PART II

Chapter 4

Conservation and sustainable use of biodiversity

Brazil is the world's most biodiverse country. This chapter reviews the current status and trends of Brazil's biodiversity, as well as pressures stemming from a range of sources. It examines Brazil's biodiversity policy and institutional framework, including its integrated strategy to combat deforestation. The chapter assesses progress in financing biodiversity conservation, mainstreaming biodiversity into sectoral policies and enhancing the knowledge base and economic valuation of Brazil's biodiversity and ecosystems.

1. Status and trends in Brazil's biodiversity

The world's most biologically diverse country, Brazil is home to around one-tenth of known species and more endemic species than most other countries (CBD, n.d).[1] It is the world's fifth-largest country, its territory spanning close to half of South America (8.5 million km^2). Its extensive coastline (about 7 500 km) borders a vast marine area (more than 4.5 million km^2). The Brazilian population is concentrated along the coast, where average population density is around six times the national average (see Basic Statistics).

Given the size of the country's territory, its physical characteristics vary enormously, as do climate, vegetation and land-use patterns. Brazil is host to six large terrestrial ecosystems, or biomes:[2] Amazon, Cerrado, Caatinga, Atlantic Forest, Pantanal and Pampa. The Amazon is the largest biome, occupying nearly half of Brazil's territory, followed by the Cerrado (Box 4.1). The Atlantic Forest and Cerrado biomes are two of the world's 35 biodiversity hotspots, which are defined as significant reservoirs of biodiversity confronted by high levels of threat (Conservation International, 2015).

1.1. Terrestrial ecosystems

Despite efforts to protect Brazil's natural wealth, pressures on terrestrial biodiversity persist. Agriculture and cattle farming, natural resource extraction and infrastructure development together have contributed to more than 80% of habitat loss. Other pressures include alien species and exotic diseases, overexploitation, pollution, fire and climate change (Figure 1.13). Overall, about 70% of the total territory still has its original vegetation, in various degrees of conservation (MMA, 2010). The share of original vegetation varies widely across biomes, with the Amazon and Pantanal having more than 80% and the Atlantic Forest biome, where nearly three-quarters of Brazilians live, about 20% (Figure 1.13).

Biodiversity conservation status varies widely across regions and states (Figure 4.1). The Biodiversity Conservation Index indicates that biodiversity in the North region is generally better preserved, owing to the larger native vegetation cover and extension of protected areas and indigenous lands, while many states in the South-east and South display lower index values (MMA, 2015). The index, however, does not consider the actual status of ecosystems within protected areas (Chapter 5).

Deforestation

Brazil has the second largest forest area in the world, second only to Russia (Figure 4.2), and is home to the world's largest rainforest (SBF, 2013). Its immense forest resources extend almost 5 million km^2 and almost two-thirds of its territory is covered with forest or other wooded land. Nearly all of Brazil's forests (98.5%) are natural, non-planted forests. While the rate of deforestation has significantly declined, Brazil is the country with the highest average annual reduction in total forest cover (Figure 4.2). Overall, total forest area has decreased by about 5% since 2000 and by 10% since 1990 (FAO, 2015).

Box 4.1. **Brazil's six terrestrial biomes**

Brazil's ecosystems have been mapped into six major terrestrial biomes by the Brazilian Institute of Geography and Statistics (IBGE). Each is briefly described below.

Amazon (49% of the territory): a moist broadleaf forest that represents about 30% of the world's tropical rainforest. It hosts more than 600 types of terrestrial and freshwater habitats and a vast stock of commercial timber and carbon. It is home to hundreds of indigenous peoples and traditional communities, such as rubber tappers, non-timber forest product harvesters and riverine people. The Amazon biome has been the world's most active agricultural frontier in terms of forest loss and CO_2 emissions. In 2009, total forest loss exceeded 18% of the original extent. In addition to agriculture and cattle ranching, pressures include forest fires, land grabbing, timber extraction, road construction, hydropower and mining projects.

Source: IBGE (2004), Map of terrestrial biomes.

Cerrado (24%): the most biologically rich tropical savannah in the world. It is also the location of important shares of Brazil's soya (50%), corn (20%), rice (15%) and Brazilian bean production (11%). Together with forest fires, these activities pose a serious threat to species and ecosystems. The Cerrado has been losing original vegetation cover at a faster rate than all other biomes and it has suffered a vegetation loss amounting to an area roughly the size of Egypt.

Caatinga (10%): a semi-arid ecosystem consisting mainly of steppe savannah along with enclaves of humid tropical forest. It is one of the richest xeric shrub lands in the world and the only biome exclusive to Brazil. It has suffered high deforestation rates due to timber extraction, overgrazing and conversion to pasture, as well as soya and sugar cane production. Irrigation for fruit production has contributed to desertification affecting 15% of this biome.

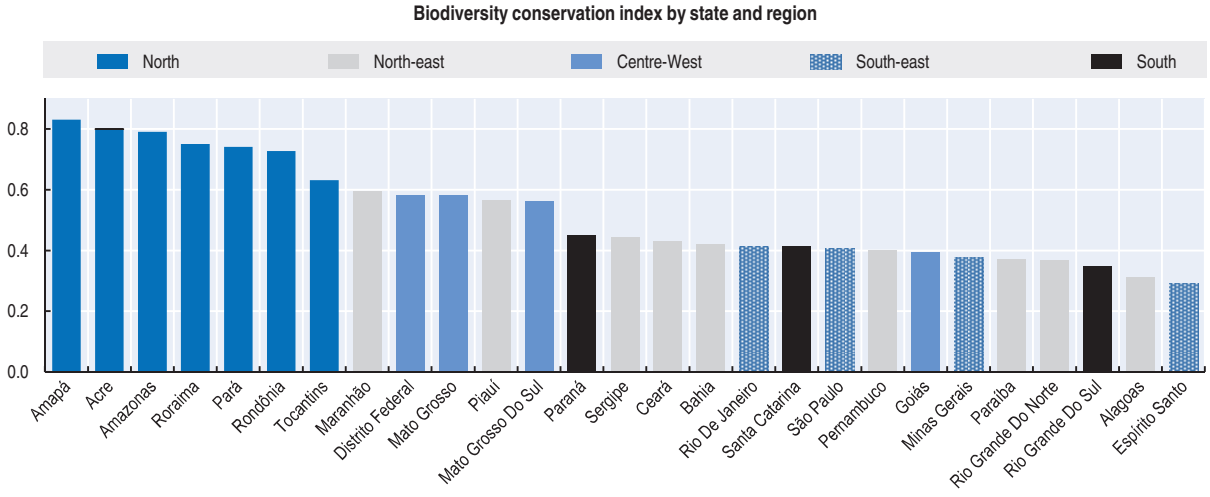
Atlantic Forest (13%): a biome along the east coast of Brazil. It is made up of tropical, subtropical and dry or moist broadleaf forests, savannahs, scrublands and mangroves and is home to a large number of species, many endemic. About 80% of its original vegetation has been lost due to colonisation, urbanisation and resource extraction and the remainder is highly fragmented. About 70% of the country's population and industrial activity are concentrated here, along with the production of most of the domestically consumed agricultural products.

Pantanal (2%): the world's largest tropical freshwater wetland. It has a wealth of terrestrial and aquatic biodiversity. Pantanal is well preserved, but it is under pressure from the expansion of unsustainable farming and ranching, erosion and siltation, and pollution of rivers due to pesticides.

Pampa (1.8%): a subtropical grassland characterised by extensive cattle raising and rice, corn, wheat and soya production, which has degraded soil fertility and caused erosion. Urban expansion is another important threat to biodiversity in the Pampa.

Source: MMA (2014), "Biomas", *www.mma.gov.br/biomas*; MMA (2010), *Fourth National Report to the Convention on Biological Diversity*; Pinto et al. (2012), "Mata Atlantica"; SFB (2014), "Os Biomas e Suas Florestas", *www.florestal.gov.br/snif/recursos-florestais/os-biomas-e-suas-florestas*.

Figure 4.1. **The status of biodiversity conservation varies widely across Brazil**



Note: The Biodiversity Conservation Index is based on number of threatened species, area covered by official protected areas and indigenous lands, remaining vegetation cover and number of *ex situ* biodiversity conservation sites. The index varies from 0 (very poor conservation status) to 1 (very good conservation status).
Source: MMA (2015), *Fifth National Report to the Convention on Biological Diversity*.

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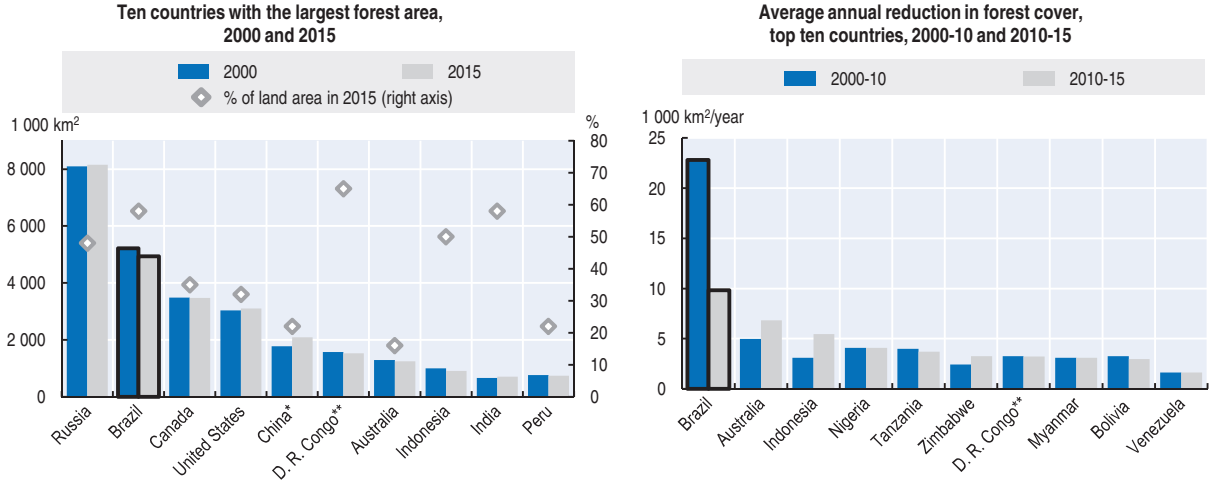
Figure 4.2. **Brazil has the world's second largest forest area and the highest deforestation rate**



* China (People's Republic of); ** Democratic Republic of the Congo.
Source: FAO (2015), *Global Forest Resources Assessment 2015*.

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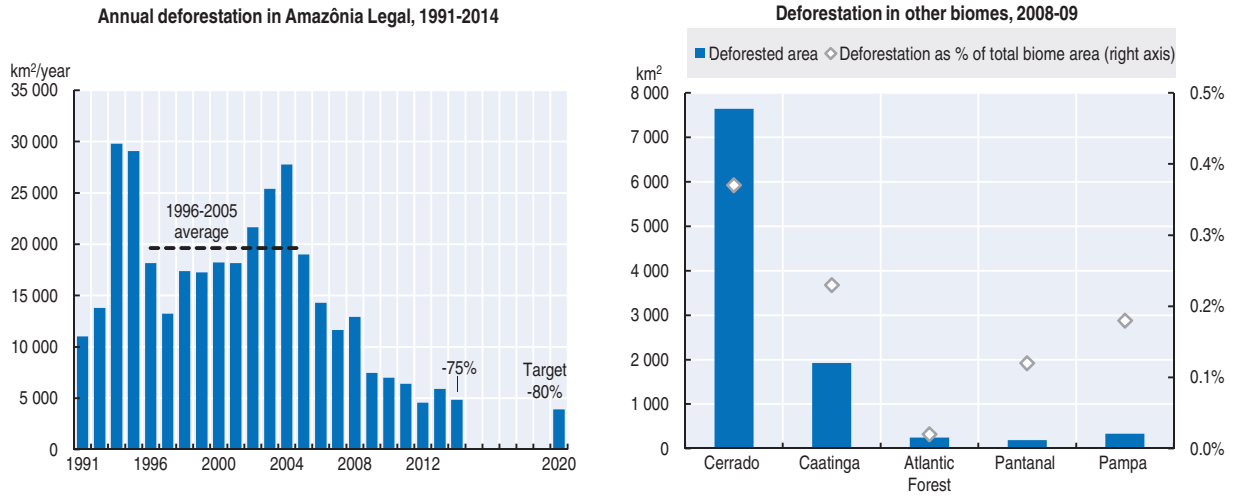
Illegal logging and land grabbing made the area known as Amazônia Legal (Legal Amazon)[3] a deforestation hotspot in the 1990s and early 2000s, with deforestation peaks in 1994 and 2004 (Figure 4.3). About two-thirds of the cleared land had been converted into pasture by 2010 (MMA, 2015). Unclear legal tenure, especially in the Amazon, has been a major driver of deforestation, as property rights can be acquired by land-use conversion. This encourages illegal land grabbing by clearing new areas (Seroa da Motta, 2011). In addition, converted areas have a higher market value than forest areas, which encourages deforestation for speculative purposes (WWF, 2015). In 2011, only 4% of the Amazon area (or 11% of the non-public land areas) had a valid private property title (Figure 4.4).

Figure 4.3. **Annual deforestation rates have declined in most Brazilian biomes**



Source: Based on IBAMA (2015), "Projeto de Monitoramento do Desmatamento dos Biomas Brasileiros por Satélite – PMDBBS"; INPE (2015), "Projeto PRODES: Monitoramento da floresta Amazônia Brasileira por satélite".

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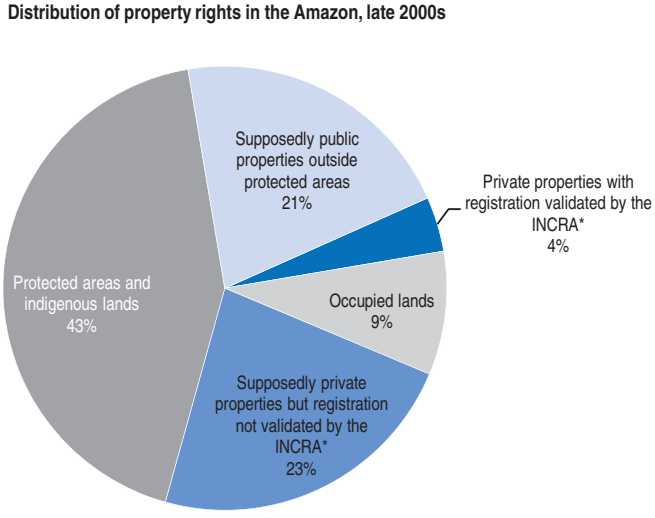
Figure 4.4. **Property rights are still unclear for a large part of Amazonian lands**



* INCRA: National Institute for Colonization and Agrarian Reform.
Source: Brito B. and P. Barreto (2009), "Os riscos e os princípios para a regularização fundiária na Amazônia", *Imazon No. 10*, March 2009.

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In 2006, the government pledged to reduce deforestation in Amazônia Legal by 80% by 2020 (compared with the average of the previous 10 years) and has since considerably scaled up efforts to fight deforestation (Section 4; also see Chapter 5 on protected areas). This helped reduce deforestation from 27 700 km^2 to 4 800 km^2 per year between 2004 and 2014. By 2014, the annual deforestation rate had dropped by 75% (Figure 4.3) (INPE, 2015), which has helped cut GHG emissions (Chapter 1). However, the current pace of deforestation still means forest loss equivalent to the size of Slovenia (or the Brazilian state of Sergipe) every

four years. Systematic implementation of the new Forest Code and the Rural Environmental Cadastre (Section 5.2) is expected to greatly contribute to controlling deforestation.

