government has recently pledged to triple the size of its marine protected areas and set up a legal framework for this. The framework will formalise existing locally managed marine areas, which now cover over 7% of Madagascar's waters. Greater efforts are needed more generally, however, to ensure that MPAs are ecologically representative and that they are effectively managed. An important challenge, especially in lower-income developing countries, is mobilising sufficient finance to effectively design and implement MPAs. Key design and implementation features that need to be considered for effective MPAs, including financing instruments and approaches, are provided in OECD (2017).

Marine spatial plans are instruments that aim to ensure a more co-ordinated and comprehensive approach to using the ocean space, given the multiple stakeholders involved. They have been developed in Australia, China, Colombia and Mexico, and with the EU Directive of Maritime Spatial Planning (France). These are also being developed in South Africa and are under discussion in Brazil, Chile, Madagascar, Thailand and Viet Nam (Ehler, 2015).

Other economic instruments in addition to ITQs (discussed above), such as PES and biodiversity offsets, in the context of the marine environment and for fishery management, are in their infancy worldwide. For a review of marine-related PES-like examples and challenges, see Bladon et al. (2014). In Madagascar, an agreement is in place between local communities and a fishing company, Unima, for the preservation and the restoration of mangroves. This is considered an important and significant programme, albeit an isolated one. Unima, the largest shrimp producer in the country, has developed and implemented a range of better management practices across its trawling and aquaculture operations (Rajaosafara and du Payrat, 2009). Similarly, the Blue Forests programme aims to make tangible contributions to poverty alleviation, climate-change preparedness and biodiversity protection in vulnerable coastal communities by assessing the feasibility of mangrove REDD+ and other PES opportunities for Madagascar's mangroves (Jones, 2013).

Government support to the fisheries sector is also prevalent in numerous countries. The impact of subsidies on fisheries resources depends on how they are designed and how the fishery resource is managed. Support for monitoring and managing fisheries can contribute positively to mainstreaming biodiversity in the fishery sector. Provision of other types of support, including for fuel, can enhance fishing capacity and thus undermine the sustainability of fish stocks. A few of the review countries are currently reporting to the OECD Fisheries Support Estimate database (e.g. Australia, Chinese Taipei, Colombia, France and Indonesia), enabling the tracking of government support to this sector over time. Examples of subsidies in place in France that contribute to the over-exploitation of the sea and fish stock, as well as opportunities for improvement, are highlighted in Box 3.18.

Box 3.18. **Opportunities for further reform in France**

Commercial fishing benefits from a number of subsidies, including exemption from the domestic consumption tax on petrol-based fuels. Moreover, there is no tax mechanism to internalise the environmental costs deriving from impacts on marine biodiversity. Many activities use coastal and marine resources, yet the taxes and charges levied on these activities remain weak compared with the benefits obtained by the economic sectors concerned (fishing, shellfish production, sailing and scuba diving in particular). Prospects for making better use of charges in the public maritime domain nevertheless abound. The potential resources for the state of such changes are estimated at EUR 150 million per year by 2020.

Source: OECD (2016d), *OECD Environmental Performance Review: France 2016*, http://dx.doi.org/10.1787/9789264252714-en.

Information instruments such as certification schemes can help consumers make more informed choices and can therefore also provide incentives for suppliers to source sustainable products and for producers to act more sustainably to maintain access to markets. The two main private fishing eco-labels are the MSC and the Friend of the Sea. For both, the volume has been steadily rising.[68] The percentage of global wild catch that is MSC-certified, for example, has almost doubled from 5% in 2010 to 9.4% in 2015. Today, 281 fisheries in 33 countries are MSC-certified. While this is strongest in developed countries, India and China, for instance, recently achieved their first MSC certifications, following programmes of improvement by the Ashtamudi short-necked clam fishery in Kerala, India, and the Zoneco scallop fishery in Zhangzidao, China (MSC, 2016).

Annex 3.A1

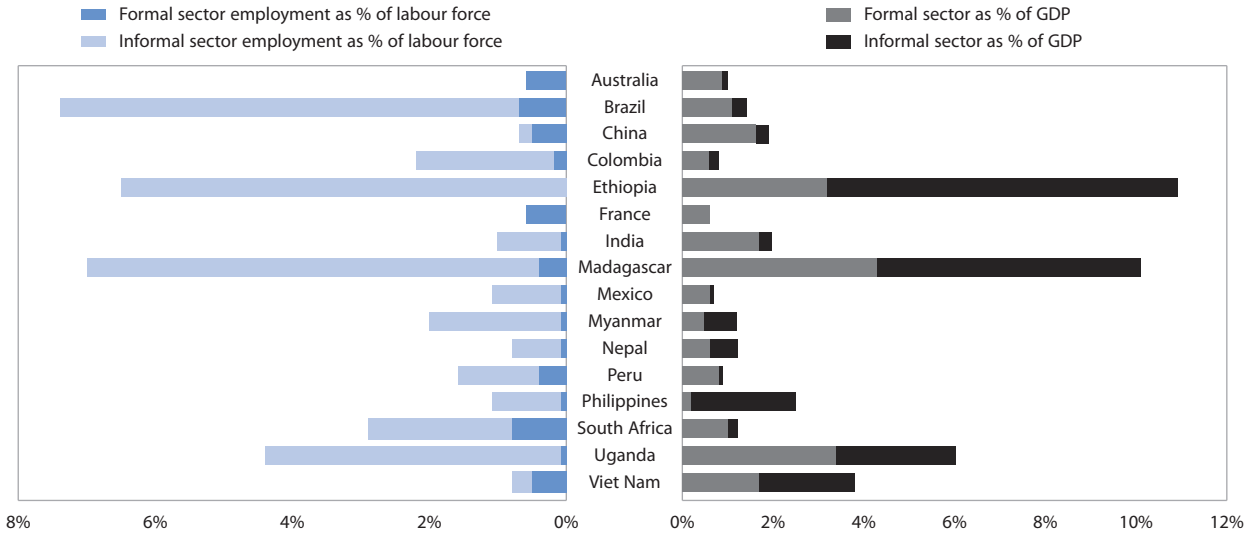
Share of agriculture as % of GDP and in employment in the 16 countries, 2016

Country	Agriculture value added (% of GDP)	Employment in agriculture (% of total employment)
Australia	2.6	3
Brazil	5.5	10
China	8.6	18
Colombia	7.1	16
Ethiopia	37.2	68
France	1.6	3
India	17.4	43
Madagascar	24.7	74
Mexico	3.8	13
Myanmar	25.5	50
Nepal	33.0	72
Peru	7.6	28
Philippines	9.7	26
South Africa	2.4	6
Uganda	25.8	69
Viet Nam	18.1	41

Source: World Bank (2018), *World Development Indicators* (database), http://data.worldbank.org/data-catalog/world-development-indicators (accessed 1 June 2018).

Annex 3.A2

Contribution of the forest sector to employment and GDP in focus countries, 2011



Source: Authors, based on data retrieved from FAO (2014b), *State of the World's Forests: Enhancing the Socioeconomic Benefits from Forests*, www.fao.org/3/a-i3710e.pdf.

Notes

1. In the agricultural sector, for instance, the European Union (EU) Common Agricultural Policy (CAP) at the EU level interacts with national agricultural plans and policies of EU member states. Based on this, priority setting and programming is undertaken by regional administrations in countries such as France.

2. Some countries, including Ethiopia and Peru, are in the process of developing land-use plans. The development of a national land-use policy and a national land-use plan was announced in Ethiopia in June 2016. A technical committee co-ordinated by the Ethiopian Ministry of Agriculture and Natural Resources, consisting of representatives from various ministries and government agencies that have a mandate to use or regulate land and natural resources, is tasked with preparing a draft policy. A high-level ministerial committee comprising eight ministers will oversee the formulation of a policy which balances the priorities of various sectors. Similarly in Peru, an ambitious and comprehensive national land-use planning initiative is under way, based on economic and ecological zoning. The zoning exercise aims at classifying landscapes by the type of climate, soil and biodiversity, at micro (community or forestry concession), meso (district or province) and macro (regional) levels. This, together with a series of specialised studies, will feed into the development of a national land-use plan.

