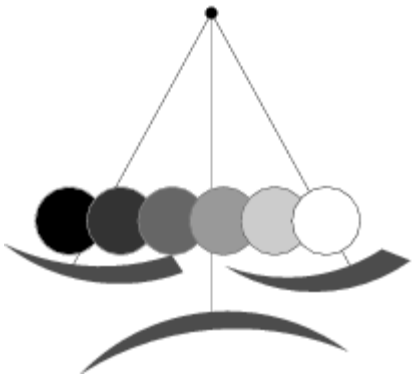

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Natural Capital Accounting and the Mobilization of Financial Resources for Biodiversity

Study commissioned by the German Federal Government

About the Author

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Executive Summary

Natural Capital Accounting (NCA) is a statistical information system that incorporates natural capital into national accounts and reveals the interaction of economic activity with the environment. It attempts to capture and show the natural basis for human economic activity and is supposed to point out how economic activities affect the natural foundation for life. NCA measures and tracks the physical stocks and flows of natural capital assets and their monetary equivalents. It provides reliable and differentiated statistical data, which helps policy makers to include the value of nature in the assessment of costs and benefits of (biodiversity) policy options and to implement effective governance instruments, for instance economic policy instruments such as levies or cap-and-trade schemes. The UN System of Environmental-Economic Accounting (SEEA) is the internationally adopted statistical standard for NCA that countries are supposed to implement. In the CBD Strategic Plan for Biodiversity the necessity to incorporate biodiversity and ecosystem services into national accounting as well as national development strategies and planning processes is explicitly listed in Aichi Target 2. At the same time, the Aichi targets 3, 5 and 20 require to stop biodiversity loss, phase out subsidies harmful to biodiversity (e.g. in favor of agriculture) and mobilize financial resources for biodiversity protection.

NCA is in many ways helpful to meet these different targets and therefore should be proposed more frequently to partner countries in developmental consulting. This should be done in several ways regarding biodiversity protection (which is in this study and elsewhere increasingly used as overarching terminology in nature conservation):

1.) If created according to SEEA standard, NCA providesin many ways a foundation for policy interventions to conserve biological diversity and for the mobilization of financial resources. Supporting partners in creating respective statistical capacities for NCA should be expanded, especially for the following reasons :

- NCA can give legitimacy to policy decisions in favor of conserving biodiversity by showing the condition of nature and the costs of its loss. NCA shows the physical condition of nature as well as often its monetary value for humanity. This is helpful although there are limits to capturing the physical condition of nature and even more to those variables which have a market price (those limits occur even more for entities that do not have a market price, e.g. the aesthetic or the health-related aspects of nature for humans). To do so, monetary relevance of damages to nature has to be allocated when they are generally measurable in market prices. This however needs to be done more consistently than is required in SEEA as NCA standard (chapter 3.4). Additionally, NCA makes it possible to monitor improvements or deterioration of a conditionof biodiversity and ecosystems.

- NCA accounts for the already existing expenditures for biodiversity. Additionally, NCA provides the integration of environmental goods into national accounts, as has been demanded.

- It reveals environmentally harmful subsidies and thus creates a foundation for a political discourse on their phase-out. In order to do so, all direct and indirect drivers of biodiversity loss have to be depicted in more detail than SEEA requires (there is no clear definition of harmful subsides in SEEA at all).

2.) If created according to SEEA standard, NCA provides the foundation for introducing environmental levies or cap-and-trade schemes regarding the drivers of biodiversity loss. By accounting for macroeconomic environmental damages and the value of biodiversity, NCA reverses the argument that environmental protection is costly. Instead, NCA reveals that drivers of biodiversity loss such as conventional agriculture are the ones causing costs. NCA therefore creates legitimacy for their taxation (particularly of fossil fuels, which are a crucial factor as a basis of conventional agriculture and for other drivers such as motorized private transport or urban development).