Deforestation rates have also declined in most, but not all, other biomes in recent years.[4] In the Atlantic Forest biome, for example, deforestation is estimated to have decreased by about 80% in the past 20 years. Pressures remain high in the Cerrado, however. It had the highest absolute and relative deforestation rates in 2008-09 (IBAMA, 2015; Figure 4.3). Some estimates indicate that annual deforestation in the Cerrado more than doubled between 2009 and 2012 (Soares-Filho et al., 2014a).

Forest fires

Uncontrolled human-caused forest fires are a major factor in degradation in many biomes, with the Amazon and Cerrado particularly affected. In the Amazon, fire occurrences have been closely related to logging and land conversion for agriculture (MMA, 2015; 2010). Forest fire occurrences have fluctuated between 100 000 and 250 000 per year since 2000. They are monitored daily by federal institutions through satellite images. The government has increased efforts to control forest fires in recent years, with additional equipment and trained firefighters, and is developing a national policy, expected to be launched in 2015.

1.2. Marine and aquatic ecosystems

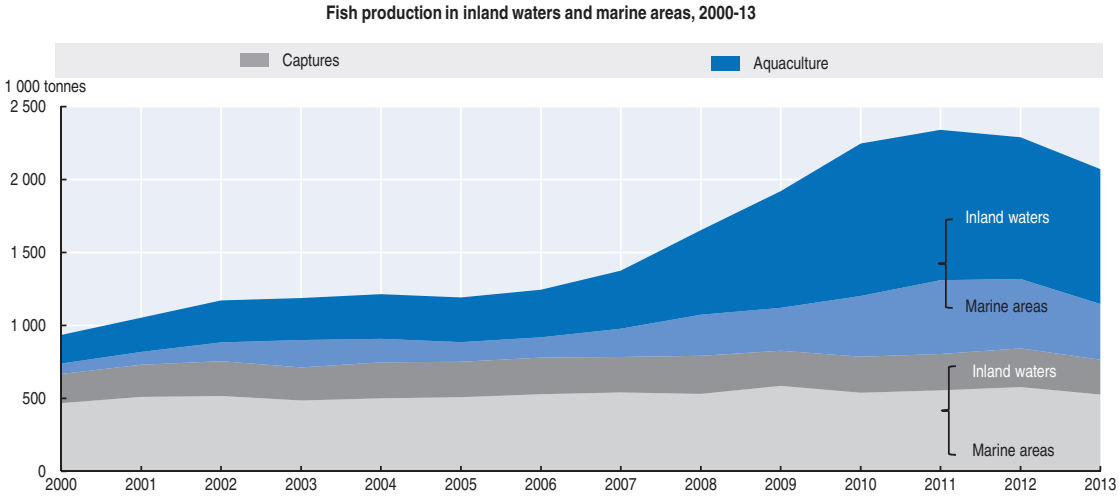
Brazil hosts rich coral reef ecosystems and the world's largest contiguous area of mangroves. Its marine waters are home to a vast range of fishery resources, vertebrates, invertebrates, mammals, birds and chelonians. Estimates suggest around 25% of mangrove ecosystems have been lost (MMA, 2015). The major drivers of marine and coastal biodiversity loss include deforestation of riparian forests and mangroves; urban development along the coasts; oil and gas development; overfishing and unplanned aquaculture; introduction of exotic species; water pollution and littering; and climate change (Prates, 2014). Currently, only 1.5% of Brazil's marine areas (including the exclusive economic zone) are under protection (Chapter 5).

Pollution from industrial, agricultural and urban effluents and infrastructure development are the main drivers of freshwater habitat loss. Dams for large-scale hydropower generation, the main source of electricity in Brazil, can cause river fragmentation and affect the habitats of aquatic species. This can also have an impact on local communities, which are often dependent on small-scale agriculture and fishing. Attempts have been made to mitigate the impact of single dams, for instance by using fish ladders. However, the cumulative impact of a series of dams built on the same river has been rarely assessed (MMA, 2015) (Section 7.4).

Fish resources and aquaculture

Marine and freshwater fish catches grew by nearly 15% in 2000-13 (Figure 4.5). Several coastal and inland fish stocks are fully exploited or overexploited as a result of overfishing, generally by industrial fisheries (FAO, 2013). Excessive fishing effort and declining fish stocks are associated with resource conflicts between artisanal and industrial fishing and among fishing communities. Artisanal fishing dominates capture production, with more than 60% of total landings, and an even higher share in inland fisheries (OECD-FAO, 2015).

Figure 4.5. **Fish production has considerably increased since 2000**



Note: Includes fish, crustaceans, molluscs and other aquatic animals; excludes marine mammals, crocodiles and alligators, and aquatic plants.
Source: FAO (2015), *FAO Global Capture and Aquaculture Production Statistics* (database).

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Aquaculture increased by almost 400% over 2000-13, with a particularly strong rise in inland water aquaculture (Figure 4.5), accounting for over 60% of total fish production in 2013. While aquaculture may have a large potential to increase fish supplies and reduce pressure on natural fishery resources, its rapid expansion can pose challenges for biodiversity and ecosystem services.

1.3. Species

Brazil hosts nearly 44 000 plant species and more than 104 500 vertebrate and invertebrate species (MMA, 2015).[5] Several Brazilian native species are important as a source of food at the regional and local scale.[6] Studies have attempted to quantify the number of known species by biome, but the data are not fully comparable (Table 4.1).

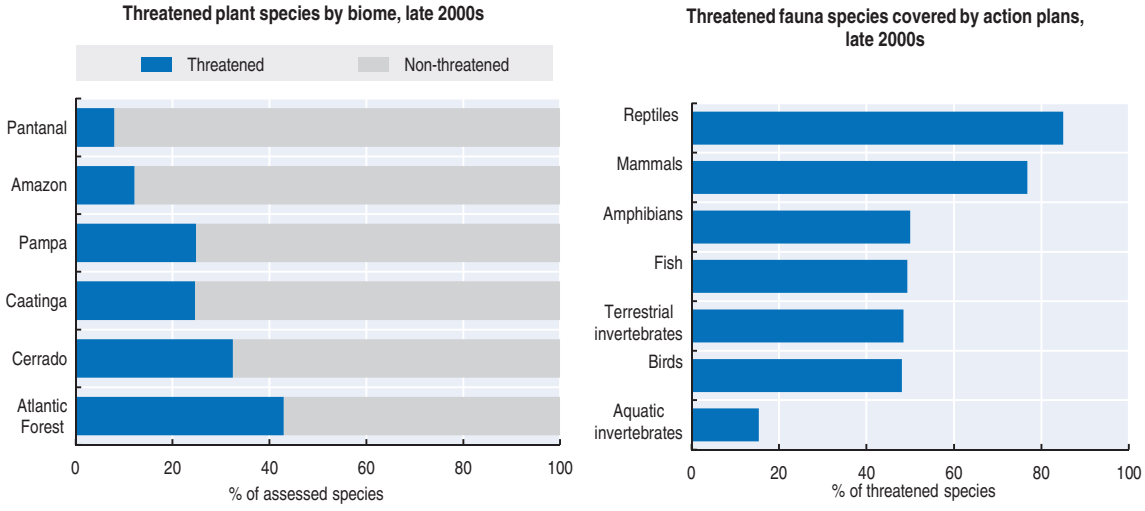
Table 4.1. **Species estimates in Brazil's terrestrial biomes**

	Amazon	Atlantic Forest	Caatinga	Cerrado	Pantanal	Pampa
Number of species	**18 026**	**21 156**	**5 512**	**15 454**	**4 818**	**2 564**
Plants	13 993	18 951	4 508	13 014	3 500	1 675
Mammals	399	298	153	251	159	102
Birds	1 300	1 020	510	837	656	476
Reptiles	284	197	107	202	98	110
Amphibians	250	340	49	150	53	50
Fish	1 800	350	185	1 000	352	151

Note: As many species occur in more than one biome, the number of species should not be added across biomes.
Source: MMA (2015), *Fifth National Report to the Convention on Biological Diversity*.

The 2014 list of threatened flora species indicates that 46% of the nearly 4 600 evaluated plant species are threatened under various risk categories.[7] The Atlantic Forest biome hosts the largest share of threatened plant species, among those that have been assessed, which reflects high pressures from urbanisation, development and habitat fragmentation; the Cerrado biome, where agricultural pressures have intensified, follows (Figure 4.6).

Figure 4.6. **Conservation plans cover about half of threatened fauna species**



Source: MMA (2015), *Fifth National Report to the Convention on Biological Diversity*.

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The 2014 list of threatened fauna species indicates that, out of over 12 000 assessed species, 1 173 species are threatened, including 110 mammal, 234 bird and 409 marine and freshwater fish species (ICMBio, 2015). This represents nearly twice the number of threatened species identified in the previous assessment, which is mostly due to improved scientific knowledge and a more extensive assessment.

Action to protect threatened species has increased. As of end 2013, Brazil had launched 48 action plans to preserve endangered species, including coastal and marine species. In 2012, about 50% of all threatened fauna species were protected under a conservation action plan, compared with 4% in 2008, with differing coverage across taxonomic groups and levels of implementation (Figure 4.6). In addition, federal protected areas now cover nearly 60% of threatened flora and fauna species (Chapter 5). Overall, the conservation status of 126 species has improved since the previous assessments (MMA, 2015).

The illegal traffic of wild animals is estimated to generate about USD 2.5 billion per year. About 38 million wild animal specimens are removed from nature every year, of which about 4 million are sold. Brazil has made progress in addressing illegal trade of endangered species with the introduction of strict regulations and improved inter-agency co-ordination. However, challenges remain, including insufficient staff, equipment and training.

Some 330 alien invasive species have been identified, mostly in the Atlantic Forest biome. It is estimated that three-quarters of alien invasive species were purposefully introduced, mostly for economic activities (including agriculture, but mainly for ornamental use of animals and plants) (IBGE, 2013; MMA, 2010). The introduction of alien plant species has led to the transformation of entire landscapes, increasing forest fragmentation and habitat degradation.[8] The presence of invasive species is estimated to cause an annual loss of USD 43 billion (MMA, 2015). Brazil has not yet developed comprehensive policies and measures for the control and monitoring of invasive species, but has implemented species-specific programmes (e.g. for the golden mussel).

2. Main actors in biodiversity policy

2.1. Institutions

In the 2000s, Brazil strengthened its institutional framework for biodiversity policy. The Ministry of the Environment (MMA) is responsible for biodiversity conservation, restoration and sustainable use. Federal executive agencies include the Chico Mendes Institute for Biodiversity Conservation (ICMBio), the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), the National Water Agency (ANA), the Rio de Janeiro Botanical Garden's Institute of Research (JBRJ) and the Brazilian Forest Service (SFB). ICMBio, established in 2007, is responsible for the implementation of the national policy on federal protected areas and endangered species. IBAMA is mainly responsible for law enforcement and licensing, in co-operation with ICMBio in protected areas and with state and municipal agencies (Chapters 2 and 5).

The National Biodiversity Commission (CONABIO) co-ordinates the design of the national biodiversity policy, oversees its implementation and monitors progress towards Brazil's commitments under the UN Convention on Biological Diversity (CBD). Established in 2003, CONABIO is chaired by the MMA and includes representatives of nine ministries, civil society, the private sector and academia. Several other federal ministries and co-ordination bodies are involved in biodiversity policy.[9] As with other environmental policy areas, however, responsibilities across institutions and levels of government often overlap and effective co-ordination is challenging (Chapter 2).

2.2. Non-government organisations and international co-operation

Non-government organisations (NGOs) and co-operation with international organisations and partner countries play a key role in supporting the design and implementation of biodiversity policy in Brazil. They provide technical capacity, expertise and advice, and leverage funding. They have also helped adopt innovative approaches for biodiversity conservation and sustainable use, and the protection of traditional communities' rights. NGOs often support the implementation of policies and programmes on the ground when institutional capacity is insufficient (Chapter 2).

As of December 2011, Brazil was a party to 233 bilateral and multilateral co-operation agreements, 22% of which had environmental themes. In 2010-13, the largest donors for environmental sustainability were Germany and Norway (Chapter 3). Co-operation with Germany and Norway has focused on the protection of tropical forests and the prevention of Amazon deforestation. Both countries are among the largest donors to the Amazon Fund (Section 6.2). Of the current 55 projects financed by the Global Environment Facility (GEF) in Brazil, 23 target biodiversity, accounting for 45% of total GEF grants received. They include the National Biodiversity Project and the Amazon Region Protected Areas (ARPA) programme (GEF, 2012).

3. The strategic policy framework for biodiversity conservation and sustainable use

Brazil was the first CBD signatory in 1992, and since then it has developed a comprehensive policy framework that is consistent with its commitments under the convention. As a result, Brazil's biodiversity policy has gradually shifted from a strict fence-and-protect and enforcement approach to a sustainable development approach,

which identifies biodiversity priority regions and recognises the role of rural, traditional and indigenous communities in preserving ecosystems.

In 2002, Brazil approved its National Biodiversity Strategy and Action Plan, setting out 51 targets to 2010, some more ambitious than the global CBD targets at the time. Only modest progress was made towards these targets. The MMA acknowledges that weaknesses in the criteria and process to define the targets and a lack of monitoring indicators were major obstacles to the success of the strategy (MMA, 2015).

Following the definition of the 20 Aichi Targets at the 2010 CBD Conference of the Parties, Brazil conducted a broad consultation process to define new national biodiversity targets to 2020.[10] In 2013, CONABIO approved 5 strategic objectives and 20 national biodiversity targets, closely aligned with those of the CBD Strategic Plan 2011-20 (Annex 4.A). In addition, the MMA launched a multisector dialogue to develop a Government Action Plan for the Conservation and Sustainable Use of Biodiversity in 2014.

To overcome the implementation difficulties of the 2002 strategy, the multistakeholder panel PainelBio has been conducting a participatory process to define indicators to monitor progress towards the 2020 targets. A mid-term assessment indicates that Brazil is on the right track to achieve most of its targets, although additional efforts are required (MMA, 2015). Impressive progress has been made in reducing habitat loss and degradation and in extending the area under protection in the Amazon (Annex 4.A).

Brazil has developed a comprehensive and stringent legislative framework for biodiversity conservation and sustainable use and launched several biodiversity-related policies and programmes. Among the key laws are the 2000 law establishing a system of protected areas (Chapter 5) and the 2012 Forest Code (Law for the Protection of Native Vegetation), which regulates the protection of forests in private properties and sets up the Rural Environmental Cadastre (Section 5.2), along with comprehensive legislation on access to genetic resources and benefit sharing (Section 5.8).

Some states, including São Paulo, Paraná and Rio Grande do Sul, have developed biodiversity strategies and action plans or programmes (Box 4.2). However, ensuring consistency and synergy with the federal biodiversity policies, programmes and targets is challenging.

Brazilian biodiversity policy has heavily focused on combating deforestation, including through the creation of a protected area system, in part in response to international pressure. While Brazil should maintain the high level of attention on this area, more policy emphasis is needed on marine, coastal and inland water ecosystems. Overall, there has been a proliferation of biodiversity-related plans and programmes since the 2000s, often with overlapping objectives. It is unclear to what extent they have been implemented or yielded the expected results. With few exceptions, implementation of biodiversity policies and plans is not systematically monitored; evaluation of their effectiveness, costs and benefits is rarely conducted.