3. This has also been reported in the Fifth National Reports reviewed by SCBD (2016).

4. Annex 3.A.1.

5. Compared with 9% in middle-income and 1% in high-income countries.

6. Around 36% of land area.

7. For example, alpine pastures and low-intensity paddy fields.

8. The report states: "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. For example, terrestrial MSA [mean species abundance] loss associated with crops and pastures is directly linked to the agricultural production of food, feed and fibre. However, the contribution made by land use and land-use change related emissions responsible for climate change is also allocated to agriculture. Fragmentation and encroachment are also closely linked to agriculture, though human settlements and infrastructure play a role as well."

9. Other factors include lack of water, climate change-related impacts and narrow genetic background (Fan et al., 2011; Peng, Tang and Zou, 2009).

10. Sustainable intensification is defined as a process or system where agricultural yields are increased without adverse environmental impact and without the conversion of additional non-agricultural land. While the term does not refer to a specific method of production, the objective is to indicate desirable outcomes of increased agricultural production and improved environmental goods and services which could be achieved by a variety of means (Pretty and Bharucha, 2014).

11. Strategy 4.10 of the plan.

12. Other objectives or "vision components" include "self-reliant", "competitive", "inclusive growth", "livelihood" and "food and nutrition security".

13. Indicators for the sustainable agriculture component include maintenance of forest cover (no net change and effective land-use management regulation enforcement), increase in soil organic matter (through promotion of integrated soil and plant nutrient management; improvement in

agricultural practices for cultivation, crop residue use, integrated crop nutrition; no increase in deforestation) and decline in area of degraded land (through rehabilitation/ reforestation; poverty reduction; land conservation and land rehabilitation programmes; reduced wood fuel demand).

14. La loi d'avenir pour l'agriculture, l'alimentation et la forêt, 2014.

15. Similar support for conversion to sustainable agriculture was provided in Australia with the Australia's Farming Future initiative.

16. Loi pour la reconquête de la biodiversité, de la nature et des paysages, 2016.

17. The NRM division concentrates on rehabilitating degraded areas to return them to productive use, and other directorates work in productive landscapes.

18. However, large-scale commercial agriculture, supported under the targets of the current NDP, is increasingly becoming a factor.

19. 2014 figures.

20. For a discussion on the arguments for and against earmarking revenue, see Chapter 3 in OECD (2013e), *Scaling-up Finance Mechanisms for Biodiversity*.

21. Support potentially most harmful for the environment includes market price support, payments based on commodity output (without imposing environmental constraints on farming practices) and payments based on variable input use (without imposing environmental constraints). Support considered potentially the most beneficial are measures that impose environmental constraints and decoupled support payments based on non-commodity criteria (such as support for farming practices beneficial to biodiversity) (OECD, 2013f).

22. The Mexican government carries out annual surveys of expenditure on and distribution of subsidies and taxes. This could be built upon to identify the environmental, economic and social impact of these taxes (OECD, 2013b).

23. Tax reform is also required in France to adjust the planning tax rate to support activities which use less space, including eliminating exemptions for public infrastructure to discourage land take and urban sprawl.

24. That is, market price support, payments based on commodity output without environmental constraints on farming practices, and payments based on variable input use without imposing environmental constraints.

25. The PSE data are obtained at the national level and then aggregated for the OECD as a whole, as depicted below. PSE estimates are calculated for the OECD countries (PSE for the European Union is obtained as whole) and eight non-OECD countries (Brazil, China, Colombia, Indonesia, Kazakhstan, the Russian Federation, South Africa and Ukraine).

26. It should be emphasised, however, that neither the total PSE nor its composition in terms of different categories of policies can be interpreted as indicating the actual impact of policy on production and markets. The actual impacts (ex post) will depend on many factors that determine the aggregate degree of responsiveness of farmers to policy changes, including any constraint of production. For example, while it is true that market price support mechanisms and payments based on output are potentially the most harmful for the environment, whether they actually are harmful depends on a host of other factors, including whether production quotas are attached to them and whether they incorporate strong cross-compliance requirements, or are constrained by agri-environmental regulations independent of the support payments. Similarly, payments based on area, animal numbers, farm receipts or income, and historical entitlements are only potentially neutral in their effects on the environment, but may be harmful – or even beneficial – depending on specific programme designs and other regulation. Moreover, "potentially environmentally harmful" does not necessarily mean "potentially harmful for biodiversity".

27. These criteria are: maintenance of areas of environmental interest on the farms, maintenance of regional ratio of permanent grassland to cropland and crop diversification with three annual crops.

28. Under the rural development programming process, regional authorities decide the operations to be mobilised, geographical zoning and priority issues

29. Ley de Mecanismos de Retribución por Servicios Ecosistémicos (Act on Compensation Mechanisms for Ecosystem Services), approved in July 2016 (http://busquedas.elperuano.com.pe/normaslegales/aprueban-reglamento-de-la-ley-n-30215-ley-de-mecanismos-de-decreto-supremo-n-009-2016-minam-1407244-4/).

30. Fewer countries have such programmes for livestock at present.

31. This has also been identified as a key challenge in generating demand for the Vietnamese government's certification scheme, Viet Nam Good Agricultural Practices.

32. In countries of the European Union where conversion payments to farmers have been made for organic farming, the share of land under organic farming is 10-17% compared with 2% on average in the OECD (OECD, 2015d).

33. Organic agriculture is an approach to food production that seeks to develop environmental and economically sustainable production systems with a strong emphasis on the use of local, renewable resources and minimum use of external inputs (OECD, 2016e).

34. Organic agriculture covers 43.7 million ha of agricultural land and approximately 2.3 million farmers across 172 countries (Willer and Lernoud, 2016).

35. https://ncof.dacnet.nic.in/objectiveandimplementation/ObjectivesandImplementationcomponents.pdf.

36. The EU GPP legislative framework is one of the most elaborate pieces of GPP-related legislation. Currently it provides definitions and verification techniques for organic food under the "food and catering" sector; however, the purchase of organic food by governments is not mandated, unlike for instance timber, energy-efficient vehicles, buildings and information technology.

37. Nearly a third of forests worldwide have production as their primary use, compared with 13% that are managed for conservation (FAO, 2016b).

38. While there is no single commonly agreed definition of the forestry sector, forestry can be "defined to include all economic activities that mostly depend on the production of goods and services from forests. This would include commercial activities that are dependent on the production of wood fibre … It would also include activities such as the commercial production and processing of non-wood forest products and the subsistence use of forest products. It could even include economic activities related to production of forest services (although it would be difficult to determine exactly which activities are really dependent on forest services)" (FAO, 2014d).

39. Some estimates point to the informal sector generating up to 60 million additional jobs (Agrawal et al., 2013).

40. Reliable, comprehensive and comparable data on historical global forest cover change prior to 1980 are scarce and incomplete, being fragmented by regions and countries. According to an FAO special study of tropical forests, conducted in 1990, around 450 million ha of forest were lost in the tropics between 1960 and 1990 (FAO, 1995).

41. Agriculture is associated with nearly 80% of global deforestation (Kissinger et al., 2012).

42. By comparison, net gain in forest area in the forest area was recorded by 88 countries, totalling 113 million ha (FAO, 2016c).

43. Projections indicate that wood removals are likely to triple by 2050 from 2010 levels, when wood removals reached 3.4 billion cubic metres (WWF, 2012). In 2012, 46.3% of industrial roundwood supply came from planted forests (Payn et al., 2015).

44. SFM is defined as "a dynamic and evolving concept, [that] is intended to maintain and enhance the economic, social and environmental value of all types of forests, for the benefit of present and future generations" (UNGA, 2008).

45. SFM indicators as proposed by FAO (2016b) include: policy and legal framework supporting SFM; national platform for stakeholder involvement; forest area under permanent forest land use; national reporting to SFM criteria and indicator process; forest area under an FMP; FMP subdivided by production and conservation; FMP includes soil and water protection; delineation of high-conservation-value forests; and social considerations.