3.) Environmental levies or cap-and-trade schemes (or reduced harmful subsidies) are a particularly effective instrument to reduce these drivers while at the same time generating revenues as a financial basis for biodiversity conservation. This is true although the need for biodiversity finance is overestimated since a consequent pricing of the drivers could reduce this demand. The BMZ should therefore support its partners increasingly to implement environmental pricing as part of their strategies for raising resources. The effectiveness of pricing drivers of biodiversity loss is so high because it reduces the absolute amount of harmful nature encroachments while avoiding rebound and displacement effects. However, this requires action for as many sectors in as many countries or regions as possible. Regulatory law in nature protection does not have the same potentials. Additionally, pricing the driver fossil fuels can address various environmental problems at once (biodiversity loss, climate change, disrupted nitrogen cycles, soil degradation etc.), which have global relevance.

4.) Furthermore, NCA creates the foundation for introducing payments for ecosystem services and offset mechanisms like eco accounts or certificate markets, if the ecosystem services are well ascertainable, like water usage. Because of the described heterogeneity, non-substitutability and complexity, this approach can only be applied on a case-by-case basis on biodiversity and ecosystems. Neither the range of effectivity nor mobilization of finances is therefore comparable to pricing drivers. Small-scale measures like PES (or offsetting approaches just for a selection of ecosystems) might also cause rebound and displacement effects. On the other hand, offsets or cap-and-trade systems addressing the drivers of biodiversity loss can be very effective (see above; the EU emissions trading scheme does not prove otherwise, as its construction errors could be avoided easily).

5.) NCA as a methodology should be taken into account more frequently, e.g. as first step of developing a biodiversity strategy in a country. This would require more co-operation among initiatives, which work on either NCA or financing of biodiversity on a global level, particularly BIOFIN and WAVES. A concrete suggestion is to include a chapter on NCA in the BIOFIN Handbook as well as adopting SEEA classifications to add substantial background to BIOFIN. Cooperation with partner countries should be significantly increased in order to create synergies. The BMZ should work on networking more strongly with these initiatives with the objective to better use synergies, particularly in the context of BMZ's activities in the WAVES program.

6.) Challenges occur if NCA is not only limited to legitimation and information and increasing effective environmental policy instruments, but is also used to calculate monetarily (!) the value of advantages and disadvantages of biodiversity protection (including aesthetic and health-related issues).

Preface

The present study analyzes questions of biodiversity, political instruments for its conservation and sustainable use, and its financing. In particular, it raises the question if and how the economic analysis of natural capital and biodiversity by way of Natural Capital Accounting (NCA) can support all three of these.

The study was conducted in spring and summer 2016 and funded by the German Federal Government. The study reflects the views of the author and not necessarily those of the contracting entity.

Even though there were no other authors involved directly, the study is strongly intersecting with the work and the discussions of my Research Unit Sustainability and Climate Policy in Leipzig and Berlin, which is why I am much obliged to my nine colleagues. I would particularly like to thank Bettina Hennig. She made substantial contributions to an earlier study about the economics of biodiversity for the German Bundestag, which constitutes a significant basis for the present study as well as for a subsequent joint position paper for Friends of the Earth Germany (BUND e.V.).

Leipzig, June 2016

Felix Ekardt

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1. Introduction and background

Sustainability might be the biggest challenge of the 21st century, if defined as the idea to create inter-temporally and globally durable ways of economy and life. The protection and conservation of biodiversity as one aspect of sustainability is a key challenge for both developed and developing countries. Biodiversity and stable ecosystems are essential for humankind as they are the basis for human life and economic activity.

In 2010, the parties to the Convention on Biological Diversity (CBD) adopted a Strategic Plan for 2011-2020, which includes 20 headline targets for biodiversity conservation (Aichi Targets; on details see chapter 2.2). The first ten of these targets relate to activities that address either systemic or direct causes of biodiversity loss. They propose, among others, to assign and communicate the value of biodiversity in order to align economic incentives with the conservation of biodiversity and ecosystem services. The next ten targets intend to improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity, to enhance the benefits to all from biodiversity and ecosystem services, and to enhance implementation through participatory planning, knowledge management, capacity building and resource mobilization. To date, the progress on almost all Aichi Targets is insufficient (CBD 2014a).