4. An integrated strategy to combat deforestation

Rising deforestation rates in the Amazon in the early 2000s prompted increasing pressure from civil society and the international community to take decisive action. In response, the Brazilian government considerably scaled up efforts to control deforestation. In 2004, it launched the Action Plan for Prevention and Control of Deforestation in Amazônia Legal (PPCDAm). In 2006, the government pledged to reduce deforestation in Amazônia

Box 4.2. **The biodiversity action plan of São Paulo state**

São Paulo was a pioneer in developing a state-level plan to support the implementation of the CBD. The Action Plan of the State of São Paulo 2011-20, launched in 2013, consolidated existing initiatives contributing to the 20 targets of the convention, and identified further actions needed. The São Paulo Biodiversity Commission oversees its implementation.

To facilitate and structure the plan's implementation, existing and proposed activities have been assessed against three criteria – generation of positive impacts, measurable results and simplicity – and grouped into seven action streams: i) awareness raising for biodiversity; ii) evaluation of São Paulo's biodiversity; iii) reducing the pressure on São Paulo's biodiversity; iv) support for sustainable production and consumption; v) instruments for biodiversity conservation; vi) ecological restoration; and vii) knowledge management. For each action stream, a project line with several concrete goals and outputs has been established. Examples of specific actions under the plan include the creation of a biodiversity portal (*www.portaldabiodiversidade.sp.gov.br*), the development of biodiversity indicators and projects on zero deforestation, forest fire control, invasive species, green economy and sectoral sustainability and protected areas, as well as the development of a support system for forest restoration. The state environment secretariat estimates that the plan's projected value exceeds BRL 100 million.

Source: MMA (2015), *Fifth National Report to the Convention on Biological Diversity*; SMA (2013), *Action Plan of the State of São Paulo. Aichi targets 2020*.

Legal by 80% by 2020 (compared with the average of the previous 10 years). This commitment was later incorporated into the National Climate Change Policy as a key element of Brazil's strategy to curb greenhouse gas (GHG) emissions (Chapter 2). It was also reinforced as part of the national biodiversity targets (target 5; see Annex 4.A).

The PPCDAm set forth an integrated strategy and an innovative governance structure, which put deforestation on the agenda of other sectors (CEPAL et al., 2011). Programme implementation was undertaken by 13 ministries and co-ordinated by the Executive Office of the Presidency (Casa Civil). The plan, currently in its third phase (2012-15), is based on three main streams of work, discussed below.

The first stream aims at clarifying land tenure in the Amazon to reduce incentives for deforestation (Section 1.1; Figure 4.4). In combination with the ARPA programme (Chapter 5), more than 500 000 km^2 of federal and state-level protected areas have been created since the start of the programme, mostly along the so-called "deforestation arc" (comprising the eastern and southern edges of the forests in the states of Rondônia, Mato Grosso and Pará) and in areas expecting road infrastructure development. This was essential in slowing the advance of deforestation for land speculation purposes (CEPAL et al., 2011; Pires, 2014). In addition, 100 000 km^2 of indigenous lands have been granted legal status and thousands of rural land holdings have been geo-referenced under the Terra Legal programme (Box 4.3).

The second work stream focuses on strengthening monitoring, enforcement and compliance. The environmental monitoring systems have been significantly enhanced to reach world-class levels (Box 4.4). This has been crucial in supporting the identification of priority locations for the creation of protected areas and allowing for informed planning of enforcement actions.

Box 4.3. **The Terra Legal programme**

The Terra Legal programme was launched in 2009 by the Ministry of Agrarian Development. It aims to regularise the occupation of federal public lands in the Amazon, fight land grabbing, control deforestation and promote sustainable development initiatives. The programme aims to provide land titles to around 300 000 rural properties occupied prior to 1 December 2004, corresponding to an area of 674 000 km^2. This regularisation gives farmers much needed legal security, as the new land titles effectively prevent future disputes over the ownership of the property.

The regularisation process involves periodic inter-institutional consultation meetings and is based on reliable spatial data. By 2014, more than 60 000 plots (covering 390 000 km^2) had been geo-referenced, and more than 10 000 titles on over 55 000 km^2 of lands had been granted (MDA, 2014). These achievements are noteworthy, and pave the way for continued implementation. In addition, about 50 000 km^2 of federal public land was assigned to the MMA for the creation of protected areas (Chapter 5).

Source: MDA (2014), "Programa Terra Legal".

Hundreds of enforcement operations have been carried out in an integrated manned by IBAMA, the Federal Police, the National Security Force and the Army, based on technical criteria and territorial priorities. Since 2008, inspections have also resulted in the economic embargo of illegally deforested areas: landholders are forbidden to sell products originating from these areas and the environmental liability extends to buyers along the market chain. Inspections have resulted in more than BRL 7 billion in fines, prison sentences for over

Box 4.4. **Brazil's deforestation monitoring systems**

The National Institute for Space Research (INPE) has monitored forest cover in the Legal Amazon region annually since 1988. This monitoring system was improved in 2002 with the adoption of digital classification of satellite images using the Amazon Programme on Deforestation Monitoring (PRODES) methodology. This new approach drastically improved the precision of deforestation monitoring. INPE also runs the Real Time Detection Programme (DETER), a deforestation monitoring system in the Amazon, which shows alerts every two to three days and has been a key support to strategic law enforcement actions. In addition, the DEGRAD system monitors forest degradation and the TerraClass analysis assesses land-use change in previously deforested areas (MMA, 2015). According to TerraClass data, about one-third of the Amazon cleared forest land has been recovering.

In addition to annual monitoring of the Amazon forest cover, in 2008 IBAMA started a satellite monitoring programme (Programme on Satellite Monitoring of Deforestation in Brazilian Biomes, or PMDBBS) for the other five terrestrial biomes. However, PRODES is more precise than the systems used by PMDBBS. Therefore, INPE and IBAMA are collaborating to develop a monitoring system for the entire national territory to generate continuous and compatible data series on deforestation, vegetation cover and land use for all biomes.

Civil society has also played a central role in supporting monitoring. For example, the NGO SOS Mata Atlântica supported monitoring vegetation cover in the Atlantic Forest biome and the NGO Imazon recently launched a new deforestation and forest degradation monitoring system for the Amazon.

600 people, the seizure of about 860 000 cubic metres of illegally logged wood and an embargo on 600 km^2 of land used for illegal activities (WWF, 2015).

Restrictions to credit from public financial institutions to landholders in municipalities with critical deforestation levels have spurred enforcement effectiveness and improved compliance. Since 2007, the MMA has maintained a blacklist of such municipalities. This has encouraged rural landholders and local authorities to work together to get their municipalities off the blacklist. In addition, a 2008 resolution of the Brazilian Central Bank made access to subsidised rural credit in the Amazon biome conditional on the legitimacy of land claims and provision of information to demonstrate compliance with environmental regulations, especially with the Forest Code (Section 5.2). As a result of this resolution, Assunção et al. (2013) estimated that BRL 2.9 billion in loans were not contracted between 2008 and 2011, roughly 90% of which were linked to cattle ranching. This is estimated to have avoided clearing of over 2 700 km^2 of land in 2009-11.

The PPCDAm's third work stream promotes sustainable production chains that provide alternatives to deforestation, as well as technology and innovation for sustainable development in the Amazon (Box 4.5). Actions taken include training and capacity building for sustainable forestry, agricultural and livestock production practices, sustainable timber logging concessions and minimum guaranteed price policies for Amazonian food products (Sections 5.7 and 7.2).

Box 4.5. **The National Institute for Amazon Research**

The National Institute for Amazon Research (INPA), founded in 1952, is one of the world's largest and most important research institutions on tropical biology. It originally focused on plant and animal inventories, but its current mission is to increase scientific knowledge of the Amazon biome with a view to promoting the economic use of its natural resources and forest conservation.

INPA runs a wide range of research groups around four major thematic clusters: biodiversity; environmental dynamics; technology and innovation; and society, environment and health. It also runs several graduate and post-graduate programmes and operates as a major training centre to respond to increasing demand for qualified personnel. As of 2014, more than 1 500 professionals have been trained.

INPA is also working with local communities to improve the sustainable use of biodiversity. This takes the form of educational workshops, technical training and other forms of capacity building to disseminate knowledge generated. Topics covered include dissemination of knowledge on sustainable agricultural practises for enhanced soil quality and agricultural output; water purification; alternative construction woods; and alternative forms of biomass for energy generation.

Source: Based on INPA (2015), INPA website, *http://portal.inpa.gov.br/*.

The PPCDAm is widely recognised as an effective strategy, which can serve as a model for other countries (WWF, 2015). The combination of this plan, rural credit restrictions and economic embargo of illegally deforested areas has greatly contributed to reducing deforestation in the Amazon. As a result, Brazil is likely to overshoot its 2020 target (Section 1; Figures 4.3 and 4.7). Assunção et al. (2013) estimate that these policies avoided 62 000 km^2 of deforestation between 2005 and 2009. Other factors may have also

contributed, including declining prices of agricultural products. Building on the success of PPCDAm, the government launched a similar programme to control deforestation in the Cerrado biome (Box 4.6).

Box 4.6. **Action Plan for the Prevention and Control of Deforestation and Fires in the Cerrado**

The Action Plan for the Prevention and Control of Deforestation and Fires in the Cerrado (PPCerrado) aims to reduce deforestation by 40% by 2020 compared to historical deforestation rates. Implementation of the plan started in 2009. It was extended to involve several government agencies in early 2010 with its integration in the National Climate Change Policy (Chapter 2). It is structured around the same three work streams as the PPCDAm.

An important feature of the PPCerrado is the development of a priority list of deforestation areas, which includes 52 municipalities. The list is based on deforestation levels observed in 2009-10, remaining native vegetation cover and the presence of protected areas in the municipality. The municipalities on the priority list correspond to only 4% of the total number of municipalities in the Cerrado biome, but accounted for 44% of deforestation and 22% of the remaining native vegetation cover in 2009-10. To improve the monitoring and evaluation of the plan's effectiveness, IBAMA and INPE are working on the definition of a baseline and on the enhancement of the vegetation monitoring system (Box 4.4).

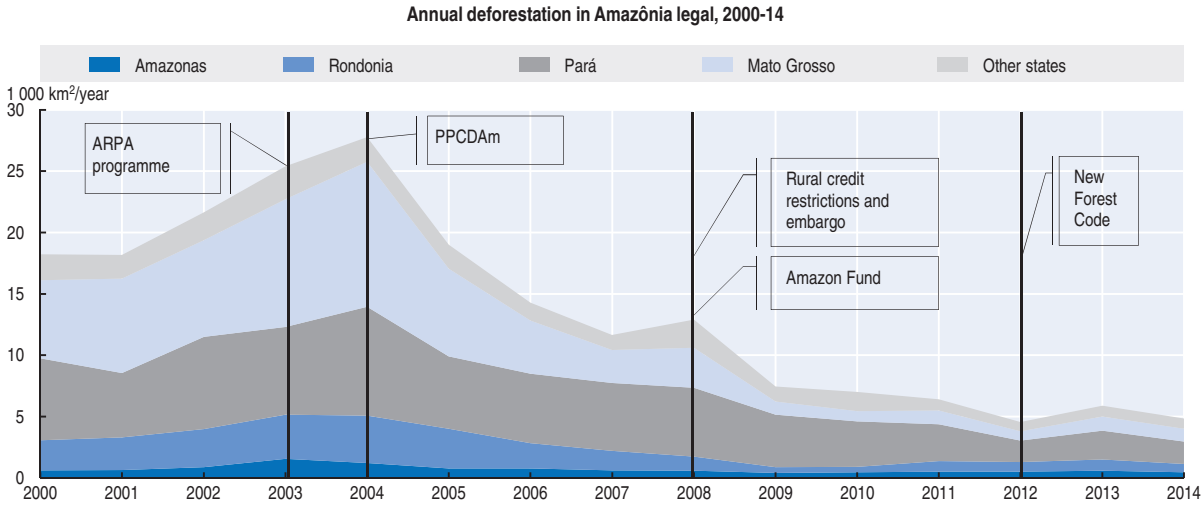
Source: MMA (2015), *Brazil Fifth National Report to the Convention on Biological Diversity*.

Challenges in the Amazon still remain. Progress has been uneven across the states that share the Amazon. The states of Pará, Mato Grosso and Rondônia are among the top contributors to deforestation (Figure 4.7). In 2014, for example, about 12% of Amazon deforestation in Mato Grosso and 16% in Pará occurred illegally in so-called Legal Reserve areas (Gibbs et al., 2015). These areas are required to be set aside by the forest legislation (Section 5.2). The lack of clarity in land tenure remains a major issue (Figure 4.4), keeping deforestation for speculative purposes attractive.

The command-and-control pillar of the PPCDAm has been the most successful so far. However, the more monitoring systems and enforcement actions improve, the more sophisticated the strategies for illegally clearing the land become (e.g. by deforesting small parcels of land or selectively logging high-value timber). This, in turn, requires increasing costs for upgrading the monitoring systems, investing in equipment (e.g. vehicles) and training the inspectors (WWF, 2015). Brazil should continue to reinforce the satellite-based deforestation monitoring systems (Box 4.4), especially for the Caatinga and Cerrado biomes where most future deforestation is expected, as well as adapting them to detect forest degradation. While the full implementation of the Rural Environmental Cadastre will further improve enforcement and compliance (Section 5.2), it is challenging for the government and its agencies to keep pace with thousands of small-scale deforestation events occurring in the huge Brazilian Amazon area.

Accompanying monitoring and enforcement actions with promotion of sustainable activities is, therefore, essential to effectiveness of the PPCDAm and PPCerrado (Box 4.6). There is a need to make sustainable logging and production chains more attractive than illegal logging and land grabbing and to promote practices that can offer alternative

Figure 4.7. **Policy measures have effectively helped curb deforestation**



Source: Based on INPE (2015), "Projeto PRODES: Monitoramento da floresta Amazônia Brasileira por satélite".

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income sources to local and traditional communities. Illegal logged wood is up to 40% cheaper than legal wood, which makes sustainable forest management uncompetitive (Nogueron and Cheung, 2013). The transaction costs involved in sustainable forest management are still too high, and many rural families do not have the knowledge or the means to adopt sustainable forestry and farming practices (WWF, 2015) (Section 7.2). This requires an integrated approach to promote research, training, technology supply, credit, technical assistance and market access, as well as more active engagement of the business sector (CEPAL et al., 2011).

5. Policy instruments for biodiversity conservation and sustainable use

Brazil has implemented a wide set of policy instruments to promote the protection, restoration and sustainable use of biodiversity. Following the categories used by the OECD (2013), these policy instruments can be classified as regulatory, economic, and voluntary and information approaches. Table 4.2 shows the key instruments in each category that Brazil has implemented and indicates where in the report they are discussed.

Overall, Brazil's biodiversity policy largely relies on regulatory approaches, but the use of economic instruments for biodiversity conservation and sustainable use has been broadened. Most such instruments aim to reward biodiversity-friendly actions, such as the use of good agricultural practices (Section 7.1). Such positive incentives can be effective because most rural private properties are small and rural people are among the poorest in the country and depend on the use of natural resources.

The use of taxes, charges and fees is very limited. The 1997 National Water Resources Policy Law introduced water abstraction and effluent charges as water resource management tools. However, only a few states and river basins charge for water. When charges exist, unit prices are often too low to affect decisions about water allocation and use (Chapter 3). National parks can charge entrance fees, but only a few of them have done so and have the capacity to collect such fees (Chapter 5).