46. FAO (2015) does not include information on the existence of a forest management plan in Ethiopia.

47. As defined by Dudley (2008), a PA is "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values".

48. A forest PA refers to a PA that includes a substantial amount of forest, covering part or the whole of its territory (Dudley and Phillips, 2006).

49. In an effort to meet its 2003 commitment under the Durban Vision, Madagascar increased the coverage of PAs from 1.7 million ha to nearly 7 million ha by 2015 (Government of Madagascar, 2015).

50. PAs vary by their main purpose, depending on the degree of activities permitted within them, from strict nature reserves to protected areas with sustainable use of natural resources. IUCN distinguishes among six categories of protected areas: Strict Nature Reserve or Wilderness Area, National Park, Natural Monument or Feature, Habitat/Species Management Area, Protected Landscape/Seascape, and Protected Area with Sustainable Use of Natural Resources (Dudley, 2008). In the past, PAs that followed a stringent exclusionary "Yellowstone approach" (IUCN categories I-IV) were a widespread tool. However, recent developments point towards more integrated approaches to PA establishment that include sustainable use considerations (Andrade and Rhodes, 2012).

51. FAO defines community forest management as "processes and mechanisms that enable key direct stakeholders in forestry to be part of decision-making in all aspects of forest management, from managing resources to formulating and implementing institutional frameworks" (FAO, 2017).

52. In Latin America and Asia, this share reaches more than 75%. While agriculture is widely recognised as the most important driver of deforestation worldwide, forest degradation is linked.

53. PES are broadly defined as "a voluntary transaction where a well-defined environmental service or a land use likely to secure that service is being 'bought' by a (minimum one) service buyer from a (minimum one) service provider, if and only if the service provider secures service provision (conditionality)" (Wunder, 2005).

54. The Business and Biodiversity Offsets Programme defines biodiversity offsets as "measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken" (BBOP, 2017).

55. This includes species composition, habitat structure, ecosystem function and cultural value attributed to biodiversity.

56. Programa de Compensación por Cambio de Uso de Suelo en Terrenos Forestales.

57. Such government support may come in a variety of forms through both direct and indirect subsidies. Direct subsidies constitute direct transfer of funds, while indirect subsidies may include tax breaks, access to undervalued public land through forest concessions, and accelerated depreciation for forestry investments (Rautner et al., 2013). Recent estimates of the value of global public support to the commercial forestry sector are scarce. This could be partly due to the lack of a co-ordinated data collection effort, similar to that for agriculture and fossil fuel subsidies within the OECD (McFarland, Whitley and Kissinger, 2015).

58. Apart from certifications for sustainable timber, certification in other sectors can also address deforestation, such as the Roundtable on Sustainable Palm Oil and Rainforest Alliance, which target agricultural drivers of deforestation and forest degradation (Section 3.1).

59. EU Timber Regulation (EUTR, Regulation 995/2010).

60. In 2014, 84% of the global population engaged in the fisheries and aquaculture sector was in Asia, followed by Africa (almost 10%), and Latin America and the Caribbean (4%).

61. The top five importing countries are the United States, Japan, China, Spain and France.

62. I.e. when the capacity of the fleet is higher than that required to harvest the stock at the targeted level.

63. Illegal in a number of countries but still common in e.g. parts of Southeast Asia, particularly Indonesia and the Philippines.

64. Ghost fishing is the result of nets and other fishing materials that are accidentally or intentionally abandoned in the sea.

65. www.seafoodsource.com/features/global-impacts-of-trawling-quantified-in-new-study.

66. The working group consisted of representatives from the Australian, state and Northern Territory governments, including representatives from both the Department of the Environment, Water, Heritage and the Arts, and the Department of Agriculture, Fisheries and Forestry.

67. http://archive.epi.yale.edu/epi/issue-ranking/fisheries.

68. The list of Friend of the Sea-approved fisheries is available at www.friendofthesea.org/fisheries.asp?ID=71.

References

Afflerback et al. (2014), "A global survey of 'TURF-reserves', Territorial Use Rights for Fisheries coupled with marine reserves", *Global Ecology and Conservation*, Vol. 2, Elsevier, Amsterdam, pp. 97-106.

Agrawal, A. et al. (2013), "Economic contributions of forests", background paper prepared for the United Nations Forum on Forests, Istanbul, 20 March 2013, www.un.org/esa/forests/pdf/session_documents/unff10/EcoContrForests.pdf.

Andrade, G.S.M. and J.R. Rhodes (2012), "Protected areas and local communities: An inevitable partnership toward successful conservation strategies?", *Ecology and Society*, Vol. 17/4: 14, The Resilience Alliance, http://dx.doi.org/10.5751/ES-05216-170414.

ANSAB (2005), *Nepal NTFP Alliance: Final Report*, Asia Network for Sustainable Agriculture and Bioresources, Kathmandu.

Ayele, G.K. et al. (2015), "The economic cost of upland and gully erosion on subsistence agriculture for a watershed in the Ethiopian highlands", *African Journal of Agricultural and Resource Economics*, Vol. 10 No. 4, African Association of Agricultural Economists, Nairobi, pp. 265-278.

BBOP (2017), Biodiversity Offsets website, Business and Biodiversity Offsets Programme, Washington, DC, http://bbop.forest-trends.org/pages/biodiversity_offsets (accessed 3 October 2016).

BBOP (2012), *Standard on Biodiversity Offsets*, BBOP, Washington, DC.

Bellassen, V. and S. Luyssaert (2014), "Carbon sequestration: Managing forests in uncertain times", *Nature*, Vol. 506/7487, Springer Nature, pp.153-55.

BirdLife International (2013), "Vultures are under threat from the veterinary drug diclofenac", www.birdlife.org/datazone/sowb/casestudy/156 (accessed 16 September 2016).

Blackman, A. and R. Woodward (2010), "User financing in a national payments for environmental services program: Costa Rican hydropower", RFF Discussion Paper, No. 09-04-REV, Resources for the Future, Washington, DC.

Bladon, A. et al. (2016), "Payments for ecosystem services in developing world fisheries", *Fish and Fisheries*, Vol. 17/3, John Wiley & Sons Ltd.

Brack, D. (2015), "Reducing deforestation in agricultural commodity supply chains using public procurement policy", Chatham House, The Royal Institute of International Affairs, London, www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20150902AgriculturalCommoditiesDeforestationBrack.pdf.

Bremer, L.L. and K.A. Farley (2010), "Does plantation forestry restore biodiversity or create green deserts? A synthesis of the effects of land-use transitions on plant species richness", *Biodiversity and Conservation*, Vol. 19/14, Springer Netherlands, pp. 3893-3915.

Brockerhoff, E.G. et al. (2008), "Plantation forests and biodiversity: Oxymoron or opportunity?" *Biodiversity and Conservation*, Vol. 17/5, Springer Science+Business Media, pp. 925-951.

Bruvoll, A., J. M. Skjelvik and H. Vennemo (2011), *Reforming Environmentally Harmful Subsidies: How to Counteract Distributional Impacts*, Nordic Council of Ministers, Copenhagen.

Carnus, J.M. et al. (2006), "Planted forests and biodiversity", *Journal of Forestry,* Vol. 104, Society of American Foresters, Washington, DC, pp. 65-77.

CBD (2011), *Mainstreaming biodiversity into national sectoral and cross-sectoral strategies, polices, plans and programs, Module 3*, Convention on Biological Diversity, Montreal, https://www.cbd.int/doc/training/nbsap/b3-train-mainstream-revised-en.pdf.

CBD (2010), "Outcomes of the global expert workshop on biodiversity benefits of reducing emissions from deforestation and forest degradation in developing countries", Convention on Biological Diversity, Nairobi.

CGDD (2013), «Quelle évaluation économique pour les services écosystémiques rendus par les prairies en France métropolitaine?», *Études et documents* of SEEIDD (Service de l'Économie, de l'Évaluation et de l'Intégration du Développement Durable) of the Commissariat Général au Développement Durable, Paris, No. 92.