Parties have committed to transform the Aichi Targets domestically into National Biodiversity Strategies and Actions Plans (NBSAPs; Aichi Target 17) and to provide adequate financial resources for their implementation. A major challenge for developing countries in this regard is the mobilization of the necessary financial resources from various sources of funding, which is why Aichi Target 20 is fully dedicated to that question. The High-Level Panel on the Global Assessment of Resources for Implementing the Strategic Plan for Biodiversity 2011-2020 estimated that worldwide 150 to 440 billion USD per annum are needed for implementing the CBD Strategic Plan and achieving the Aichi Targets (High-Level Panel 2012).

Natural Capital Accounting (NCA) is a statistical information system that incorporates natural capital into national accounts and reveals the interaction of economic activity with the environment. It attempts to capture and show the natural basis for human economic activity as well as point out how economic activities affect the natural basis for life. NCA measures and tracks the physical stocks and flows of natural capital assets and their monetary equivalents. It provides reliable and differentiated statistical data, which helps policy makers to include the value of nature in the assessment of costs and benefits of (biodiversity) policy options and to implement effective governance instruments, for instance economic policy instruments such as levies or cap-and-trade schemes. The UN System of Environmental-Economic Accounting (SEEA) is the internationally adopted statistical standard for NCA that countries are supposed to implement. In the CBD Strategic Plan for Biodiversity the necessity to incorporate biodiversity and ecosystem services into national accounting as well as national development strategies and planning processes is explicitly listed in Aichi Target 2. In Aichi Targets 5 and 20, it is formulated

that biodiversity loss has to be stopped and financial resources for biodiversity protection have to be mobilized. In addition, Aichi Target 3 states that subsidies, which support actions harmful to biodiversity, are to be abolished or substantially modified by 2020. Having said that, this study pursues the following objectives:

- The study will map out the (potential) systematic, practical and political interlinkages between NCA, effective policy instruments for biodiversity conservation and the mobilization of financial resources for biodiversity conservation.

- In particular, this study aims to show that economic instruments can play an exceptional part in environmental policy and especially in biodiversity policy in industrialized and developing countries. It will also determine how NCA provides evidence of that.

- Furthermore, the study will discuss options and formulate recommendations on how the German government's bilateral development cooperation could support its partner governments in this field.

In order to achieve these objectives, the study will also include the following topics:

- Which are the most important direct and indirect pressures that negatively affect biodiversity? What determines the need to mobilize financial resources for biodiversity conservation?

- What is NCA? In how far can NCA provide data and information on the interlinkages between economy and the environment/ biodiversity? How does NCA reflect the condition of the environment/ biodiversity and the costs of environmental degradation and of responsible drivers of biodiversity loss?

- How can the benefits of an intact environment and especially biodiversity be made visible in the SEEA in particular? To what extent is the SEEA an important method for monitoring expenditures related to biodiversity conservation and how can this help national resource mobilization strategies? How can SEEA data and methods specifically support concrete domestic biodiversity policy and resource mobilization strategies, e.g. an environmental fiscal reform?

- Are there known examples and best-practice projects of country experiences?

- To address the challenge of mobilizing financial resources for biodiversity, the United Nations Development Programme (UNDP) launched the Biodiversity Finance Initiative in 2012 and now receives significant funding from the Government of Germany. BIOFIN is the leading global initiative in the field of biodiversity finance. In 2014, UNDP published the BIOFIN Workbook to propose a new methodological approach to address biodiversity finance in developing countries; a new version is currently under development. This study will discuss how the methodological approach of UNDP Biodiversity Finance Initiative (BIOFIN) in the

Workbook can be extended or concretized by the NCA (and especially SEEA) approach.

A science-based study also implies to address problematic aspect of biodiversity finance in the following. This is in parts done relatively precisely to break down complex problems. This does not change the conclusion that the concept of biodiversity finance in general is very promising for an effective nature protection and better mobilizing of resources.

2. Basic structures of biodiversity and resource mobilization

2.1 Biodiversity: Relevance, (direct and indirect) pressure and drivers of change

The current biodiversity loss is exceeding the earth's capacity and is alarming in several respects. For humankind, an intact nature is central as the physical means of existence as well as in aesthetic and economic terms. Intact ecosystems provide human beings with goods and services like food and active pharmaceutical ingredients. Furthermore, they support the regulation of the global climate and are important for the soil development, for the nutrient cycle and for clean drinking water, for research, recreation, identity, and well-being. Usually, an intact biodiversity supports soil protection, flood protection and climate protection all at once (on the meaning and condition of biodiversity recently and comprehensively CBD 2014b).