Table 4.2. **Main policy instruments for biodiversity conservation and sustainable use in Brazil**

Regulatory instruments	Economic Instruments	Information and voluntary approaches
Restrictions or prohibitions on use or on access: ● Protected areas (Chapter 5) ● Set-aside native vegetation areas, as foreseen in the 2012 Forest Code (Section 5.2) ● Rural Environmental Cadastre (Section 5.2) ● Regulation on access to genetic resources and benefit sharing (Section 5.8) ● Embargo on illegally deforested areas (Section 4) Planning and licensing instruments: ● Ecological-economic zoning (Section 5.1) ● Environmental licensing (Chapter 2) Permits and quotas ● Concessions for sustainable timber logging (Section 7.2)	Payment for ecosystem services systems and conditional cash-transfer programmes (Section 5.5), including: ● Bolsa Floresta ● Bolsa Verde ● Water producer programme Tradable environmental reserve quotas (Section 5.3) Biodiversity offsets (Section 5.4) ● Environmental reserve offsets, as foreseen in the 2012 Forest Code ● Environmental compensation in the framework of environmental licensing (Chapters 2 and 5) ● Financial compensation for water and mining resources. Water abstraction and pollution charges (Chapter 3) National park entrance fees (Chapter 5) Subsidies (e.g. for good agricultural practice) (Section 7.1) Rural credit restrictions (Section 4). Removal of environmentally harmful subsidies.	Eco-labelling and certification: ● Certification of organic products (Section 7.1) ● Timber certification (Section 7.2) ● Life certification (Section 5.6) Green public procurement: ● National Plan to Promote the Production Chain of Socio-Biodiversity Products (Section 5.7) Voluntary agreements ● Soya Moratorium (Box 4.9)

Source: Adapted from OECD (2013), *Scaling-up Finance Mechanisms for Biodiversity*.

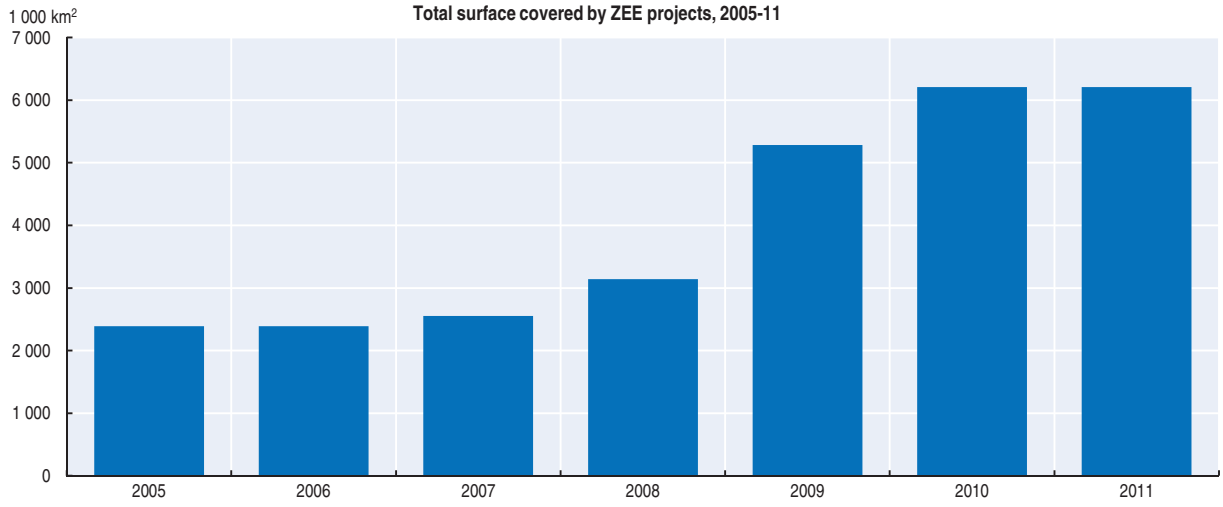
Some progress has been made in mainstreaming biodiversity considerations in financial support policies, such as linking the access to concessional rural credits to compliance with environmental regulations (Section 7.1). However, little progress has been made in identifying and phasing out subsidies that can be detrimental to biodiversity and ecosystems as foreseen by the national biodiversity target 3. These include implicit subsidies such as tax exemptions for fertilisers and pesticides (Section 7.1). Brazil would benefit from improving the analysis of subsidies that can be environmentally harmful, with a view to gradually removing those subsidies that are not justified on economic, social and environmental grounds. Sound information about the magnitude of subsidies and their impact is needed to build support for subsidy reforms.

5.1. *Ecological-economic zoning*

The National Environment Policy introduced environmental or ecological-economic zoning (ZEE) as a landscape-scale planning and management tool, aimed at allocating compatible activities in defined environmental areas so as to maintain sustainable use of natural resources and a balanced ecosystem. ZEE has been effectively used since 2002; in 2013, the MMA released methodological guidelines to support the preparation of ZEEs at the subnational level and their co-ordination with other territorial planning instruments (e.g. water resource plans).

The MMA led the development of a macro ZEE of the Legal Amazon, approved in 2010; the macro ZEEs of the Cerrado biome and the São Francisco river basin were under development at the time of writing. Several states have also developed state-level ZEEs. By 2013, ZEEs covered 73% of Brazil's territory (Figure 4.8), including the entirety of the Amazon and Pantanal biomes. ZEEs also cover about 62% of the Cerrado biome and 22% of the Atlantic Forest biome, but less than 2% of the Caatinga (MMA, 2015).

Figure 4.8. **The area under ecological-economic zoning has expanded**



Note: The overlapping of areas of state and federal initiatives is not considered.
Source: MMA (2014), *PNIA 2012: Painel Nacional de Indicadores Ambientais. Referencial teórico, composição e síntese dos indicadores.*

StatLink http://dx.doi.org/10.1787/888933279724

ZEE maps and guidelines are made available as territorial and development planning tools, but there is no evidence that they have been effectively used in spatial planning and policy making. In addition, the municipal capacity to implement zoning requirements is weak (Chapter 2). In a welcome move, the 2012 Forest Code (Section 5.2) required all states to approve their ZEEs by 2017.

5.2. *Forest conservation and restoration obligations on private properties*

In 2012, Brazil approved the new Forest Code (Law for the Protection of Native Vegetation), which replaced and updated the 1965 code. The new Forest Code aims to reconcile the objectives of preserving biodiversity and forests and of ensuring a good business environment for agriculture, a key sector of Brazil's economy.

The Forest Code, modified several times, had traditionally been Brazil's most important legal instrument to protect native vegetation on private properties. The 1965 code required landowners to maintain native vegetation on a proportion of their properties – the so-called Legal Reserve (RL) – and along water bodies and sensitive areas to protect water resources and prevent soil erosions – the so-called Permanent Preservation Area (APP). However, levels of compliance have historically being low, with considerable areas being deforested illegally.

In response, the new and updated Forest Code introduced more effective enforcement instruments, although some of its elements have been criticised as being too indulgent towards commercial interests and less protective than the old code (Box 4.7). The new law maintained the requirements to conserve or restore vegetation cover in RL and APP areas, although it changed the definitions of these areas. The percentage of rural properties to be maintained as RL varies according to biome: up to 80% in the Amazon, 20% to 35% in the Cerrado biome and 20% in the Atlantic Forest and other biomes.

To improve monitoring of, and compliance with, the forest conservation requirements, the new code introduced the Rural Environmental Cadastre (CAR). The system uses high-

Box 4.7. **The new Forest Code: Some critical elements**

The 2012 Forest Code was approved after long and intense national debate and it has been highly criticised by environmentalists. Among the criticised elements of the law are a partial amnesty granted on illegal deforestation that occurred before 2008, the broadening of possibilities for offsite compensation of damage to ecosystems and the transfer of legislative autonomy to the state level (Leitão, 2014).

The new law reduced the total area previously required to be set aside as APPs and RLs by adjusting their definition. The changes in the definition of hilltop preservation areas (part of APPs), for example, reduced their total area by 87%. About 90% of rural properties (covering less than 30% of rural areas) qualify as "small" properties according to the new law,* and benefit from the amnesty on illegal deforestation in RL and APP areas before 2008. Under the previous Forest Code, landowners would have been required to restore the illegally deforested areas at their own expense. Overall, the changes to the forest code reduced by 58% the total forest area to be restored (to about 210 000 km^2), affecting mainly the Amazon, Atlantic Forest and Cerrado biomes (Soares-Filho et al., 2014b).

* The law defines small properties as those whose size ranges from 20 ha (0.2 km^2) in southern Brazil to 440 ha (4.4 km^2) in the Amazon.

resolution satellite images, which are the basis for localising and registering each rural parcel. Registration in the CAR is mandatory for all rural properties and holdings, including information about the RL and APP in each area, by May 2016. The rural properties that do not comply with the land set-aside obligations will be required to join a state-level environmental regularisation programme. As required by the Brazilian Central Bank, CAR registration will be a condition to access rural credits, from both public and private banks, as from October 2017. Although the CAR is not designed for regularising land property rights, the authorities responsible for rural development and settlements can use the geo-referenced information about the location of rural plots (as declared by their owners or holders) to clarify land tenure.

The CAR implementation is on track: as of April 2015 about 53% of the private rural area to be registered actually had been. States are responsible for the implementation of the cadastre, but in many states less than 20% of the target rural area has been registered, especially in the North-east region (SFB, 2015a). The delay is caused in large part by a lack of staff and resources at the state and municipal levels. The federal government has invested in establishing the necessary information system and in building implementation capacity at state level. It developed a detailed plan for the implementation of the CAR, including appropriate budget, timeline and targets.

Strict enforcement of the new code, as well as clarification of land tenure, is expected to greatly help reducing deforestation rates further. More efforts are needed to raise awareness about the CAR – e.g. by launching information campaigns to encourage registration – and to develop capacities of states and municipalities to implement the system. States need also to quickly develop their environmental regularisation programmes, which non-compliant rural holders need to adhere to. More incentive-based measures, such as payments for ecosystem services (Section 5.5) and the REDD+ mechanism, could be considered to encourage registration and reward compliant landowners.

5.3. *Tradable forest quotas*

The new Forest Code also introduces an economic instrument, Environmental Reserve Quotas (CRAs), to facilitate compliance with the land set-aside obligations. CRAs can be issued for each hectare of area maintained as native vegetation in excess of the RL requirement and be used to offset a RL deficit in a different property within the same biome, preferably within the same state. In practice, landholders who do not meet the RL obligation can either restore the tree cover of the area or purchase an equivalent amount of CRAs. Only properties which had a RL deficit prior to 2008 are allowed to use this mechanism. The system, therefore, creates demand for forested areas and enables the emergence of a market for conservation of private land. The system ultimately encourages maintaining the forest cover on areas in excess of the RLs (which could be legally deforested), instead of restoring the tree cover in areas that have been deforested (Soares-Filho et al., 2014b).

Four million of the about 5.6 million rural properties do not meet the legal vegetation cover obligations. While the size of the "deficit" in native vegetation will be known only after full implementation of the CAR, it is estimated at between 160 000 and 300 000 km^2, concentrated in the Amazon, Atlantic Forest and Cerrado biomes (BV Rio, 2014). Restoring a hectare of the Amazon forest can cost up to BRL 15 000 (in addition to the opportunity costs of alternative land use), which can be prohibitively high for small rural holders (Financial Times, 2012). Soares-Filho et al. (2014b) estimate that compensating the RL deficit by purchasing CRAs would be cheaper than restoration for about 92 000 km^2. The demand for CRAs is, therefore, potentially large and could be a cost-effective way of ensuring compliance with the forest legislation. For example, Bernasconi (2013) estimates a 76% reduction in the compliance costs in São Paulo state.

CRA transactions need to be registered in the CAR, which is still under implementation. Therefore, no CRA has been issued yet. The Bolsa Verde do Rio de Janeiro, a non-profit organisation, launched a platform to make the exchange of future CRAs possible. As of end-2013, this platform had registered 1 600 participants and more than 15 000 km^2 of rural properties offering CRAs, which signals good market prospects (BV Rio, 2014).

While the CRA system is promising, there is a risk that only low-opportunity-cost areas may be competitive in the market, leading to increased conservation of areas that do not necessarily have the highest biodiversity value. Adjusting the system design to allow CRA exchanges within the same priority areas, in terms of biodiversity value, would likely raise compliance costs, but environmental effectiveness would improve (Bernasconi, 2013). Thus, it may be necessary to provide additional incentives to ensure that high-biodiversity-value areas are restored. The functioning of the system should be systematically monitored and allow for the adjustments necessary to achieve its forest preservation and restoration objectives.

5.4. *Environmental offsets*

In addition to the CRA market, the legislation allows compensation of the RL deficit by buying private properties within official protected areas on behalf of the government, i.e. paying owners of land within protected areas and transferring the tenure title to the government. This offset mechanism would allow the consolidation of protected areas, many of which include extensive private lands (Chapter 5).

An offset mechanism is in place within the environmental licensing procedure. An environmental licence is required before the construction, installation, expansion and functioning of any enterprise or activity that is deemed to be effectively or potentially

polluting, or that could cause environmental degradation (Chapter 2). In addition to meet the environmental impact mitigation requirements indicated in the licence, project developers can be required to pay an environmental compensation, whose amount varies according to the severity of the environmental impact of the project. Clear mechanisms for monetising the environmental impact and the amount of the compensation are still missing. All revenue from environmental compensation is earmarked for protected areas (Chapter 5).

In addition, financial compensation requirements apply to operators of hydropower plants (6.75% of the value of electricity produced) and mines (between 1% and 3% of turnover) to compensate for the use of water and natural resources. The amounts are substantial and are shared between the federal government and the state and municipal governments affected by the installations. These charges, however, do not reflect the value of resources (e.g. water scarcity) and do not contribute to their efficient use (OECD, 2015). Revenue is not earmarked to compensate for environmental degradation. In some other countries, such as Colombia, revenue from hydropower financial compensation is partly earmarked for environmental and watershed protection (OECD, 2015b).

5.5. *Payments for ecosystem services and conditional cash-transfer programmes*

Brazil has implemented several payments for ecosystem services (PES) and conditional cash-transfer programmes that integrate environmental requirements, at both federal and state levels; examples include Bolsa Floresta and Bolsa Verde, discussed below. Another example is the Water Producer Programme, launched in 2011 by the National Water Agency to financially compensate investment in soil and water protection in river basins that provide water resources to a large population. Conservation activities include building terraces and infiltration basins, restoring and protecting riparian vegetation, and adopting sustainable farming practices.

A legislative proposal to establish a national PES policy and a federal PES programme has been under parliamentary discussion since 2007. While Brazil does not yet have a national legal framework governing PES, the new Forest Code opens the possibility of using such instruments at federal level. In the absence of an overarching national framework, several states and municipalities have elaborated their own laws and PES programmes. Table 4.3 provides some examples. Guedes and Seehusen (2011) identified 78 such programmes for water conservation, carbon storage and biodiversity protection in the Atlantic Forest biome.