Chao, S. (2012), *Forest Peoples: Numbers across the World*, Forest Peoples Programme, Stratford.

Chaudhary, A. et al. (2016), "Impact of forest management on species richness: Global meta-analysis and economic trade-offs", *Scientific Reports*, Vol. 6, Springer Nature.

Chiabai, A. et al. (2011), "Economic assessment of forest ecosystem services losses: Cost of policy inaction", *Environmental and Resource Economics*, Vol. 50/3, Springer Netherlands, pp. 405-445.

Christy, F.T. (1982), "Territorial use rights in marine fisheries: Definitions and conditions," FAO (Food and Agricultural Organization of the United Nations) Fisheries Technical Paper 227.

Cisneros, P. and J. McBreen (2010), "Overlap of indigenous territories and protected areas in South America: Executive summary", IUCN (International Union for Conservation of Nature) and DFID (Department for International Development), Quito, Ecuador.

Cuthbert, R.J. et al. (2015), "Continuing mortality of vultures in India associated with illegal veterinary use of diclofenac and a potential threat from nimesulide", *Oryx*, Vol. 50/1, Fauna and Flora International, pp. 104-112. https://doi.org/10.1017/S003060531500037X.

David and Lucile Packard Foundation (2014), *A Marine Conservation Assessment in Peru, December,* www.fondationensemble.org/wp-content/uploads/2015/02/ACS-Marine-Conservation-Assessment-of-Peru-final.pdf.

DEADP (2007), *Provincial Guideline on Biodiversity Offsets*, Department of Environmental Affairs and Development Planning, Republic of South Africa, Provincial Government of the Western Cape, Cape Town, www.westerncape.gov.za/text/2007/3/pgwcoffsetsguidelinedraft_5march_07.pdf.

Dethier, J. and A. Effenberger (2012), "Agriculture and development: A brief review of literature", *Economic Sytems*, Vol. 36/2, Elsevier, pp. 175-205.

Deuffic, P. et al. (2015) *Forest Land Ownership Change in France*, COST Action FP1201 FACESMAP Country Reports, European Forest Institute Central-East and South-East European Regional Office, Vienna, http://facesmap.boku.ac.at/library/FP1201_Country%20Report_FRANCE.pdf.

Dudley, N. (2008), *Guidelines for Applying Protected Area Management Categories*, IUCN (International Union for Conservation of Nature), Gland, Switzerland.

Dudley, N. and A. Phillips (2006), "Forests and protected areas: Guidance on the use of the IUCN protected area management categories", *Best Practice Protected Area Guidelines Series*, No. 012, IUCN, Gland, Switzerland, and Cambridge, UK.

EBI (2014), *Ethiopia's Fifth National Report to the Convention on Biological Diversity*, Ethiopian Biodiversity Institute, Government of Ethiopia, Addis Ababa.

EIA (2012), "The laundering machine: How fraud and corruption in Peru's concession system are destroying the future of its forests", Environmental Investigation Agency, Washington, DC, and London.

EIA (2009), "Peru's forest sector: Ready for the new international landscape?", EIA, Washington, DC, and London.

EKZNW (2009), *Norms and Standards for Biodiversity Offsets: KwaZulu-Natal Province, South Africa*, Ezemvelo KZN Wildlife, Pietermaritzburg.

ELD Initiative (2015), *The Value of Land: Prosperous Lands and Positive Rewards through Sustainable Land Management,* The Economics of Land Degradation Initiative, Bonn.

Ehler, C. (2014), *A Guide to Evaluating Marine Spatial Plans*, IOC (Intergovernmental Oceanographic Commission) Manuals and Guides, No. 70, ICAM (Integrated Coastal Area Management) Dossier 8, UNESCO, Paris.

EU FLEGT (2016), *EU Forest Law Enforcement, Governance and Trade Facility,* www.euflegt.efi.int/about-flegt.

Fan, M. et al. (2012), "Improving crop productivity and resource efficiency to ensure food security and environmental quality in China", *Journal of Experimental Botany*, Vol. 63/1, Oxford University Press, pp. 13-24, https://doi.org/10.1093/jxb/err248.

FAO (2017), "Community-based forestry", Food and Agriculture Organization of the United Nations, Rome, www.fao.org/forestry/participatory.

FAO (2016a), *The State of World Fisheries and Aquaculture 2016: Contributing to Food Security and Nutrition for All*, FAO, Rome.

FAO (2016b), *Global Forest Resources Assessment 2015: How Are the World's Forests Changing?*, second edition, FAO, Rome, www.fao.org/3/a-i4793e.pdf.

FAO (2016c), *State of the World's Forests 2016: Forests and Agriculture: Land-Use Challenges and Opportunities*, FAO, Rome, www.fao.org/3/a-i5588e.pdf.

FAO (2015), *Global Forest Resources Assessment 2015: Desk Reference*, FAO, Rome, www.fao.org/3/a-i4808e.pdf.

FAO (2014a), "Aqauastat water withdrawal by sector, around 2007" (updated 2014), FAO, Rome, www.fao.org/nr/water/aquastat/tables/WorldData-Withdrawal_eng.pdf.

FAO (2014b), *State of the World's Forests: Enhancing the Socioeconomic Benefits from Forests,* FAO, Rome, www.fao.org/3/a-i3710e.pdf.

FAO (2014c), *The State of World Fisheries and Aquaculture 2014: Opportunities and Challenges*, FAO, Rome.

FAO (2014d), *Contribution of the Forestry Sector to National Economies, 1990-2011*, Forest Finance Working Paper, FSFM/ACC/09, FAO, Rome.

FAO (2013a), "Rewarding water-related ecosystem services in the Canete Basin, Peru", *Case Studies on Remuneration of Positive Externalities (RPE)/Payments for Environmental Services (PES)*, prepared for the multi-stakeholder dialogue, 12-13 September 2013, FAO, Rome.

FAO (2013b), "The Vittel case: A public-private partnership in the mineral water industry", *Case Studies on Remuneration of Positive Externalities (RPE)/Payments for Environmental Services (PES)*, prepared for the multi-stakeholder dialogue, 12-13 September 2013, FAO, Rome.

FAO (2013c), "No free lunches: PES and the funding of agricultural biodiversity conservation – Insights from a competitive tender for quinoa-related conservation services in Bolivia and Peru", *Case Studies on Remuneration of Positive Externalities (RPE)/Payments for Environmental Services (PES)*, prepared for the multi-stakeholder dialogue 12-13 September 2013, FAO, Rome.

FAO (2012), *FAO Statistical Yearbook 2012,* FAO, Rome.

FAO (2002), "Land tenure and rural development", *FAO Land Tenure Studies*, No. 3, FAO, Rome.

FAO (1995), *Forest Resources Assessment 1990: Global Synthesis,* FAO, Rome, www.fao.org/docrep/007/v5695e/V5695E00.htm.

FIDH (2009), *Peru – Bagua: Bloodshed in the Context of Amazon Protest – Urgent Need for Good Faith Dialogue,* International Federation for Human Rights, Paris.

FLEGT Licensed Timber (2016), "FLEGT and VPA countries", www.flegtlicence.org/vpa-countries (accessed 3 October 2016).

Flynn, D.F.B. et al. (2009), "Loss of functional diversity under land use intensification across multiple taxa", *Ecology Letters,* Vol. 12, John Wiley & Sons Ltd., pp. 22-33, https://doi.org/10.1111/j.1461-0248.2008.01255.x.

Forest Trends (2015), "Indonesia's legal timber supply gap and implications for expansion of milling capacity: A review of the *Road Map for the Revitalization of the Forest Industry, Phase 1*", www.forest-trends.org/publication_details.php?publicationID=4843.

FSC (2018), Forest Stewardship Council International, website, Bonn, https://ic.fsc.org/en (accessed 7 July 2018).

FSC (2013), "Patneshwari Agri Cooperative Ltd. in India", January, FSC International, Bonn, https://ic.fsc.org/preview.india.a-2197.pdf.

FSC (2011), *Celebrating Success: Stories of FSC Certification*, FSC International Center, Bonn.