Therefore, for years, biodiversity has been on the international agenda as one aspect of sustainability strategies, including poverty reduction. For quite some time, the term biodiversity protection is increasingly used as the new generic term for nature conservation and ecosystem protection. A rich biological diversity constitutes the basis for intact ecosystems. Accordingly, "ecosystem services" refer to the benefits deriving from the ecosystems – especially economically – for human beings. Taking the examples of an agricultural harvest or the use of water in return for payment, many ecosystem services can be attributed relatively easily to a monetary value that is acquired by humans with the aid of nature. Other services like the recreational value of a landscape possess a value of an economic relevance, which is much harder to define, as will be shown in detail in the following.

The main cause of the disturbance of biodiversity and ecosystems is conventional intensive agriculture, but also the increasing soil sealing for housing, industry and traffic routes (IAASTD 2008; Rockström et al. 2009). Additionally, there are factors like the prevalence of invasive species especially due to the barely regulated international trade as well as the pollution of the environment with chemicals. Climate change, too, has foreseeable negative effects, as many species will not be able to adapt as quickly as climate change progresses. Regarding all these issues, there are considerable differences depending on the land in correlation with population density, wealth, intensity of land use. Pastoral agriculture for example causes comparatively small impacts on the environment.[1]

It is interesting that environmental problems like biodiversity loss and climate change not only mutually reinforce each other, but they have partly similar causes, too. In particular, the use of fossil fuels for electricity, heating, mobility and agriculture does not

[1] Another question is whether animal farming in ecological agriculture causes less environmental problems than animal farming at the same scale in conventional agriculture. Regarding climate change, this is not evident, however probably correct on the bottom line.On that, see Ekardt/ Garske/ Stubenrauch/ Wieding 2015.

only cause the anthropogenic climate change that endangers less resilient species. Fossil fuels are also a key factor in the intensive agriculture, which is the major cause for biodiversity losses resulting from fertilization, disturbed nitrogen cycles, cleared land, land use changes, etc. Other harmful factors like growing private transport (with its land consumption, its nitrogen emissions, its contribution to climate change etc.) are essentially dependent on fossil fuels. Fossil fuels are therefore a common element in different environmental problems; they also connect different causes of biodiversity loss.

In general, the negative biodiversity developments show that renewable resources, too, can be overexploited and thus become to some extent finite. Usually, the overexploitation does not happen only or not even primarily in the country where the consumers of the final product, for example the food products, live. Developing countries for example produce large amounts of food and animal feed for export markets in wealthy industrialized countries. Because of that, people in industrialized countries use statistically a much larger agricultural area for their requested products than is available in the respective country. This “import of land” leads to biodiversity impairments in other countries – especially in developing countries.

2.2 Aichi Biodiversity Targets and financial requirements

As aforementioned, the objective of the CBD to stop the loss of biological diversity has not yet been achieved. The same is about to happen to the objective to not only stop the loss by 2020 but to reverse it in parts. The Aichi Targets represent the attempt to pursue a positive development path. Several Aichi Targets are relevant for the intersection of biodiversity protection and finance. Those are especially:

- Target 5: Reduction of the rate of loss of all natural habitats, including forests and reduce degradation and fragmentation by at least half;
- Target 2: Integration of biodiversity values into development and poverty reduction strategies, and into national accounting and reporting systems;
- Target 3: Removal or reform of harmful incentives and subsidies and application of positive incentives;
- Target 20: Mobilize financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020. COP 9 Decision IX/11 underlines this further, however without establishing detailed requirements, referring to strengthen existing financial instruments und explore new and innovative instruments, without further specification.[2]

[2] It is still not evident in International Environmental Law, whether Decisions (by CBD, UNFCCC etc.) are actually always legally binding. There is a strong argument for saying that Decisions are binding if there is

- Target 17: By 2015, each Party has to develop an effective, participatory and updated national biodiversity strategy and action plan, and adopt it as policy instrument and has to have started implementation.