The PES and cash-transfer programmes and legislation currently in place vary widely across states and federal agencies in terms of payment and valuation methods,

Table 4.3. **Examples of state-level PES laws**

Region/ State	Law
North	
Acre	State System of Incentives for Environmental Services (SISA; Law 2308/2010)
Amazonas	Law of the State Climate Change Policy, Environmental Conservation and Sustainable Development of the Amazon (Law 3135/2007 and Law 3184/ 2007)
Mato Grosso	The State System for Reducing Emissions from Deforestation and Forest Degradation, Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks (REDD+)
South-east	
Espírito Santo	Law of PES (Law 8995/2009)
Minas Gerais	Law of Green Grant (Law 17.727/2008)
São Paulo	Law of the State Climate Change Policy (Law 1/2009)

Source: Adapted from Guedes and Seehusen (2011), *Pagamento por Serviços Ambientais na Mata Atlântica, Lições Aprendidas e Desafios*.

socio-environmental safeguards, institutional arrangements and sources of funds. Beneficiaries are mostly rural family producers and settlers, traditional communities and indigenous peoples. These programmes have rarely established sound monitoring systems and their effectiveness is not systematically evaluated. For example, the Water Producer Programme has generated income for over 1 000 rural people (MMA, 2015), but the extent to which this has resulted in an additional level of protection of water resources is unclear.

Most PES and conditional cash-transfer programmes are government financed. As the costs of these programmes, including investment in field activities and administrative costs, can be high, it is necessary to identify alternative source of funding to expand the scale and scope of PES and cash-transfer systems and reach more beneficiaries (Guedes and Seehusen, 2011). Developing more standardised programmes would also help lower the transaction costs. Brazil would benefit from developing framework PES legislation to improve consistency of programmes across the country. Establishing a sound monitoring system is also necessary to verify the delivery of the ecosystem services that are being paid for. Such a system could be helpfully linked to the CAR, which represents an important source of information to improve monitoring.

Bolsa Floresta

Bolsa Floresta (*bolsa* means stipend or grant) is a pioneer PES programmes launched by the state of Amazonas in 2007. It is mainly a cash-transfer system based on some environmental requirements. It aims to compensate traditional and local families living in state-level sustainable development reserves for their environmental conservation efforts, mainly to limit the amount of forested lands cleared and converted to farming (Box 4.8). It is the first internationally certified programme of its type in Brazil, and one of the largest REDD+ pilot projects in the world, providing income to more than of 35 000 people scattered in hundreds of communities. Resources for this programme are provided through a partnership between the government of the state of Amazonas and some large companies.

Börner et al. (2013) found evidence of positive impacts of Bolsa Floresta on local quality of life and biodiversity conservation in selected sustainable use areas. Income and access to health and education had increased for 86% of the surveyed families; with better income, households were also able to better resist to deforestation pressures coming from people outside the communities. Deforestation decreased faster in the protected areas participating in the programme than in the others.

The programme has been implemented so far in areas where there is relatively low pressure over forest resources and beneficiaries are homogeneous. The opportunity cost of complying with the rules of the programme is relatively low for most participants. Börner et al. (2013) suggest that scaling up the programme and extending it to areas under higher deforestation pressures would require stronger and more differentiated incentives and greater involvement of the participants in monitoring activities and in protection against external threats.

Bolsa Verde

Building on the Bolsa Floresta initiative, in 2011 the federal government launched Bolsa Verde as part of Brasil Sem Miséria (Chapter 3), extending the federal social protection system to include payments conditional on the use of environmentally sustainable practices. The programme is also intended to promote participation of beneficiaries in environmental, social and technical training.

Box 4.8. **Bolsa Floresta and Bolsa Verde**

The **Bolsa Floresta programme** has four components:

i) The Income Forest Stipend (Bolsa Floresta Renda) is an incentive to sustainable income-producing activities (e.g. fish farming, non-timber forest products or ecotourism), and invests BRL 140 000 per year in each protected area.

ii) The Social Forest Stipend (Bolsa Floresta Social) has the objective of enhancing community development, public service provision and quality of life of isolated communities, investing BRL 140 000 per year in each protected area according to a participatory work plan.

iii) The Family Forest Stipend (Bolsa Floresta Familiar) is an incentive to families to reduce deforestation, paying a monthly reward of BRL 50 to mothers living inside protected areas who commit to environmental conservation and sustainable development (mainly a commitment not to deforest and not to use resources unsustainably).

iv) The Association Forest Stipend (Bolsa Floresta Associação) grants the equivalent of 10% of the total amount paid for the Family Forest Stipend to strengthen local producer associations composed of families living in protected areas. Funds are also used to promote social control over the Forest Stipend programme.

The **Bolsa Verde programme** has four main objectives: i) promoting ecosystem conservation and sustainable use; ii) promoting community participation and improvement of participants' quality of life; iii) increasing the income of people living in extreme poverty who carry out activities for the conservation of natural resources in rural areas; and iv) promoting the participation of beneficiaries in environmental, social, technical and professional capacity-building activities.

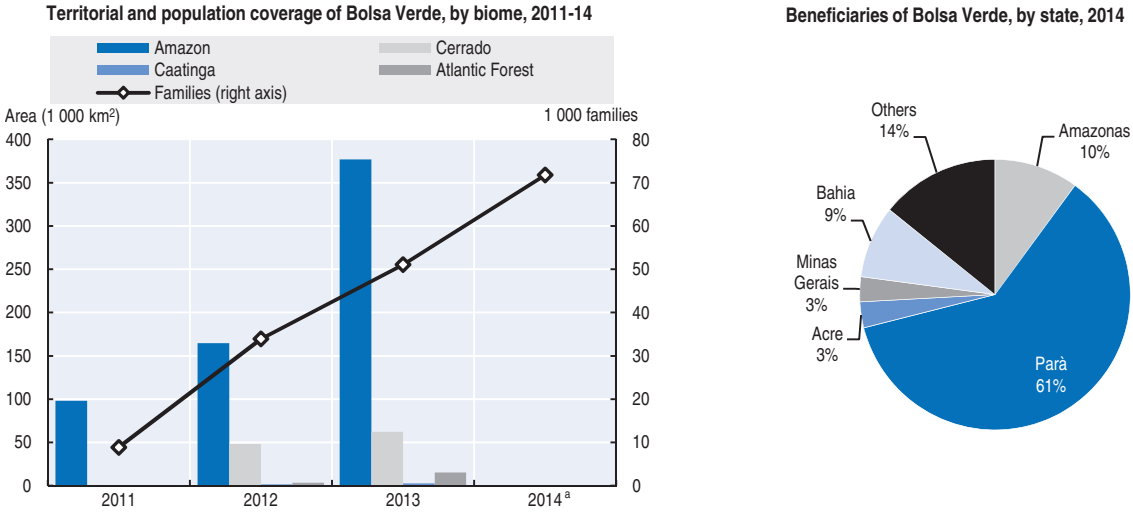
Bolsa Verde provides quarterly grants of BRL 300 to extremely poor families living in some categories of federal protected areas and other designated areas,* in return to commitments to certain conservation efforts and sustainable use activities. By including territories occupied by traditional and indigenous communities, the programme recognises these communities' role in preserving environmental services. To participate in the programme, families must be beneficiaries of Bolsa Família and registered in the Single Registry (Box 3.1). Payments through Bolsa Verde are additional to benefits received through Bolsa Família. The benefit may be granted for two years, with the option of renewal.

* The federal areas include sustainable use protected area, environmentally distinctive settlement projects, territories occupied by traditional peoples and communities, and other rural areas defined as priority by decree. Families in extreme poverty are defined by the federal government as those receiving no more than BRL 77 (USD 33) per capita per month.

The number of households enrolled in the programme has steadily grown, mostly in the Amazon biome and in the state of Parà (Figure 4.9). As of 2014, 30% of beneficiaries were living in federal protected areas. The government estimates that there are 213 000 potential beneficiary families living in 1.45 million km^2 of priority areas and that reaching all of them would imply paying BRL 1.72 per hectare per year (MMA, 2015). This is a low price for the potential outcomes in terms of improved living conditions and conservation of natural resources, provided that the beneficiaries effectively make additional conservation efforts thanks to the programme.

However, the programme faces difficulties in maintaining the database of beneficiaries, and no monitoring process or criteria for assessing compliance with conservation commitment are yet in place (CGU, 2014). No training activities had been conducted as of

Figure 4.9. **Participation in the Bolsa Verde programme has steadily grown**



a) Number of beneficiary families as of 25 January 2015.
Source: MMA (2015), "Bolsa Verde", MMA em Números (website); MMA (2014), *PNIA 2012: Painel Nacional de Indicadores Ambientais. Referencial teórico, composição e síntese dos indicadores.*

StatLink http://dx.doi.org/10.1787/888933279736

July 2014, despite such training likely being essential to support beneficiaries in meeting their commitments. In addition, the programme seems complex from an administration point of view, with many institutions involved and managed at central level, far from the beneficiaries. Viana (2015) suggests delegating the management of the programme to the states as a way to improve execution and reach a larger part of the target population.

The lack of monitoring impedes evaluation of the effectiveness of the payments in promoting the conservation of biodiversity in the target areas. Developing a monitoring process, including conservation-based indicators, is necessary to ensure that the programme generates environmental benefits that are additional to the social benefits generated by the Bolsa Família programme (Box 3.1).

5.6. *Voluntary agreements and company certification*

The business sector, especially large companies, has been progressively more active in supporting biodiversity conservation and sustainable use initiatives and in providing related finance.[11] An increasing number of farmers and ranchers have adhered to voluntary registries that require commitments to improving social and environmental performance (Soares-Filho et al., 2014b). Yet as of 2014, only two Brazilian businesses had been certified under Life Certification, a voluntary process to assess a company's environmental management and impact on biodiversity (Instituto Life, 2014).[12]

The business sector has helped combat deforestation in the Amazon. In 2006, following a report from Greenpeace and under pressure from consumers, a group of large companies, in co-operation with the MMA, implemented a supply chain governance agreement called Soya Moratorium, agreeing to stop using soya grown on cleared forestland in the Brazilian Amazon. This initiative was one of the first voluntary zero-deforestation agreements in the world (Box 4.9). A similar initiative, the Beef Slaughterhouse Pact, involves the cattle industry.

The Soya Moratorium has proved effective, as farmers respect the requirements of the demand of the market. According to Gibbs et al. (2015), farmers are five times less likely to

Box 4.9. **The Soya Moratorium**

In 2006, large companies including McDonald's and Wal-Mart decided to stop buying soya grown on cleared forestland in the Brazilian Amazon, thereby launching the so-called Soya Moratorium. This put pressure on commodity traders, such as Cargill, who in turn agreed to no longer purchase soya from farmers who cleared rainforest to expand soya fields. In all, 47 companies associated with the Brazilian Association of Vegetable Oil Industries (ABIOVE – 12 companies) and the Cereal Exporters National Association (ANEC – 35 companies) joined the moratorium. From the start, the initiative also had strong support and participation from eight civil society organisations: Conservation International, Greenpeace, IPAM, TNC, WWF-Brazil, Amigos da Terra Amazônia Brasileira, Imaflora and STTR Santarém. Since 2008, the MMA has also been part of the initiative.

A study to evaluate the agreement analysed satellite-based imagery covering the Brazilian Amazon forest and the Cerrado from 2000 to 2014 to measure how much land had been cleared to grow soya. The study shows that the moratorium helped to drastically reduce the amount of deforestation linked to soya production. In 2004 and 2005, nearly 30% of soya expansion occurred through deforestation. By 2014, this rate had fallen to only ~1% in the Amazon biome. The study also found there is enough already-cleared, suitable land in the Amazon to allow the soya production area to expand by 600%. In the Cerrado biome, where the Soya Moratorium does not apply, the annual rate of soya expansion into native vegetation remained sizeable, ranging from 11% to 23% over 2007-11 (Gibbs et al., 2015).

Source: Gibbs et al. (2015), "Brazil's Soy Moratorium. Supply-chain governance is needed to avoid deforestation".

violate private sector agreements than they are to violate government policy. This points to the opportunity of further developing voluntary initiatives like the Soya Moratorium after its expiration (in 2016), as well as extending them to the Cerrado biome, where deforestation rates are high. More broadly, there is scope to further engage the business sector in biodiversity protection by promoting sustainable production and consumption plans.

5.7. Green public procurement

In 2012, the government launched its sustainable procurement policy to prioritise environmental goods and services, among other areas (Chapter 2). In addition, a national procurement programme targeting specifically biodiversity-related products exists and similar initiatives have been launched at state level, e.g. in the state of Amazonas (MMA, 2015).

The 2009 National Plan to Promote the Production Chain of Socio-Biodiversity Products (PNPSB) aims to strengthen the production and commercialisation of 30 traditional non-timber products from sustainably managed forests (Section 7.2), thereby providing a source of income for rural communities.[13] It provides facilitated access to credit and markets as well as technical assistance. The PNPSB includes a minimum price programme for selected socio-biodiversity products (PGPMBio), such as açai fruit, natural rubber and Brazil nuts, aimed at supporting producer income. This was recently linked to the large-scale federal Food Acquisition Programme, one of the world's largest institutional procurement programmes for smallholder or family farm products.[14]

The quantity of subsidised production and the number of "extractivists" benefitting from the programme has fluctuated since its establishment in 2009, but the trend is

increasing; in 2013, PGPMBio reached 12 000 extractivists in six states, mostly in the Amazon and Atlantic Forest biomes. Subsidy payments reached USD 2.6 million, about 25% of the available budget, which is linked to high market prices (above guaranteed price levels) but also to difficulties in the operationalisation of payments (Viana, 2015).[15] Overall, the subsidy still benefits only a small fraction of total production of the targeted products.[16] Nevertheless, the PGPMBio support has led to an increase in production and commercialisation of socio-biodiversity products and helped increase competition among buyers, with positive income effects for extractive workers (MMA, 2015).

The PNPSB and PGPMBio have been implemented in selected areas, including sustainable use protected areas (Chapter 5). Many producers currently not in such areas have requested a protected area status for the lands they live and work on, in particular that of extractive reserve, because of the potentially higher accessibility to the PNPSB, PGPMBio and other public services.

5.8. Access to genetic resources and benefit sharing

Indigenous lands make up over 13% of Brazil's territory and the country is home to thousands of *quilombolas* and members of traditional communities (Box 5.2), who have considerable knowledge relating to plant and animal resources and how to manage them. This underlines the importance of ensuring access to genetic resources and the fair sharing of the benefits deriving from it for both the effective protection and sustainable use of the resources and the well-being of these communities.

Brazil signed the Nagoya Protocol to the CBD on Access and Benefit-Sharing (ABS) in 2011 and started the process for its ratification. Until May 2015, the Brazilian regulation was included in a provisional emergency rule dating back to 2001, when a business proposal to access and develop Brazil's genetic heritage sparked public concerns about "bio-piracy". This provisional rule severely restricted access to genetic resources for both commercial and scientific purposes (Cabrera et al., 2014).

The emergency rule introduced a highly bureaucratic and time consuming licensing process for accessing genetic resources and traditional knowledge. If access was required for commercial purposes, a bilateral contract was to be signed to set out how the benefits arising from the commercialisation were to be shared. Despite efforts to clarify the terms and scope of the provisional rule, regulatory uncertainty remained high, resulting in only a few benefit-sharing contracts being approved and a large number of pending cases (IEEP et al., 2012). This also constrained research and innovation.[17]

Acknowledging the need to improve regulations, broad public consultations were initiated in 2006, with a view to replacing the interim rule with a comprehensive law. In May 2015, the Parliament approved the Biodiversity Framework Law, which aims at reducing the administrative burden and at improving the participation of indigenous groups and traditional communities in decision making. It sets clear rules and creates a fund for benefit sharing. This could reduce the transaction costs previously associated with bilateral benefit-sharing contracts, including those due to the fact that various indigenous and traditional communities often share resources and knowledge (IEEP et al., 2012). Implementing regulations are due to be issued by November 2015.