German Environment Agency (2014), *Environmentally Harmful Subsidies in Germany: Updated Edition 2014*, Technical Brochure, German Environment Agency (Umweltbundsamt), Dessau-Roßlau, www.umweltbundesamt.de/sites/default/files/medien/376/publikationen/environmentally_harmful_subsidies_in_germany_2014.pdf.

Gibbons, P. and D.B. Lindenmayer (2007), "Offsets for land clearing: No net loss or the tail wagging the dog?", *Ecological Management and Restoration*, Vol. 8/1, Ecological Society of Australia and John Wiley & Sons Australia Ltd., pp. 26-31.

Gilmour, D. (2016), *Forty Years of Community-Based Forestry: A Review of Its Extent and Effectiveness*, FAO Forestry Paper, No. 176, FAO, Rome, www.fao.org/3/a-i5415e.pdf.

GIZ (2015), *GIZ Ethiopia: Lessons and Experiences in Sustainable Land Management*, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH, Bonn and Eschborn, www.giz.de/en/downloads/giz2015-en-lessons-experience-sustainable-land-management-ethiopia.pdf.

GIZ (2014), "Payment for Environmental Services (PES) to conserve agricultural biodiversity", GIZ GmbH, Eschborn, www.giz.de/expertise/downloads/giz2014-en-pes.pdf.

Global Nature Fund and Bodensee-Stiftung (2014), "Biodiversity criteria in standards and quality labels for the food industry: Baseline report", https://www.globalnature.org/en/biodiversity-food-industry.

Government of Madagascar (2015), "Madagascar's Intended Nationally Determined Contribution", submitted to UNFCCC in September 2015, www4.unfccc.int/ndcregistry/PublishedDocuments/Madagascar%20First/Madagascar%20INDC%20Eng.pdf.

Green, R.E. et al. (2016), "Potential threat to Eurasian griffon vultures in Spain from veterinary use of the drug diclofenac", *Applied Ecology*, Vol. 53, British Ecological Society, pp. 993-1003, https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/1365-2664.12663.

Greenspan, E. (2014), "Protestors and UN report test Peru's new indigenous peoples' consultation law", *The Politics of Poverty*, 16 May 2014, Oxfam America, Boston and Washington, DC., http://politicsofpoverty.oxfamamerica.org/2014/05/protestors-un-report-test-peru-new-indigenous-peoples-consultation-law/.

Greenspan, E. (2011), "Peru's Congress passes precedent-setting Consultation Law", *The Politics of Poverty,* 2 September 2011, Oxfam America, Boston and Washington, DC, https://politicsofpoverty.oxfamamerica.org/2011/09/peru-congress-passes-precedent-setting-consultation-law/.

Hardt, E. et al. (2015), "Does certification improve biodiversity conservation in Brazilian coffee farms?' *Forest Ecology and Management*, Vol. 357, Elsevier, pp. 181-194, https://doi.org/10.1016/j.foreco.2015.08.021.

Hartley, M.J. (2002), "Rationale and methods for conserving biodiversity in plantation forests", *Forest Ecology and Management*, Vol. 155/1-3, Elsevier, pp. 81-95, https://doi.org/10.1016/S0378-1127(01)00549-7.

Heal, G.B. et al. (2003), "Genetic diversity and interdependent crop choices in agriculture", *Resource and Energy Economics,* Vol. 26/2, Elsevier, pp. 175-184, http://dx.doi.org/10.1016/j.reseneeco.2003.11.006.

Hersey, F. and M. Kovacs (2015), "New Chinese fertiliser VAT to have limited industry impact", Industrial Minerals, London, www.indmin.com/Article/3483296/New-Chinese-fertiliser-VAT-to-have limited-industry-impact.html.

Holden, S.T. and K. Otsuku (2014), "The roles of land tenure reforms and land markets in the context of population growth and land use intensification in Africa", *Food Policy*, Vol. 48, Elsevier, pp. 88-97, http://dx.doi.org/10.1016/j.foodpol.2014.03.005.

Hosonuma, N. et al. (2012) "An assessment of deforestation and forest degradation drivers in developing countries", *Environmental Research Letters*, Vol. 7/4, IOP Publishing Ltd., http://dx.doi.org/10.1088/1748-9326/7/4/044009.

Human Rights Watch (2013), "The dark side of green growth: Human rights impacts of weak governance in Indonesia's forestry sector", 15 July 2013, Human Rights Watch, New York, www.hrw.org/report/2013/07/15/dark-side-green-growth/human-rights-impacts-weak-governance-indonesias-forestry.

Huong, T.T.T., M. Zeller and C.T. Hoanh (2014), "The 'Five Million Hectare Reforestation Program' in Vietnam: An analysis of its implementation and transaction costs: A case study in Hoa Binh province", *Quarterly Journal of International Agriculture*, Vol. 53/4, Humboldt-Universität zu Berlin (Humboldt University of Berlin), Berlin, pp. 341-375.

IEG (2013), *Managing Forest Resources for Sustainable Development: An Evaluation of World Bank Group Experience,* Independent Evaluation Group, World Bank, Washington, DC.

IPBES (2018), "Biodiversity and Nature's Contributions Continue Dangerous Decline, Scientists Warn", Media Release, https://www.ipbes.net/news/media-release-biodiversity-nature%E2%80%99s-contributions-continue-%C2%A0dangerous-decline-scientists-warn.

IPBES (2016), "Summary for policymakers of the assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food. Production", https://www.ipbes.net/system/tdf/downloads/pdf/ipbes_4_19_annex_ii_spm_pollination_en.pdf?file=1&type=node&id=28363.

IUCN (2016), *IUCN Policy on Biodiversity Offsets,* IUCN.

Jakobsson, C. (ed.) (2014), *Sustainable Agriculture*, Ecosystem Health and Sustainable Agriculture 1, Baltic University Press, Uppsala.

Jardim, A. and E. Caldas (2012), "Brazilian monitoring programs for pesticide residues in food – Results from 2001 to 2010", *Food Control*, Vol. 25/2, Elsevier, pp. 607-616, http://dx.doi.org/10.1016/j.foodcont.2011.11.001.

Jones, T.G. (2013), "Shining a light on Madagascar's mangroves", *Madagascar Conservation & Development*, Vol. 8/1, http://dx.doi.org/10.4314/mcd.v8i1.1.

Kanel, K.R., R.P. Poudyal and J.P. Baral (2005), "Nepal community forestry 2005", in *First Regional Community Forestry Forum: Regulatory Frameworks for Community Forestry in Asia*, Proceedings of a Regional Forum, Bangkok, 24-25 August 2005, pp. 69-83.

Karsenty, A. (2015), "Using PES to achieve 'zero deforestation' agriculture", *Perspective*, No. 36, CIRAD, Paris.

Kissinger, G., M. Herold and V.D. Sy (2012), *Drivers of Deforestation and Forest Degradation: A Synthesis Report,* Lexeme Consulting, Vancouver.

Kraxner, F. et al. (2018), "Mapping certified forests for sustainable management – A global tool for information improvement through participatory and collaborative mapping", *Forest Policy and Economics*, Vol. 83, Elsevier, pp. 10-18.

Leverington, F. et al. (2010), *Management effectiveness evaluation in protected areas – a global study*, Second edition 2010, The University of Queensland, Brisbane, Australia.

Liddick, D. (2014), "The dimensions of a transnational crime problem: the case of iuu fishing." *Trends in Organized Crime*, Vol 17, 4.

Liu, J.Y. (2013), "Status of marine biodiversity of the China seas", *PLoS ONE*, Vol. 8/1, Public Library of Science, San Francisco, https://doi.org/10.1371/journal.pone.0050719.

Liu, Z. and Henningsen A. (2016), "The effects of China's Sloping Land Conversion Program on agricultural households", *Agricultural Economics*, Vol 47 (3).

Loayza, N.V. and C. Raddatz (2010), "The composition of growth matters for poverty alleviation"*, Journal of Development Economics*, Vol. 93/1, Elsevier, pp. 137-151, http://dx.doi.org/10.1016/j.jdeveco.2009.03.008.