In short, the targets aim (inter alia) at focusing on the economic meaning of biodiversity protection, while at the same time using economic instruments for a more effective protection and mobilizing financial resources for the measures of biodiversity protection. A central notion hereby is that the biodiversity protection requires money. This notion is (at least partially) based on the assumption that biodiversity protection must be centrally taken care of by state measures, or anyhow measures that concretely target biodiversity, e.g. through the designation of protection areas. This assumption is the basis for the estimate of the financial needs mentioned in the beginning of this report.[3] Disregarding individual assessment of this requirement, it is undeniably part of Aichi Target 20 as a political requirement. The concrete amount of the financial needs depends on the measures that will be focused upon in the end. This potentially includes the accounting of different subsidy programs as well as the direct activities helping biodiversity like the creation of nature reserves including the coverage of subsequent administrative costs for the establishment and maintenance for example.

The interactions between biodiversity protection and economic processes are however broader and it partly challenges this approach of financing biodiversity. Does the protection of biodiversity always have to involve additional financial costs? Does it not rather save money because it helps to avoid certain damages for which otherwise the society would have to pay? NCA could be a method to create these linkages and to calibrate possible political counter-measures. All these issues will be addressed in particular hereinafter. The Aichi Targets already reveal that biodiversity and finances are also an issue of wrong economic incentives and economic damages. Subsidies for fossil fuels can for instance heat up in particular the human demand of nature. Furthermore, the consideration of natural damages within the national accounts might even be necessary in order to obtain an accurate picture of the economic developments of a country.

This suggests that the possible financing of biodiversity measures should not be considered without looking at other factors. Above all, this suggests that the aforementioned biodiversity targets require radical measures against the drivers of damaging biodiversity. The far-reaching objectives of the CBD and especially Aichi Target 5 will probably not be met by merely designating protection areas and the limited improvement of certain agricultural practices. This includes the phase-out of harmful subsidies according to Aichi Target 3. Besides, if the state pays for such measures, someone has to procure the

a parenting act for the decision in the underlying contract. Whether there is such a foundation is up to discussion for many decisions and their details. Brief on that Ekardt/ Wieding 2016.

[3] These estimations are in detail usually controversial, because they depend on a variety of basic assumptions. Every form of estimation leads inevitably to the questions of which are the effective policy instruments for biodiversity protection, how can natural damages be accounted for monetarily, and whether it is possible to translate advantages and disadvantages of biodiversity protection into money, thus allowing for a calculation of the optimum policy path (or not). See also Hansjürgens/ Lienhoop 2015.

money, either certain private stakeholders or the body of taxpayers (which displays that a strict separation between state and private finance is formalistic). Therefore, also according to the polluter-pays principle, this suggests to combine the Aichi Targets in a way that effectively takes action against the drivers of biodiversity loss and at the same time generates funds for domestic nature conservation measures (which then perhaps do not have to be as enormous anymore). Economic policy instruments that impose a financial burden on the drivers of destruction and at the same time generate income could be the means to achieve this. At the moment, countries are far from meeting their finance commitments under Aichi Target 20. In the following, another link is shown: Particularly economic policy instruments could represent an especially effective biodiversity policy because they help to avoid some otherwise imminent governance problems of nature conservation.

Even more clearly than the CBD target of reducing the biodiversity losses, article 2 paragraph 1 of the Paris Agreement points towards a more ambitious nature conservation by a rigorous modification of the present damaging practices. (As mentioned before, climate and biodiversity are integrally linked.) The legally binding norm of a maximum increase of the global temperature of well below (!) 2 degrees, rather 1.5 degrees Celsius, compared to pre-industrial levels, suggests to fully phase-out fossil fuels within timeframes clearly before 2050 (e.g. see calculation with IPCC data at Ekardt 2016). If this were to be done, this alone would initiate a broad transformation of practically all drivers damaging biodiversity such as the intensive agriculture, the focus on motorized individual transport or the diffuse deposition of air pollutants from power plants. At the same time, climate change as a biodiversity damaging factor would be dealt with.