Brazil needs to quickly implement the new legislation so as to overcome the bottlenecks associated with the previous ABS regulations while ensuring effective engagement of the indigenous and traditional communities. This could have multiple

benefits, notably resulting in innovation and business opportunities, helping vulnerable populations that depend on genetic resources to use them sustainably and providing resources for conservation and sustainable use of biodiversity, for example in protected areas and on indigenous lands.

6. Financing biodiversity conservation and sustainable use

6.1. The federal budget for biodiversity-related activities

Several sources contribute to the financing of biodiversity conservation and sustainable use. Comprehensive and consistent information on public and private biodiversity-related spending is not available, however, and Brazil would benefit from developing a resource mobilisation strategy for achieving its national biodiversity targets. The federal budget allocated to selected biodiversity-related programmes, including for managing protected areas and monitoring deforestation in the Amazon, provides an indication of public resources available for biodiversity conservation, although these amounts are probably an underestimate (Table 4.4). Between 2010 and 2014, the federal budget outlays for these biodiversity-related programmes grew by nearly 50% in real terms, in line with the overall growth of the federal budget outlays for environmental management (according to the Treasury's budget classification by government function; see Chapter 2). In 2014, 9% of the budget related to environmental management was allocated to these biodiversity-related programmes.

Table 4.4. **Federal budget outlays for selected biodiversity-related programmes**

BRL million (nominal values), 2010-14

Programme	2010	2011	2012	2013	2014
Integrated information for Amazon protection	99.9	88.9	–	–	–
Conservation and sustainable use of biodiversity and genetic resources	129.0	129.6	–	–	–
Forests	56.7	48.8	–	–	–
Conservation and restoration of Brazilian biomes	96.8	89.4	–	–	–
Conservation, management and sustainable use of agro-biodiversity	23.6	29.4	–	–	–
Biodiversity	–	–	344.5	263.7	514.0
Forests, prevention and control of deforestation and fires	–	–	162.0	249.8	266.3
Total	406.0	386.1	506.4	513.6	780.3
Share of the federal budget outlays for environmental management	*8.9%*	*8.5%*	*8.0%*	*6.4%*	*8.9%*

Source: Senado Federal (2015), *Portal Orçamento* (database).

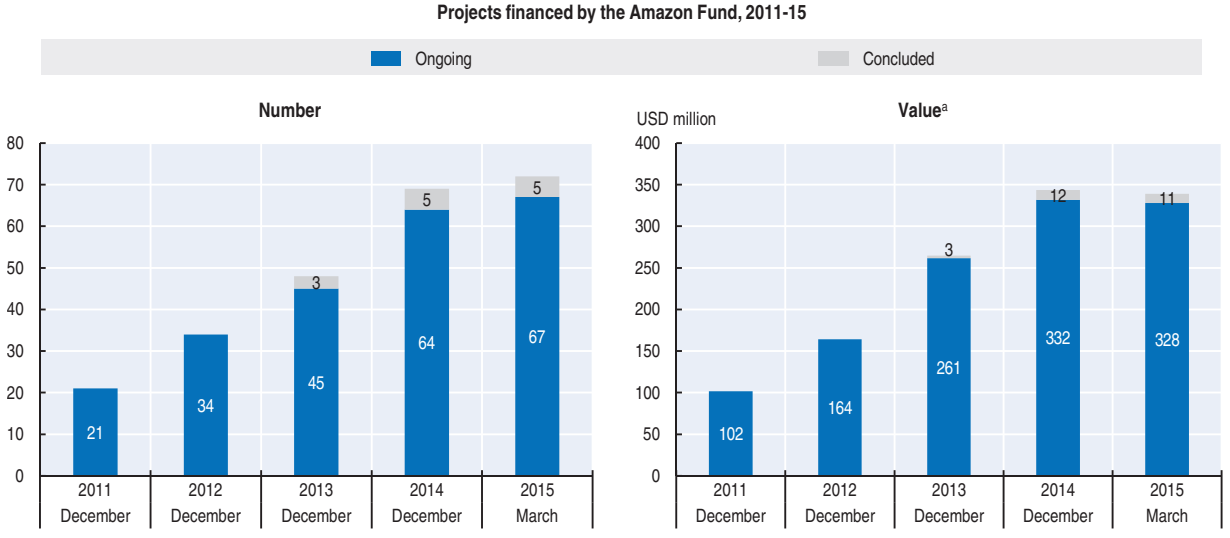
ICMBio administers most of the budget for biodiversity-related programmes, mainly for managing the federal official protected areas (Chapter 5), followed by the MMA. The real budget of ICMBio increased by 57% between 2008, when it started operating, and 2014, when it reached BRL 783 million (Chapter 2). In 2013, about half of ICMBio's budget was used for staff salaries; investment accounted for between 2% and 11% (Funbio, 2014).

6.2. Biodiversity-specific funds and other sources of finance

Several budget and extra-budgetary funds contribute to financing biodiversity-related expenditure. These include the National Fund for the Environment (Chapter 2); the Protected Areas Fund (Chapter 5); the Forest Development Fund, managed by the Brazilian Forest Service to promote sustainable forestry; and the Atlantic Forest Restoration Fund, managed by the MMA to finance environmental restoration and scientific research in the Atlantic Forest biome (Table 2.2).

One of the key funds is the innovative Amazon Fund, established in 2008 to invest in forest conservation and sustainable use and deforestation prevention and monitoring, thereby contributing to reducing GHG emissions resulting from deforestation and forest degradation. At least 80% of the fund's investments are earmarked for the Amazon region and up to 20% can be invested in deforestation monitoring and control in other Brazilian biomes or tropical countries. The fund is managed by the Brazilian Development Bank (BNDES) in co-ordination with the MMA. Most funds come from international donors, mainly Norway and, to a lesser extent, Germany, but also from companies such as Petrobras, the majority-government-owned oil company.[18] The total cumulated contributions received between 2009 and early 2015 amounted to over BRL 2 billion (or USD 970 million). By comparison, the federal budget allocation to ICMBio in 2009-14 was BRL 4 billion (at 2014 prices). The fund has supported an increasing number of projects (Figure 4.10). As of March 2015, the fund had supported 72 projects with USD 339 million, with most projects being in the states of Parà, Amazonas and Mato Grosso (Amazon Fund, 2015).

Figure 4.10. **The Amazon Fund has supported an increasing number of projects**



a) At 2015 prices and exchange rates.
Source: Based on Amazon Fund (2015), *Portfolio Report*, 31 March 2015.

StatLink http://dx.doi.org/10.1787/888933279748

Part of the Amazon Fund is channelled through the Brazilian Biodiversity Fund (Funbio), a private non-profit organisation that raises and invests financial resources for biodiversity conservation, mostly in protected areas, on behalf of the federal and state governments. In addition to the Amazon Fund, Funbio manages resources largely provided by partner countries and multilateral organisations such as the GEF (Chapter 5).

Brazil has received about half the total approved international finance from Reducing Emissions from Deforestation and Forest Degradation (REDD and REDD+) through the Amazon Fund (Norman et al., 2014). In June 2014, Brazil was the first country to submit its forest reference emission level for payments under REDD+ as required by the 2013 Warsaw Framework. A national REDD+ strategy has been under discussion since 2010, but has yet to be approved.

Overall, international multilateral and bilateral co-operation as well as private and corporate foundations play an important role in providing finance for biodiversity protection, especially in the Amazon. According to OECD statistics of official development assistance (ODA), in 2010-12 aid flows to Brazil targeting the objectives of the CBD increased four-fold to USD 675 million (at 2012 prices). They dropped to less than half this amount in 2013, however (Figure 3.10).

Estimates by Castro de La Mata and Riega-Campos (2014) indicate that from 2007 to mid-2013, the international funding for conservation of the whole Amazon forest (including that outside Brazil) amounted to USD 1.34 billion (or USD 206.2 million per year). The Brazilian Amazon received about 50% of these resources. Seven of the top ten donors were from international multilateral and bilateral co-operation, two were private foundations and one was an international NGO. National and subnational governments were the main recipients, followed by NGOs and the private sector.

7. Mainstreaming biodiversity into sectoral policies

7.1. Agriculture

Brazil is a major agricultural producer and exporter and agriculture accounts for about 15% of employment (Chapter 1; also see Basic Statistics). Since the mid-2000s, the government has placed a greater focus on encouraging the adoption of new technology and sustainable agricultural practices and discouraging conversion of forests in agricultural areas. As Section 4 notes, since 2008 access to subsidised rural credit in the Amazon biome has been conditional on the legitimacy of land claims and compliance with environmental regulations, and rural credit will be conditional on land registration in the Rural Environmental Cadastre from October 2017 (Section 5.2).

Special programmes support small family farms, organic farming and sustainable production such as the National Agroecology and Organic Production Plan 2012-15. For example, the Family Production Socio-environmental Development Programme (Proambiente) awards farmers and ranchers with up to one-third of the minimum wage when they use more environmentally sound production practices, such as no pesticides or sustainable agroforestry (OECD, 2013). In 2010, the government launched the Low-Carbon Agriculture programme to provide subsidised credits for implementing good environmental practices. While the focus of this programme is on reducing GHG emissions, it contributes to mitigating the impact on biodiversity (Box 4.10).

Demand for organic products has grown in recent years. This fact and higher product prices are making organic production a viable way for small-scale rural producers to increase their income. The Ministry of Agriculture, Livestock and Food Supply has developed an online system for registering organic producers. In 2014, there were more than 7 100 organic producers registered in the system (MMA, 2015). Yet organic farming accounts for a very small share of agricultural output and less than 1% of agricultural land area, and the area dedicated to organic practices has declined since 2010 (Figure 4.11).

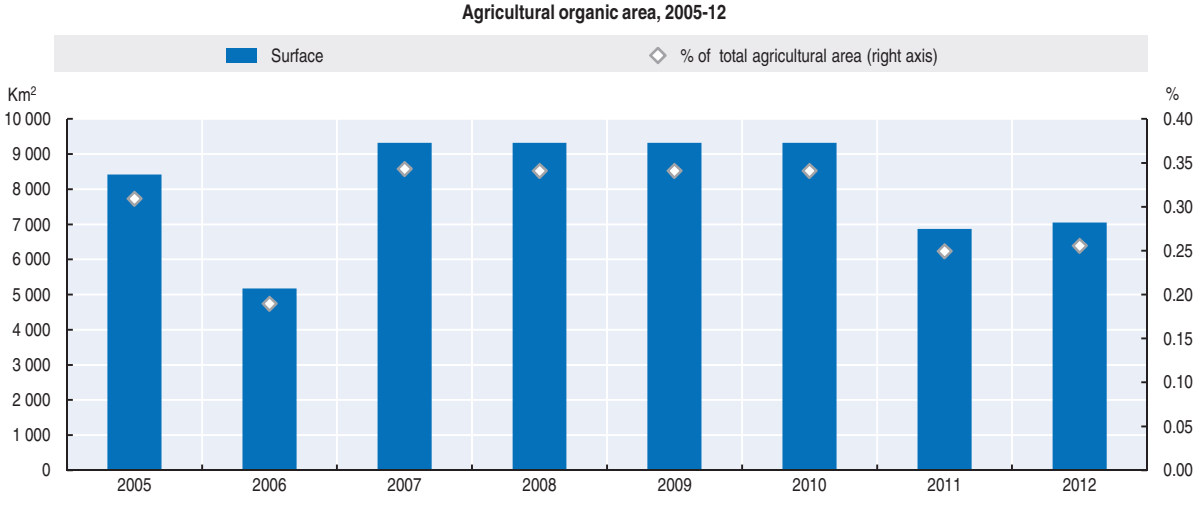
Overall, the volume of the programmes to support sustainable agriculture is small compared to the total support provided to farmers. Most of the support and loans to agriculture are based on conventional agriculture practices (hybrid seeds, chemical fertilisers and pesticides), with potentially negative impacts on soil and water. The vast majority of support is tied to production, as it is based on commodity output and input use (Chapter 3). This is the most distorting and potentially environmentally harmful form of agricultural support.

Box 4.10. **The Low-Carbon Agriculture programme**

The Low-Carbon Agriculture (ABC) programme, launched in 2010 as part of the National Climate Change Policy (Chapter 2), consolidated a range of concessional credit lines that targeted good environmental practices and the reduction of GHG emissions with a view to facilitating investment. Unlike previous rural credit lines, the programme does not finance specific items (e.g. machinery, seeds, fertilisers), but may finance actions that jointly reduce environmental impacts. The programme took off slowly, due to various technical and capacity challenges, but disbursement picked up in 2012 as more financial intermediaries became involved, the interest rate was decreased, technical capacity strengthened and dissemination of information about the programme improved. The total contracted operations in 2013/14 amounted to BRL 3 billion, nearly double the amount of the 2011/12 growing season. By July 2014, total contracted operations had reached BRL 8.2 billion, 62% of the planned value (FEBRABAN, 2014).

Despite improvement, intermediary banks continue to show little interest in the programme: 91% of disbursements were executed by the public Banco do Brasil, while only 9% were transferred by private banks with funds from the BNDES. This is partly because an ABC credit with the BNDES entails high transaction costs (FEBRABAN, 2014). Information on the programme needs to be expanded and resources for training technical assistants and for financial officers increased. Prioritising areas for expansion (e.g. where GHG reduction potentials are greatest) would help increase the effectiveness of the programme while it is gradually scaled up. As the programme expands, efforts should be undertaken to monitor its effectiveness in reducing GHG emissions and pressures on biodiversity. Overall, the volume and scale of the ABC programme remain small when compared to conventional agricultural support.

Figure 4.11. **Agricultural organic area is small and has declined**



Source: FAO (2015), *FAOSTAT* (database).

StatLink http://dx.doi.org/10.1787/888933279755

By stimulating production and input use, and thereby agricultural intensification and expansion, these support and credit programmes risk increasing pressures on the natural resource base and encourage deforestation. These policies reduce incentives to use production factors more efficiently and tend to encourage agricultural production over

other land uses, such as conservation, restoration and sustainable forestry. Agricultural support could be more strongly oriented to encouraging environmental improvement and efficient use of inputs, as well as to addressing infrastructure gaps. This could improve productivity of agriculture and cattle farming and reduce the impetus for converting land and clearing forests.

In addition, key agricultural inputs such as water, pesticides and fertilisers are implicitly subsidised. Water abstraction is not charged for in many regions (Section 5). 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 United States) and fertiliser use is particularly high for certain crops, such as soya, and in the South and South-east regions where large-scale farming prevails (Chapter 1). Several widely used pesticides are considered dangerous or highly dangerous for the environment and detrimental to pollinators (MMA, 2015); and the use of non-authorised pesticides is high (Jardim and Caldas, 2012).

The current regulation on pesticide approval should be revised to require periodic renewal of approvals, rather than these being granted permanently (MMA, 2015). When conducted, the review process often takes several years (Friedrich, 2013). In addition, tax exemptions for fertilisers and pesticides should be reconsidered with a view to encouraging more rational use of products that can harm human and animal health and ecosystems. The experience of other countries shows that this can lead to economic and environmental benefits. Indonesia, for example, gradually removed pesticide subsidies, while assisting farmers with the use of integrated pest management approaches. Three years later, this resulted in record levels of rice production and over USD 100 million in savings (OECD, 2013).