MAAF (2016), The Agroecology Project in France, agriculture.gouv.fr.

MAAF (2013), "Agroecology: Different Definitions, Common Principles", *Center for Studies and Strategic Foresight*, No. 59, http://agreste.agriculture.gouv.fr/IMG/pdf/analyse591307anglais.pdf.

MAAF (n.d.), "Agroecology In France", http://agriculture.gouv.fr/telecharger/58144?token=84c0ffff0caf34ea89f434e9745865a2.

Macfadyen, G., et al. (2009), *Abandoned, lost or otherwise discarded fishing gear*, UNEP Regional Seas Reports and Studies No. 185, FAO Fisheries and Aquaculture Technical Paper No. 523, UNEP/FAO, Rome.

Maclaughlin, A. and P. Mineau (1995), "The impact of agricultural practices on biodiversity", *Agriculture, Ecosystems and Environment*, Vol. 55/3, Elsevier, pp. 201-212.

Makino, S. (2007), "Degradation of longicorn beetle (Coleoptera, Cerambycidae, Disteniidae) fauna caused by conversion from broad-leaved to man-made conifer stands of Cryptomeria japonica (Taxodiaceae) in central Japan", *Ecological Research*, Vol. 22/3, Springer-Verlag, pp. 372-381.

Manuel, J. et al. (2016), "Key ingredients, challenges and lessons from biodiversity mainstreaming in South Africa: People, products, process", *OECD Environment Working Papers*, No. 107, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlzgj1s4h5h-en.

MARD (2011), *The 5MHRP Assessment Report*, Ministry of Agriculture and Rural Development, Hanoi.

May, P.H. et al. (2015), "Environmental reserve quotas in Brazil's new forest legislation: An ex ante appraisal", *CIFOR Occasional Paper*, No. 131, Center for International Forestry Research, Bogor, Indonesia.

McElwee, P. (2009), "Reforesting 'bare hills' in Vietnam: Social and environmental consequences of the 5 Million Hectare Reforestation Program", *Ambio*, Vol. 38/6, Springer Netherlands, pp. 325-333.

McFarland, W., S. Whitley and G. Kissinger (2015), "Subsidies to key commodities driving forest loss: Implications for private climate finance", working and discussion papers, Overseas Development Institute, London.

MEP (2014), *China's Fifth National Report on the Implementation of the Convention on Biological Diversity*, Ministry of Environment Protection of China, Beijing.

MFSC (2014), *Nepal Fifth National Report to Convention On Biological Diversity*, Ministry of Forests and Soil Conservation, Government of Nepal, Kathmandu.

Milder, J.C. and Newsom, D. (2015), *2015 SAN/Rainforest Alliance Impacts Report: Evaluating the Effects of the SAN/Rainforest Alliance Certification System on Farms, People, and the Environment*, Rainforest Alliance and Sustainable Agriculture Network, New York and Cuauhtémoc, Mexico.

Mirzabaev, A., E. Nkonya, and J. von Braun (2015), "Economics of sustainable land management", *Current Opinion in Environmental Sustainability*, vol. 15, pp. 9-19

Miteva, D.A. et al. (2012), "Evaluation of biodiversity policy instruments: what works and what doesn't?", *Oxford Review of Economic Policy*, Vol. 28/1, Oxford University Press, pp. 69-92.

MMA (2015), *Brazil Fifth National Report to the Convention on Biological Diversity*, Ministry of the Environment, Brasília, www.cbd.int/doc/world/br/br-nr-05-en.pdf.

MoEFCC (2015), "Environment Ministry recommends ban on multidose vial of diclofenac to save vultures", 18 September 2015, Ministry of Environment, Forest and Climate Change, Government of India, http://pib.nic.in/newsite/PrintRelease.aspx?relid=127003.

MoEFCC (2014), *India's Fifth National Report to the Convention on Biological Diversity 2014*, MoEFCC, New Delhi.

MONRE (2014), *Vietnam's Fifth National Report to the United Nations Convention on Biological Diversity 2009-2013,* Ministry of Natural Resources and Environment, Hanoi.

MSC (2016), *Global Impacts Report 2016*, Marine Stewardship Council, London.

Narloch U., A.G. Drucker and U. Pascual (2011), "Payments for agrobiodiversity conservation services for sustained on-farm utilization of plant and animal genetic resources", *Ecological Economics*, Vol. 70/11, Elsevier, pp. 1837–1845, https://dx.doi.org/10.1016/j.ecolecon.2011.05.018.

Nelson, A. and K.M. Chomitz (2009), "Protected area effectiveness in reducing tropical deforestation: A global analysis of the impact of protection status", *IEG Evaluation Brief*, No. 7, World Bank, Washington, DC.

Nepstad, D. et al. (2014), "Slowing Amazon deforestation through public policy and interventions in beef and soy supply chains", *Science*, Vol. 344, Issue 6188, pp. 1118-1123, https://doi.org/10.1126/science.1248525.

Nguyen, H.L. (2012) "Agricultural land tenure security under Vietnamese land law: legislative changes and improvements since the economic reform", *Land Tenure Journal*, No. 2, Vol. 2, FAO, pp. 66-93.

Niraula, R.R. et al. (2013), "Measuring impacts of community forestry program through repeat photography and satellite remote sensing in the Dolakha district of Nepal", *Journal of Environmental Management*, Vol. 126, Elsevier, pp. 20-29.

OECD (2018), Combatting Illegal, Unreported and Unregulated Fishing.

OECD (2017), *Marine Protected Areas: Economics, Management and Effective Policy Mixes*, OECD Publishing, Paris, https://doi.org/10.1787/9789264276208-en.

OECD (2016a), *Agricultural Policy Monitoring and Evaluation 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/agr_pol-2016-en.

OECD (2016b), *Biodiversity Offsets: Effective Design and Implementation*, OECD Publishing, Paris, https://doi.org/10.1787/9789264222519-en.

OECD (2016c), Database on Policy Instruments for the Environment (PINE), OECD Publishing, Paris, www2.oecd.org/ecoinst/queries/Default.aspx.

OECD (2016d), *Environmental Performance Reviews: France 2016*, OECD Environmental Performance Reviews, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264252714-en.

OECD (2016e), *Farm Management Practices to Foster Green Growth*, OECD Green Growth Studies, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264238657-en.

OECD (2016f), Producer and Consumer Supports Database, OECD Publishing, Paris, www.oecd.org/agriculture/agricultural-policies/producerandconsumersupportestimatesdatabase.htm.

OECD (2016g), *Policy Perspectives on Environmental Labelling and Information Schemes*, OECD Publishing, Paris.

OECD (2016h), "Protected area indicators (forthcoming)", OECD Environment Statistics (database), OECD Publishing, Paris.

OECD (2015a), *Agricultural Policies in Viet Nam 2015,* OECD Food and Agricultural Reviews, OECD Publishing, Paris, https://doi.org/10.1787/9789264235151-en.

OECD (2015b), *Environmental Performance Reviews: Brazil 2015*, OECD Environmental Performance Reviews, OECD Publishing, Paris, https://doi.org/10.1787/9789264240094-en.

OECD (2015c), *Environment at a Glance 2015: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/9789264235199-en.

OECD (2015c), *Green Growth in Fisheries and Aquaculture*, OECD Green Growth Studies, OECD Publishing, Paris, https://doi.org/10.1787/9789264232143-en.

OECD (2015d), *Public Goods and Externalities: Agri-Environmental Policy Measures in Selected OECD Countries*, OECD Publishing, Paris.

OECD (2015e), *Review of Fisheries: Policies and Summary Statistics 2015*, OECD Publishing, Paris, https://doi.org/10.1787/9789264240223-en.

OECD (2013a), *Compendium of Agri-environmental Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264186217-en.

OECD (2013b), *Energy Use in Fisheries,* OECD Publishing, Paris.

OECD (2013c), *Environmental Performance Reviews: Mexico 2013*, OECD Environmental Performance Reviews, OECD Publishing, Paris, DOI: 10.1787/9789264180109-en

OECD (2013d), *Environmental Performance Reviews: South Africa 2013*, OECD Environmental Performance Reviews, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264202887-en.

OECD (2013e), *OECD Investment Policy Reviews: Costa Rica 2013*, OECD Investment Policy Reviews, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264203952-en.

OECD (2013f), *Policy Instruments to Support Green Growth in Agriculture,* OECD Green Growth Studies, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264203525-en.

OECD (2013g), *Scaling-up Finance Mechanisms for Biodiversity,* OECD Publishing, Paris, https://doi.org/10.1787/9789264193833-en.

OECD (2012), *OECD Environmental Outlook to 2050: The Consequences of Inaction*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264122246-en.

OECD (2011), *Food and Agriculture,* OECD Green Growth Studies, OECD Publishing, Paris, https://doi.org/10.1787/9789264107250-en.

OECD (2010), *Paying for Biodiversity: Enhancing the Cost-Effectiveness of Payments for Ecosystem Services*, OECD Publishing, Paris, https://doi.org/10.1787/9789264090279-en.

OECD (2008a), *OECD Environmental Outlook to 2030*, OECD Publishing, Paris, https://doi.org/10.1787/9789264040519-en.

OECD (2008b), *Environmental Performance of Agriculture in OECD Countries since 1990,* OECD Publishing, Paris.

OECD (2007), *Subsidy Reform and Sustainable Development: Political Economy Aspects*, OECD Sustainable Development Studies, OECD Publishing, Paris, https://doi.org/10.1787/9789264019379-en.

OECD-ECLAC (2017), *OECD Environmental Performance Reviews: Peru 2017*, OECD Publishing, Paris, dx.doi.org/10.1787/9789264283138-en.

OECD/FAO (2016), *OECD-FAO Guidance for Responsible Agricultural Supply Chains*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264251052-en.

OECD/FAO (2015), *Fishing for Development*, The Development Dimension, FAO, Rome, http://dx.doi.org/10.1787/9789264232778-en.

ONF (2017), "Gérer les forêts", website of the National Forestry Office of France www.onf.fr/gestion_durable/sommaire/action_onf/gerer/@@index.html (accessed 17 January 2017).

Pandey, G.A. and B.R. Paudyall (2015), *Protecting forests, improving livelihoods – Community forestry in Nepal,* Fern, September 2015, http://fern.org/node/199.

Payn, T. et al. (2015), "Changes in planted forests and future global implications", *Forest Ecology and Management,* Vol. 352, Elsevier, pp. 57-67.

PBL (2014), *How Sectors Can Contribute to Sustainable Use and Conservation of Biodiversity*, CBD Technical Series, No. 79, PBL Netherlands Environmental Assessment Agency, The Hague, www.cbd.int/doc/publications/cbd-ts-79-en.pdf.

Pe'er. G. et al. (2014), "EU agricultural reform fails on biodiversity", *Science*, Vol. 344/6188, AAAS (American Association for the Advancement of Science), Washington, DC, pp. 1090-1092, http://dx.doi.org/10.1126/science.1253425.

PEFC (2016) "Promoting sustainable forest management around the world: PEFC & FSC", Programme for the Endorsement of Forest Certification, Sheffield, www.pefc.co.uk/publications/pefc-promoting-sustainable-forest-management-around-the-world.

Peng, S., Q. Tang and Y. Zou (2009), "Current status and challenges of rice production in China", *Plant Production Science*, Vol. 12/1, Taylor & Francis, pp. 1-6, https://doi.org/10.1626/pps.12.3.

Perrot-Maître, D. (2006), "The Vittel payments for ecosystem services: A 'perfect' PES case?", IIED, London.

Pham T.T. et al. (2013), "Payments for forest environmental services in Vietnam: From policy to practice", *CIFOR Occasional Paper*, No. 93, CIFOR, Bogor, Indonesia, https://dx.doi.org/10.17528/cifor/004247.

Porras, I. et al. (2013), *Learning from 20 years of Payments for Ecosystem Services in Costa Rica*, IIED, London.

Porter-Bolland, L. et al. (2012), "Community managed forests and forest protected areas: An assessment of their conservation effectiveness across the tropics", *Forest Ecology and Management*, Vol. 268, Elsevier, pp. 6-17, http://dx.doi.org/10.1016/j.foreco.2011.05.034.

Potts, J. et al. (2014), *The State of Sustainability Initiatives Review 2014: Standards and the Green Economy*, International Institute for Sustainable Development (IISD) and IIED, Winnipeg/London.

Poux, X. (2013), "Biodiversity and agricultural systems in Europe: Drivers and issues for the CAP reform", Studies No. 03/13, IDDRI (Institut du développement durable et des relations internationales), Paris.

Pretty, J. and Z. Bharucha (2014), "Sustainable intensification in agricultural systems", *Annals of Botany*, Vol. 114/ 8, pp. 1571–1596, https://doi.org/10.1093/aob/mcu205.

Qiao, Y. (2001), "Organic agriculture development in China" in *The World of Organic Agriculture: Statistics and Emerging Trends* (2011), FiBL (Research Institute of Organic Agriculture) and IFOAM – Organics International, Frick, Switzerland, and Bonn.

Rajaosafara, S. and T. du Payrat (2009), *Sustainable Development in Madagascar: A Case Study*, Unima Group and WWF, http://unima.com/en/UNIMA_WWF.pdf.

Rakotomanana, H., R. Jenkins and J. Ratsimbazafy (2013), "Conservation challenges for Madagascar in the next decade", in *Conservation Biology: Voices from the Tropics*, John Wiley & Sons Ltd., pp.33-39.

Ratnadass, A. et al. (2012) "Plant species diversity for sustainable management of crop pests and diseases in agroecosystems: A review", *Agronomy for Sustainable Development,* Vol. 32/1, Springer-Verlag, pp. 273-303, https://doi.org/10.1007/s13593-011-0022-4.

Rautner, M., M. Leggett and F. Davis (2013), *The Little Book of Big Deforestation Drivers*, Global Canopy Programme, Oxford.

Rénique, G. (2009) "Law of the Jungle in Peru: Indigenous Amazonian uprising against neoliberalism', *Socialism and Democracy*, Vol. 23/3, Taylor & Francis, pp. 117-135, https://doi.org/10.1080/08854300903290835.

Rodriguez-Ferrand, G. (2011), "Peru: New law granting right of consultation to indigenous peoples", *Global Legal Monitor*, 27 September 2011, Library of Congress, Washington, DC, www.loc.gov/law/foreign-news/article/peru-new-law-granting-right-of-consultation-to-indigenous-peoples/.

Rueda, X., N.E. Thomas and E.F. Lambin (2015) "Eco-certification and coffee cultivation enhance tree cover and forest connectivity in the Colombian coffee landscapes", *Regional Environmental Change,* Vol. 15/1, Springer Berlin Heidelberg, pp. 25-33, https://doi.org/10.1007/s10113-014-0607-y.

Sainteny, G. et al. (2012), *Public Incentives Harmful to Biodiversity*, Centre d'analyse strategique, Paris.

Samii, C. et al. (2014), "Effects of payment for environmental services (PES) on deforestation and poverty in low and middle income countries: A systematic review", *Campbell Systematic Reviews*, 2014 4/11, The Campbell Collaboration, Oslo, http://dx.doi.org/10.4073/csr.2014.11.

Sandhu, H. et al. (2015), "Significance and value of non-traded ecosystem services on farmland", *PeerJ,* 3:e762, https://doi.org/10.7717/peerj.762.

SCBD (2016a), Mainstreaming of biodiversity across sectors including agriculture forestry and fisheries, *Subsidiary Body on Scientific Technical and Technological Advice. Twentieth Meeting 25-30 April 2016 Item 13 of the Provisional agenda,* Secretariat of the Convention on Biological Diversity, Montreal.

SCBD (2016b), Strategic, scientific and technical issues related to the implementation of strategic plan for biodiversity 2011-2020; Biodiversity, food systems and agriculture. *Subsidiary Body on Scientific Technical and Technological Advice. Twentieth Meeting 25-30 April 2016 Item 13 of the Provisional agenda,* Secretariat of the Convention on Biological Diversity, Montreal.