The Rural Land Tax (ITR), although not very significant, also incentivises agricultural production over conservation. The ITR is higher for "unproductive" land than for land under agricultural production. RL and APP areas benefit from ITR exemption, which partly compensates for the opportunity cost of not engaging in more intensive land use; however, the value of the exemption is so low that the incentive is negligible (MMA, 2015).

7.2. Forestry

Timber and non-timber resources

Brazil is a large producer and consumer of tropical timber. In 2007, the forestry sector accounted for 3.5% of GDP and 7.3% of exports, and employed about 7 million people (SFB, 2015b). Less than 1% of total forest area was designated for production in 2011/12 (SFB, 2013).[19] Legally extracted timber from native forests came from both sustainable forest management (49%) and authorised deforestation (51%) in 2007-10. Extraction from planted forests has almost doubled since 2000 and reached almost five times the volume of extracted timber from native forests in 2013. Planted forests can help reduce demand for timber products from native forests and generate employment and income. Most planted forests are located in southern Brazil, while timber from native forests primarily originates in the Amazon and, to a lesser extent, the Atlantic Forest (SFB, 2015b).

Non-timber forest products generated BRL 936 million in 2011, or 5.1% of total primary forest production (MMA, 2015). The extraction of non-timber forest products is a diffuse and informal economic activity, practiced mainly, though not exclusively, in remote

regions by traditional and rural communities. Extractive activities often comprise an important (if not the only) source of their income. Products exploited for economic purposes include rubber, straws, reeds, leaves, fibres, seeds, resins and essential oils, but production scale varies significantly and species and/or environmental sustainability is not yet ensured for all products (MMA, 2015).

Production of such products has been encouraged through federal programmes such as the PNPSB (Section 5.7) and the creation of sustainable use protected areas (Chapter 5). In Manaus and Belém, productive chains are being developed to connect and co-ordinate extractive activities in forest communities with urban economic sectors, small and medium-size processing industries, local research and technological support institutions, and other relevant sectors (MMA, 2015). However, the production extracted from the forest in sustainable conditions amounts to less than 0.2% of the GDP of the Legal Amazon municipalities, mainly due to insufficient demand and a missing link between production and commercialisation (WWF, 2015).

Concessions for sustainable forest management

The government is committed to increasing the sustainable use of its forest resources, recognising that sustainable economic alternatives for local populations are needed to prevent deforestation and other environmentally harmful practises.

The 2006 Public Forests Management Law reinforced the right of local communities to manage their forests[20] and introduced concessions as an instrument to promote sustainable forest management for timber production. It established the SFB to manage concessions. The law allows federal, state and municipal governments to grant, through a bidding process, the legal right for private companies to harvest timber and non-timber forest products, provided that the forest is sustainably managed.[21] The selection of concessionaries is based on best price offers and on technical criteria such as lowest environment impact and highest social benefits. Forest concessions must be preceded by public hearings. Part of the concession area must be set aside and extractive activities need to respect local populations (SFB, 2013).

While the area of public forests is extensive, only a very small part of it is being used for sustainable forest management concessions. As of November 2012, Brazil had an area of 3.1 million km^2 registered as natural public forests in the National Public Forest Registry (CNPF),[22] representing 36% of the national territory (SFB, 2013). The first forest concessions were granted in 2008, but by 2013 only 0.2% of the public forest area available for concessions was under a federal or state concession regime.

Among the reasons for the slow take-off of concessions are insufficient expertise in technology for sustainable forest management in companies; the insufficient technical and economic capacity at government level to manage the concessions; lack of infrastructure in the concession areas; and unsolved land tenure conflicts. Forestry companies often complain about the high concession fees (for each cubic metre of wood harvested) and the technical specifications in contract terms. Rural communities have difficult access to concessions because they lack the ability to compete in a highly bureaucratic process (WWF, 2015). Systematic monitoring of areas under concessions is needed to ensure that forests are managed sustainably, according to the contract specifications, and that they achieve the expected environmental and social outcomes.

Timber certification

The forest management and chain of custody certification in Brazil is carried out by several companies through two certification systems: the Brazilian Programme for Forest Certification (Cerflor), bound to the Programme for the Endorsement of Forest Certification Schemes (PEFC), and the Forest Stewardship Council (FSC). Total area of certified forests has increased. By the end of 2012, more than 14 000 km^2 of forest was certified by Cerflor and another 72 000 km^2 by FSC (SFB, 2013).

Forest restoration

As Section 5.2 points out, a large share of rural holdings do not comply with forest conservation obligations set in the 2012 Forest Code and the tree cover will need to be restored on these lands, especially in the Amazon, Atlantic Forest and Cerrado biomes. As of April 2015, data registered in the CAR indicated the need to restore 80 000 km^2 of forest land (SFB, 2015a).

The National Plan for Native Vegetation Recovery (Planaveg), developed by the MMA and currently under public consultation, aims to promote large-scale forest restoration. The proposal projects recovery of at least 125 000 km^2 within 20 years,[23] primarily in APPs (46%) and RLs (37%), but also on degraded or low productivity areas where restoration is not required by law. The proposed plan includes several groups of actions aimed at raising awareness, making seedlings available and affordable, creating markets for products from restored forests and introducing new finance mechanisms (such as extending the existing tax-free infrastructure bonds to restoration investment), among other goals. It is expected to complement other initiatives, such as the ABC programme (Box 4.10) and ongoing land regularisation efforts. The MMA expects the plan to generate up to 191 000 direct jobs in rural areas.

Restoration costs are high, and can be prohibitive for small-scale land holders. Meeting Brazil's restoration targets is therefore challenging and will require significant resources, financial and human. The preliminary budget for implementation is BRL 181 million for the first five years,[24] but funding sources are yet to be defined. In addition to providing cost estimates, Brazil should prioritise the most important areas for restoration (e.g. using priority maps such as key areas for water production and biodiversity protection).

7.3. Fishery and aquaculture

The Brazilian government has committed to support growth of the fishery sector as an important tool for food security and regional socio-economic development. The capacity of fishing vessels and tools has increased, which is reflected in increased fishery production (Section 1.2). Most fisheries, however, are carried out by obsolete fleets very often directed at fish stocks that are already heavily exploited, resulting in negative outcomes with respect to both biodiversity and efficiency. Resource conflicts between artisanal and industrial fishing and among fishing communities tend to exacerbate pressures on fish stocks (OECD-FAO, 2015).

Aquaculture production has grown nearly five-fold since 2000 and it is expected to grow further, driven by increasing domestic demand and policy support to the sector (OECD-FAO, 2015).[25] Increasing aquaculture production may contribute to increase fish and seafood supply while reducing pressure on natural fishery resources, but policies aimed at expanding aquaculture needs to take into account potentially negative impacts on biodiversity and ecosystems, particularly when alien fish species (or Brazilian species outside of their original habitat) are being cultivated. Aquaculture activities are subject to environmental licencing.

Brazil has adopted a shared fishery management model based on permanent management committees involving government and civil society institutions. This model aims to address environmental sustainability and social inclusion concerns. No formal environmental licensing of fishing activities is required, but several measures apply to limit their environmental impact (e.g. on fishing periods and areas, and gear). However, an audit conducted by the Federal Court of Accounts (TCU) found that this structure was not fully implemented, with measures for the sustainable use of fishery resources still being carried out by the government alone. Limitations in data on aquatic habitats and fishery resources, insufficient mechanisms to monitor and control compliance, and difficult co-operation between the MMA and the Ministry of Fisheries and Aquaculture were found to pose further challenges to sustainable fishery management (MMA, 2015).

Additional measures, including fish catch quotas, effective management plans for overexploited species and the extension of marine protected areas, are needed, particularly in coastal and marine areas where fish stocks are at their limits. The Sectoral Plan for Sea Resources includes an initiative focusing on evaluation, monitoring and conservation of marine biodiversity (REVIMAR). For 2012-15, this initiative was to include establishing monitoring programmes for marine species, continuing the assessment and monitoring of mangrove areas and protected areas containing coral reefs, increasing the number of conservation plans for marine threatened species and expanding the total marine protected areas to 4% of Brazil's territorial waters and exclusive economic zone (Chapter 5).

7.4. Infrastructure development: the case of hydropower

Hydropower is, and will continue to be, a major energy source, but its expansion is constrained by location: most potential is located in the Amazon, which raises difficulties with environmental licensing and public acceptance (Box 2.8). Efforts are being made to develop new techniques to reduce the environmental impact of large hydropower plants, including platform hydropower, and, when suitable, new projects are designed as run-of-river (IEA, 2013). Yet hydropower plants can have a number of adverse impacts on biodiversity, disrupting river connectivity, changing habitats and interfering with the natural cycles of aquatic species. The development of dams for large hydro may also encourage road construction, migration and urbanisation, further increasing pressures on native vegetation. About 95% of deforestation in the Amazon occurs within 5 km of roads (or rivers) (Barber et al., 2014).

Like all infrastructure projects, hydropower plants are subject to environmental licensing and impact assessment (Chapter 2). However, the licensing process and allocation of water use permits has paid little attention to environmental flows, i.e. to how much water is needed to sustain freshwater ecosystems and ecosystem services to prevent negative (and often unexpected) impacts. Legislation in many countries requires environmental water needs to be considered as part of the licensing process (OECD, 2015).

The streamlining of biodiversity into large-scale infrastructure projects benefits from enhanced co-operation between the MMA and the Ministry of Mines and Energy. With a few exceptions, however, impacts are addressed through *ex post* mitigation measures, rather than being considered at the early planning stages. Better integration between the regulatory and institutional frameworks for the environmental and energy sectors would allow a shift from project-based planning to a more strategic integration of energy development and conservation objectives. Brazil could consider using strategic environmental assessment procedures for hydropower development (Chapter 2). This would make it possible, for

example, to identify where energy capacity could be built with the least environmental impact and take account of cumulative impact (e.g. from a series of dams on the same river). This could help reduce the costs of mitigation the environmental and social impact of hydropower development projects, as identified by the environmental licence, which represent up to 12% of the total costs of these projects (World Bank, 2008).

8. Knowledge base and economic valuation for biodiversity policy making

8.1. The knowledge base

Brazil has made progress towards achieving national biodiversity target 19 on enhancing and systematising biodiversity-related knowledge (Annex 4.A). In 2014, the MMA released the updated lists of threatened flora and fauna species, based on extensive scientific assessment, and ICMBio has been monitoring the biodiversity conservation status in protected areas (Chapter 5). The SFB co-ordinates an annual national forest inventory. Many other initiatives are also being undertaken to monitor biodiversity in protected areas (Chapter 5).

Brazil is a world leader in monitoring deforestation via satellite imaging, which has been key in supporting government enforcement actions to fight deforestation in the Amazon biome (Section 4). Satellite deforestation monitoring has been implemented for the other biomes too, but it is less developed and the data are not fully compatible across systems. Reinforcing the satellite-based deforestation monitoring systems for all biomes and adapting them to detect forest degradation will be essential in order to enforce the new Forest Code and further reduce forest clearing (Section 5.2).

In 2010, the Ministry of Science, Technology and Innovation (MCTI) launched the online Information System on Brazilian Biodiversity (SiBBr), which aims to organise information on Brazilian biodiversity and ecosystems to support research and public policy. The first set of scientific data is being uploaded.[26] However, operational challenges remain with regards to regularly updating the databases and making them more user friendly (MMA, 2015). Brazil could benefit from the effective implementation of an umbrella system such as the SiBBr to compile, consolidate, systematise and regularly update existing and new biodiversity-related information and make it more accessible for research and policy design and evaluation.

8.2. Economic valuation of biodiversity and ecosystems

Despite the increasingly vast amount of information available, only modest progress has been achieved in terms of economic valuation of biodiversity and ecosystems. In 2012 the Institute for Applied Economics Research (IPEA) surveyed the existing biodiversity and ecosystem valuation studies in Brazil to identify knowledge gaps. After a review of 103 studies, IPEA concluded that the majority of the studies were thematic and site specific and therefore not conducive to estimating values on a larger scale (Roma et al., 2013). One notable exception is an assessment of the contribution of Brazil's protected areas to the national economy (Box 5.3).

However, valuation studies have rarely been used in decision-making processes. Progress has been made on including the value of water resources into national accounting and work is continuing on forest economic accounting. Brazil should build on these experiences to fully integrate the values of biodiversity and ecosystem services into the national accounts. Increased effort is needed to improve understanding of these values, and the risks associated with their loss, as a means of raising public awareness and providing support for policy making.

Progress has been made in this direction. As part of Brazil's international commitment under the CBD to implement a national TEEB (The Economics of Ecosystem and Biodiversity), in 2013 the MMA launched the Brazilian Natural Capital Initiative (EEB). The MMA and key partners are engaging in an national effort to: i) identify and highlight the benefits of conservation and sustainable use of national biodiversity and ecosystem services, as well as estimate the costs of their loss; ii) promote mainstreaming of the economics of ecosystems and biodiversity in decision-making processes at different levels, so that decisions may lead to the sustainable use of natural assets; and iii) influence the implementation of public policies and management instruments, as well as promote behavioural changes to ensure the long-term provision of natural assets. Box 4.11 describes the main activities and outcomes of EEB.

Box 4.11. **The Brazilian Natural Capital Initiative**

The Brazilian National Capital Initiative is conducted by a broad partnership, including the MMA and other federal ministries and agencies, industry organisations and international partners.* The EEB has three inter-related components: i) national policies (National TEEB); ii) internalisation of the value of ecosystem services in decision-making processes (Regional-Local TEEB); and iii) risks and costs of the loss of biodiversity to the business sector (Business Sector TEEB).

In November 2013, the EEB partnership identified the thematic priorities to be addressed in the first phase of the National TEEB: i) promotion of sustainable production chains through public procurement processes; ii) economics of ecological restoration; iii) impacts and dependence of the agriculture sector on ecosystem services; and iv) mapping of ecosystem services. The initiative has commissioned the work necessary to develop a work plan for these four priority themes. The next step will involve the engagement of strategic stakeholders, especially from sectors not yet sensitive to these themes.

The GIZ supports the development of a Regional-Local TEEB project on the basis of pilot projects to improve understanding about economic and financial instruments for biodiversity protection and approaches to incorporate biodiversity and ecosystem service values into policy making at regional and local levels. As part of the project, a manual for practitioners was released ("Integration of ecosystem services into development planning: A step-by-step guide for practitioners based on the TEEB Initiative") and two international events were held in 2014: i) the Brazil-India-Germany TEEB Dialogue; and ii) the International Workshop on Businesses and Natural Assets, which was an open event to strengthen co-operation among governments, the business sector, academia and civil society towards achieving the objectives of the CBD.

The Business Sector TEEB aims at highlighting the economic benefits of business initiatives that favour the conservation of biodiversity and maintenance of ecosystem services. In March 2014, a study comparing the environmental value of different agricultural practices for the production of palm oil (*dendê*) and soya in pilot projects of the Natura and Monsanto companies was published. In both cases, results suggest that conserving natural capital is good business.

* The EEB is a joint partnership of the MMA, the Ministry of Internal Revenue, the MCTI, the IPEA, the, Secretariat of Strategic Affairs of the President's Office, the IBGE, the United Nations Environment Programme, the National Industry Confederation, Conservation International Brazil and the German technical co-operation body, GIZ.

Source: MMA (2015), *Fifth National Report to the Convention on Biological Diversity*.

Recommendations on conservation and sustainable use of biodiversity

Knowledge base and evaluation

- Build on the Information System on Brazilian Biodiversity to compile, consolidate and systematise existing and new biodiversity-related information and make it more accessible for research and policy design and evaluation; ensure that the system is regularly and timely updated.
- Continue to develop satellite-based monitoring systems that detect forest deforestation and degradation and cover all biomes, especially the Cerrado, Caatinga and Pampa, where most vegetation clearing is expected; ensure that the systems generate up-to-date and compatible data series.
- Pursue the Brazilian Natural Capital Initiative; conduct a national ecosystem assessment at the earliest opportunity to improve knowledge of the values of biodiversity and ecosystem services and of the risks associated with their loss; ensure that the values of ecosystem services are integrated in national accounts and in policy design and evaluation.

Policy framework

- Maintain the policy focus on combatting deforestation and clarifying land tenure, and extend it to all the terrestrial biomes and to marine, coastal and inland water ecosystems.
- Streamline the multitude of biodiversity-related plans and programmes with a view to eliminating overlap and duplication of efforts and increasing cost-effectiveness; systematically evaluate the implementation of policies and measures in terms of results, costs and benefits, and revise policies and programmes accordingly.

Forest conservation, restoration and sustainable management

- Strengthen implementation of the Rural Environmental Cadastre (CAR) by providing economic incentives to encourage cadastre enrolment, promote compliance and support sustainable management and restoration of set-aside areas; build on the CAR information system to improve compliance monitoring, landscape planning and policy priority setting.
- Support the development of state-level environmental regularisation programmes and enhance implementation capacity of states and municipalities.
- Consider adjusting the Environmental Reserve Quota system to allow quota exchanges within the same priority areas, in terms of biodiversity value; systematically monitor the functioning of the system and allow for the adjustments necessary to achieve its forest preservation and restoration objectives.
- Scale up support for sustainable forestry and farming practices, including in protected areas, by providing training and technical assistance to rural and traditional communities and small farms and facilitating their access to credit and product markets.
- Speed up the use of concessions for sustainable forest management, including in eligible protected areas, by simplifying procedures and improving capacity of government officials to design and negotiate concession contracts; systematically monitor the areas under concession to ensure compliance with the contract specifications and delivery of the expected environmental and social outcomes.
- Accelerate the development of the proposed National Plan for Native Vegetation Recovery, estimate its costs and identify priority areas (with high biodiversity value) for restoration; identify funding sources and assess the feasibility of extending the existing tax-free infrastructure bonds to restoration investment.

Recommendations on conservation and sustainable use of biodiversity *(cont.)*

- Further encourage the private sector to implement sustainable and traceable value chains that would minimise their impact on biodiversity and ecosystems, including deforestation.
- Adopt a national REDD+ strategy at the earliest opportunity, indicating objectives, actions, institutional arrangements, monitoring mechanisms and the necessary resource allocation.

Payments for ecosystem services (PES)

- Continue discussing the current federal legislation proposal and adopt an overarching federal PES law to provide a framework for PES implementation and improve consistency across state regulations and programmes.
- Put in place a countrywide monitoring system for PES programmes, possibly within the framework of a federal PES law, with a view to verifying their effectiveness in maintaining the ecosystem services that are being paid for.
- Scale up and improve the management of Bolsa Verde and reinforce its link with the Rural Environmental Cadastre; ensure adequate training of beneficiaries to help them meet their conservation commitments.

Mainstreaming biodiversity in sectoral policies

- Re-orient agricultural support to encourage environmental improvement and efficient use of agricultural inputs.
- Reform land taxation to encourage land conservation and gradually remove the tax exemptions on fertilisers and pesticides; use the resulting tax revenue to improve farmers' knowledge of good agricultural practices such as alternative pest control methods; review the pesticide regulations to make licences subject to periodic renewal and intensify efforts to control unauthorised pesticide use.
- Introduce measures to improve sustainability of fishing in marine and inland waters, including fish catch quotas, management plans for overexploited species and the extension of marine protected areas, particularly in coastal and marine areas where fish stocks are at their limits.
- Introduce strategic planning, including environmental assessment procedures, for hydropower development so as to identify where energy capacity could be built with the least environmental impact, take account of cumulative effects and, ultimately, reduce the costs of mitigating the environmental and social impact.
- Clarify the rules for biodiversity and finance compensations in the framework of the licensing process; improve the quantification of the impact of infrastructure projects on biodiversity and ecosystems and the definition of the associated compensatory measures.

Notes

1. Together the 17 megadiverse countries in the world contain around 70% of the world's biodiversity.
2. A biome is a large naturally occurring community of flora and fauna occupying a geographic region.
3. The Amazônia Legal super-region corresponds to an area larger than the Amazon biome, encompassing both the Amazonian forest (about 4.1 million km^2) and transitional vegetation (1 million km^2); the Amazon biome covers only the forest area. Amazônia Legal takes in nearly nine states: Amazonas, Pará, Acre, Roraima, Rondônia, Amapá and Tocantins, and part of Mato Grosso and Maranhão.
4. The tracking of deforestation in Brazil's other five biomes began later than in the Amazon. Annual deforestation data started being produced in 2009.

5. These include 732 mammal, 1 980 bird and 4 507 marine and freshwater fish species.
6. These include cassava, pineapple, peanuts, cocoa, cashew, cupuassu, passion fruit, Brazil nut, guarana and jabuticaba.
7. The list of threatened flora species is based on the 2013 Red Book by the National Centre for Plant Conservation at the Rio de Janeiro Botanical Garden's Institute of Research.
8. For example, the North American Pinus pine replaced steppe habitat in the south of Brazil with simplified forest habitats (MMA, 2015),
9. These include the National Environment Council (CONAMA) (Chapter 2), the National Council for the Legal Amazon (CONAMAZ), the Council for the Management of the Genetic Patrimony, the Commission for the Management of Public Forests and the Commission for Sea Resources.
10. The consultation process, called "Dialogues on biodiversity: building the Brazilian strategy for 2020", involved participants from all sectors, including businesses, NGOs, academia, the federal and state governments, indigenous peoples and traditional communities, and the general public by means of an online public consultation process.
11. Some examples are the Vale Company, which invests through its Fundo Vale; Petrobras, which invests through Petrobras Ambiental; the cosmetic company Boticário, which invests through its Boticário Foundation; and the Natura cosmetic company (Box 3.8), which invests through Fundação Natura.
12. Life Certification was launched in 2009 under the aegis of the CBD. To obtain the certification, a company must implement a minimum set of biodiversity conservation and mitigation actions.
13. Some examples include pequi pulp, pine nuts, umbu and licuri, piassava palm babassu, buriti and carnauba palm, Brazil nut, andiroba and copaiba oils.
14. The National Supply Company (CONAB) implements the programme; it defines minimum prices and is responsible for operationalising the payment of benefits.
15. The operationalisation of subsidy payment is bureaucratic; the extractivists are required to possess personal documentation and a checking account.
16. In the case of babassu almond, the percentage of production subsidised by the PGPMBio was less than 2%. For rubber, a larger share of total production was subsidised, reaching almost 27% in 2012.
17. Obtaining a permit usually took about three years. Researchers have complained about the requirement of obtaining the consent of relevant communities for their research, arguing that they do not always know early on where a genetic resource is found (IEEP et al., 2012).
18. Payment into the Amazon Fund was based on reducing GHG emissions from historical average deforestation rates, using a formula that converted estimated CO_2 emission reductions from deforestation abatement against an average rate and applied a value of USD 5 per tonne of avoided GHG emissions. The pace of decline in deforestation rates, however, was actually higher than the rate at which funding from international donors, primarily Norway, was provided, so the funding mechanism followed a predetermined commitment and disbursement schedule instead (Birdsall et al., 2014).
19. Includes national forests, states forests and forest plantations.
20. Community forests are forests designated for the use by traditional people and communities, indigenous people, family farmers and settlers registered in the national land reform programme. The Brazilian Constitution safeguards the right of indigenous peoples and *quilombola* groups to their ancestral territories. Community forests amounted to 62% of the national registered public forests in 2012, most of which are indigenous lands or protected areas (extractive reserves and sustainable development reserves).
21. To qualify for sustainable forest management, producers may only explore forest or form secondary forest with prior approval of a sustainable forest management plan detailing technical guidelines and procedures by the competent forest agency. The forest management system used in the Amazon is polycyclic, based on a 35-year cutting cycle and on technical and environmental criteria to promote the regeneration of the managed forest species. In practice, only four to six trees per hectare are felled. Forest management in Caatinga is based on a monocyclic system, with a rotation period estimated at between 12 to 15 years. Trees are cut near the base to allow sprouting regeneration by regrowth (SFB, 2013).
22. The CNPF was established to produce and compile detailed information about the use, conservation and restoration of all forest resources, including those not designated for production. It gathers biophysical, socio-environmental and landscape data covering Brazil's entire territory.

23. The total area to be restored under Planaveg was defined based on Soares-Filho et al. (2014), who suggested that up to 92 000 km^2 (of the total compliance deficit of 210 000 km^2) could be offset through CRAs. Planaveg suggests that another 15 000 km^2 could be offset by buying "inholdings" in protected areas (Section 5.4). Planaveg's target thus exceeds by 22 000 km^2 the estimated restoration needed to achieve compliance with the new Forest Code.

24. The plan calls for the government to conduct a mid-term review after ten years of implementation as well as intermediate progress reviews after 5 years, with a view to refine strategies and actions based on the results achieved, lessons learned and advances in knowledge and experience, and to respond to potentially changing public and private demands.

25. The Harvest Plan for Fisheries and Aquaculture 2012-14 foresees investments of BRL 9.8 billion for expanding aquaculture and modernising and strengthening the fishing industry and fishery trade.

26. Other programmes are being implemented through the National Council for Scientific and Technological Development, including the National System of Research on Biodiversity (SISBIOTA), the Biodiversity Research Programme (PPBio) and the International Biodiversity Symposium System (SINBIO), with information on biological inventories compatible with SiBBr.

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ANNEX 4.A

Brazil's national biodiversity targets 2011-20

National biodiversity target	Mid-term assessment
Strategic Objective A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity considerations across government and society.	
National Target 1: By 2020, at the latest, Brazilian people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	On the right track, but additional measures needed.
National Target 2: By 2020, at the latest, biodiversity values, geo-diversity values, and socio-diversity values are integrated into national and local development and poverty reduction and inequality reduction strategies, and are being incorporated into national accounting, as appropriate, and into planning procedures and reporting systems.	On the right track, but additional measures needed.
National Target 3: By 2020, at the latest, incentives harmful to biodiversity, including the so-called perverse subsidies, are eliminated, phased out or reformed in order to minimise negative impacts. Positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the CBD, taking into account national and regional socio economic conditions.	On the right track, but additional measures needed.
National Target 4: By 2020, at the latest, governments, private sector and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption to mitigate or prevent negative impacts from the use of natural resources.	On the right track, but additional measures needed.
Strategic Objective B: Reduce the direct pressures on biodiversity and promote sustainable use.	
National Target 5: By 2020, the rate of loss of native habitats is reduced by at least 50% (in comparison with the 2009 rate) and, as much as possible, brought close to zero, and degradation and fragmentation is significantly reduced in all biomes.	The target can be exceeded in the Amazon, but additional measures are needed in the other biomes.
National Target 6: By 2020 all stocks of any aquatic organism are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overharvesting is avoided; recovery plans and measures are in place for 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, when scientifically established.	On the right track, but additional measures needed, especially for the recovery of depleted species and limiting the impact of fisheries on stocks, species and ecosystems.
National Target 7: By 2020 the incorporation of sustainable management practices is disseminated and promoted in agriculture, livestock production, aquaculture, silviculture, extractive activities, and forest and fauna management, ensuring conservation of biodiversity.	On track to achieve the target in silviculture, but additional measures needed in the other sectors.
National Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	On the right track, but additional measures needed.
National Target 9: By 2020, the National Strategy on Invasive Alien Species is fully implemented, with the participation and commitment of states and the elaboration of a national policy, ensuring the continuous and updated diagnosis of species and the effectiveness of action plans for prevention, containment and control.	On the right track, but additional measures needed.
National Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other marine and coastal ecosystems impacted by climate change or ocean acidification are minimised, so as to maintain their integrity and functioning.	On the right track, but additional measures needed.
Strategic Objective C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.	
National Target 11: By 2020, at least 30% of the Amazon, 17% of each of the other terrestrial biomes and 10% of the marine and coastal areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through protected areas foreseen under the SNUC Law and other categories of officially protected areas such as Permanent Protection Areas, Legal Reserves and indigenous lands with native vegetation, ensuring and respecting the demarcation, regularisation and effective and equitable management, so as to ensure ecological interconnection, integration and representation in broader landscapes and seascapes.	On track to achieve the target in the Amazon, but additional measures needed in the other biomes (also see Chapter 5).

Brazil's national biodiversity targets 2011-20 *(cont.)*

National biodiversity target	Mid-term assessment
National Target 12: By 2020, the risk of extinction of threatened species has been significantly reduced, tending to zero, and their conservation status, particularly of those most in decline, has been improved.	On the right track, but additional measures needed.
National Target 13: By 2020, the genetic diversity of microorganisms, cultivated plants, farmed and domesticated animals and of wild relatives, including socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimising the loss of genetic diversity.	On the right track, but additional measures needed.
Strategic Objective D: Enhance the benefits to all from biodiversity and ecosystem services.	
National Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, traditional peoples and communities, indigenous peoples and local communities, and the poor and vulnerable.	On the right track, but additional measures needed.
National Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced through conservation and restoration actions, including restoration of at least 15% of degraded ecosystems, prioritising the most degraded biomes, hydrographic regions and ecoregions, thereby contributing to climate change mitigation and adaptation and to combatting desertification.	On track to achieve the target in the Amazon, but additional measures needed in the other biomes.
National Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilisation is in force and operational, consistent with national legislation.	On the right track, but additional measures needed.
Strategic Objective E: Enhance the implementation through participatory planning, knowledge management and capacity building.	
National Target 17: By 2014, the national biodiversity strategy is updated and adopted as policy instrument, with effective, participatory and updated action plans, which foresee periodic monitoring and evaluation.	On the right track, but additional measures needed.
National Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous peoples, family rural producers and traditional communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, in accordance with their uses, customs and traditions, national legislation and relevant international commitments, and fully integrated and reflected in the implementation of the CBD, with the full and effective participation of indigenous peoples, family rural producers and traditional communities, at all relevant levels.	On the right track, but additional measures needed.
National Target 19: By 2020, the science base and technologies necessary for enhancing knowledge on biodiversity, its values, functioning and trends, and the consequences of its loss, are improved and shared, and the sustainable use of biodiversity, as well as the generation of biodiversity-based technology and innovation are supported, duly transferred and applied. By 2017, the complete compilation of existing records on aquatic and terrestrial fauna, flora and microbiota is finalised and made available through permanent and open access databases, with specificities safeguarded, with a view to identify knowledge gaps related to biomes and taxonomic groups.	Generally on track, but additional measures needed to the support and apply sustainable use of biodiversity and biodiversity-based technology and innovation.
National Target 20: Immediately following the approval of the Brazilian targets, resource needs assessments are carried out for the implementation of the national targets, followed by the mobilisation and allocation of financial resources to enable, from 2015 on, the implementation and monitoring of the Strategic Plan for Biodiversity 2011-20, as well as the achievement of its targets.	On the right track, but additional measures needed.

Source: MMA (2015), *Fifth National Report to the Convention on Biological Diversity*.