SCBD (2014), *Global Biodiversity Outlook 4,* Secretariat of the Convention on Biological Diversity, Montreal.

SCBD (2010), *China – Country Profile, Biodiversity Facts*, Convention on Biological Diversity, Montreal, https://www.cbd.int/countries/profile/default.shtml?country=cn.

Sharma, S., S. Tripathi and T. Moerenhout (2015), *Rationalizing Energy Subsidies in Agriculture: A Scoping Study of Agricultural Subsidies in Haryana, India*, IISD, Winnipeg.

Smith, P. et al. (2014) "Agriculture, forestry and other land use (AFOLU)", in *Climate Change 2014: Mitigation of Climate Change – Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge and New York.

Smith, L.E.D. and I. Urey (2002), *Agricultural Growth and Poverty Reduction: A Review of Lessons from Post-Independence and Green Revolution Experience in India,* Department of Agricultural Sciences, Imperial College at Wye.

Soares-Filho, B. et al. (2014), "Cracking Brazil's forest code", *Science,* Vol. 344/6182, AAAS, Washington, DC, pp. 363-364, http://dx.doi.org/10.1126/science.1246663.

Sobrevila, C. (2008), *The Role of Indigenous Peoples in Biodiversity Conservation: The Natural but Often Forgotten Partners,* World Bank, Washington, DC.

Sthapit, B., S. Padulosi and B. Mal (2009), "Role of on-farm/in situ conservation and underutilised crops in the wake of climate change", presented at the National Symposium on Recent Global Developments in Management of Plant Genetic Resources, National Bureau of Plant Genetic Resources, New Delhi, 17-18 December 2009.

Tadesse, B., G. Tesfay and S.M. Gebreslase (2016), "Effect of integrated soil bunds on key soil properties and soil carbon stock in semi-arid areas of northern Ethiopia", *South African Journal of Plant and Soil*, 33/4, pp. 297-302, https://www.researchgate.net/publication/301901998_Effect_of_integrated_soil_bunds_on_key_soil_properties_and_soil_carbon_stock_in_semi-arid_areas_of_northern_Ethiopia.

Takahashi, R. and Y. Todo (2013), "The impact of a shade coffee certification program on forest conservation: A case study from a wild coffee forest in Ethiopia", *Journal of Environmental Management*, Vol. 130, pp. 48-54, https://doi.org/10.1016/j.jenvman.2013.08.025.

TEEB (The Economics of Ecosystems and Biodiversity) (2015), *TEEB for Agriculture & Food: Interim Report*, United Nations Environment Programme, Geneva.

Tissot, W. and Y. Kohler (2013), "Integration of nature protection in forest policy in France", INTEGRATE Country Report, EFICENT-OEF (Central European Regional Office of the European Forest Institute – Observatory for European Forests), Freiburg.

To, X.P. and Tran, H.N. (2014), "Rubber expansion and forest protection in Vietnam", Tropenbos International Viet Nam, Hue.

UNDP (2012), *Catalysing Ocean Finance: Volume I – Transforming Markets to Restore and Protect the Global Ocean*, United Nations Development Programme, New York, www.undp.org/content/undp/en/home/librarypage/environment-energy/water_governance/ocean_and_coastalareagovernance/catalysing-ocean-finance.html.

UNEP-WCMC (2011), *Review of the Biodiversity Requirements of Standards and Certification Schemes: A Snapshot of Current Practices*, Technical Series No. 63, Secretariat of the Convention on Biological Diversity, Montreal.

UNFCCC (2011), "Report of the Conference of the Parties on its sixteenth session", Addendum, Part Two: Action taken by the Conference of the Parties at its sixteenth session, United Nations Framework Convention on Climate Change, Decision 1/CP.16.

UNGA (2015), "Transforming our world: The 2030 Agenda for Sustainable Development", resolution adopted by the General Assembly on 25 September 2015, A/RES/70/1, United Nations General Assembly, New York, www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E.

UNGA (2008), "Non-legally binding instrument on all types of forests", resolution adopted by the General Assembly on 17 December 2007, A/RES/62/98, UNGA, New York, www.un.org/en/ga/search/view_doc.asp?symbol=A/RES/62/98.

UNHRC (2014), "Report of the Special Rapporteur on the rights of indigenous peoples, Addendum: The situation of indigenous peoples' rights in Peru with regard to the extractive industries", 3 July, A/HRC/27/52/Add.3, www.refworld.org/docid/53eb3c774.html (accessed 27 June 2018).

VNFF (2016), "Assessment of the PFES Policy for the period of 2011-2015", Vietnam Forest Protection and Development Fund.

VNFF (2015), "Lessons and experiences from the implementation of the PFES in Viet Nam", presented at 6th ASEAN Social Forestry Network Conference, Shan State, Myanmar, 1-3 June 2015, Inle Lake, Shan State, Myanmar,

WDR (2008), *World Development Report 2008: Agriculture for Development*, World Bank, Washington, DC, https://doi.org/10.1596/978-0-8213-6807-7.

West, P.C. et al. (2014), "Leverage points for improving global food security and the environment", *Science*, Vol. 345/6194 AAAS, Washington, DC, pp. 325-328, https://doi.org/10.1126/science.1246067.

Wiggins, S. and J. Brooks (2010), "The use of input subsidies in developing countries", presented at the Global Forum on Agricultural Development, Poverty Reduction and Food Security, Paris, 29-30 November 2010.

Willer, H. and J. Lernoud (eds.) (2016), *The World of Organic Agriculture: Statistics and Emerging Trends 2016*, Research Institute of Organic Agriculture (FiBL) and IFOAM – Organics International, Frick, Switzerland, and Bonn.

World Bank (2018), World Development Indicators (database), http://data.worldbank.org/data-catalog/world-development-indicators (accessed 1 June 2018).

World Bank (2016), "Restoring the landscapes of Ethiopia's highlands: Enhancing livelihoods through scaling-up sustainable climate-smart land management practices and improving tenure security", 21 July 2016, www.worldbank.org/en/results/2016/07/21/restoring-the-landscapes-of-ethiopias-highlands-enhancing-livelihoods-through-scaling-up-sustainable-climate-smart-land-management-practices-and-improving-tenure-security.

World Bank (2014), World Development Indicators, inputs for agriculture, http://data.worldbank.org/indicator/AG.LND.AGRI.ZS?end=2013&start=1961&view=chart.

World Bank (2008), *World Development Report 2008: Agriculture for Development*, World Bank, Washington, DC.

Wunder S. (2006), "Are direct payments for environmental services spelling doom for sustainable forest management in the tropics?", *Ecology and Society*, Vol. 11/2.

Wunder, S. (2005), "Payments for environmental services: Some nuts and bolts", *CIFOR Occasional Paper,* No. 42, CIFOR, Bogor, Indonesia.

Wunder, S., S. Engel and S. Pagiola (2008), "Taking stock: A comparative analysis of payments for environmental service programs in developed and developing countries", *Ecological Economics,* Vol. 65/4, Elsevier, https://doi.org/10.1016/j.ecolecon.2008.03.010.

WWF (2015), "Peru's Forestry and Wildlife bylaws finally promulgated", 5 October 2015, www.wwf.org.pe/en/?254031/peru--forestry-and-wildlife-bylaws-finally-promulgated.

WWF (2014), "Peruvian government takes first steps towards responsible procurement of wood products", 13 November 2014, www.wwf.org.pe/en/?233073/peruviangovernmenttakesfirststepstowardsresponsibleprocurementofwoodproducts.

WWF (2012), "Living Forests Report: Chapter 4 – Forests and wood products, World Wide Fund for Nature, WWF International, Gland, Switzerland, http://d2ouvy59p0dg6k.cloudfront.net/downloads/living_forests_report_ch4_forest_products.pdf.

Young, J. and Lankester, K. (2013), "Catch shares in action: Peruvian anchoveta northern-central stock individual vessel quota program", Environmental Defense Fund.