The last mentioned point makes it at present difficult to estimate the current demand for biodiversity finance[4] – since already on the part of the climate protection radical measures are indicated against the damaging parties. In case of ratification, article 2, paragraph 1 of the Paris Agreement becomes internationally binding anyway. However ambiguous the agreement is otherwise – in this regard, the states do not have a choice. The temperature limit covers both Global North and Global South in total; despite all remaining differences, developing countries will therefore need to also phase-out fossil fuels in the medium-term (at this point not saying how costs have to be shared; more on that below). To our knowledge, none of the estimations for necessary biodiversity finance to date consider this and therefore all of them are based on at least some incorrect assumptions.

[4] As mentioned in chapter 1, the High-Level Panel on the Global Assessment of Resources for Implementing the Strategic Plan for Biodiversity 2011-2020 estimated that worldwide 150 to 440 billion USD per annum are needed for implementing the CBD Strategic Plan and achieving the Aichi Targets (High-Level Panel 2012)

2.3 Biodiversity and NCA (SEEA)

The interlinkage of biodiversity and finance points towards a currently much discussed concept to improve the situation of biodiversity: Natural Capital Accounting and the application of economic thinking and economic instruments to biodiversity issues. Thereby, several aspects have to be considered. The issues at hand include identifying the political targets (what should be protected and how to assess biodiversity compared to other targets?), the political and legal governance instruments (e.g. levies or certificate markets), fundraising, and comprehensive information about the economic significance of nature by the supplementation of the national accounts. This induces great hopes like increasing investment in nature conservation, a more rational political identification of targets, better benefit sharing and a more effective nature conservation policy. In contrast to that, others fear that a linkage of nature conservation and economy could become counterproductive precisely for the protection of biodiversity.[5]

Natural Capital Accounting could be seen as the basis for an economic approach to raise effectiveness of nature conservation. At its roots, NCA is a methodological approach to connect a statistic view of the economy with a statistic view of the environment. While traditional political economics consider in their final calculation merely the factors "capital and labor", NCA additionally includes the factor environment. This pays tribute to the fact that economic activity might cause environmental problems, by exploiting resources and using environment as sink for pollution, greenhouse gas emissions, waste etc. – and that in turn, environment is a crucial basis of production in the economy.

NCA calculates the stocks and flows related to the natural resources and ecosystems of a certain region. In the end, the NCA is a reproduction of the usual national calculation of the GDP and it can produce findings about the physical but also about the monetarized stocks of natural resources. The approach thus depends on the preferably correct und complete mapping of the counted items. The SEEA as it exists today after a revision process of several years is probably the most advanced version of the NCA. It consists of three elements: The *Central Framework* (SEEA CF), adopted by the UN Statistical Commission as the first international standard for environmental-economic accounting; *Experimental Ecosystem Accounting* (SEEA EEA) and Applications and Extensions of the SEEA. Subsystems of the SEEA provide further details on specific topics and try to build bridges between the accounting community and the community of experts in each specific subject area.

SEEA CF is the deciding element (more detailed in SEEA 2012a), which is mainly used by many countries. In SEEA CF, first, material and energy flows are physically evaluated,

[5] See also Unmüßig 2014 as an example. Criticism of economic evaluation (chapter 3.2) and of economic instruments for ecosystems directly (see chapter 3.4) is formulated correctly. However, it seems to kill the good alongside the bad by denying the great potentials of certain ways to use NCA and economic thinking (see chapter 3.1 and 3.3, in parts also 3.4). These negative conclusions are drawn from negative experience with economic instruments as implemented so far, such as emissions trading, CDM and REDD+ (see also chapter 3.4)

including their pollutant and greenhouse gas emissions in order to depict nature as basis for production as well as environmental affects by economy. Expenditures for environmental protection, environmental taxes and environmentally relevant subsidies (potentially including harmful subsidies) are statistically accounted for in the next steps. All payments regarding environmental goods to governments, from governments and other institutional bodies are reflected. Environmental assets of different types of resources and especially for land are also determined. SEEA CF records therefore in parallel many intersecting variables regarding the natural livelihoods and meanwhile regarding the ecosystems, supply and use, stocks and flows, environmental activities and assets.

SEEA CF includes biological resources, aquatic resources and soil resources, which are variables with a high relevance for biodiversity and ecosystems. In terms of qualitative evaluation, SEEA CF is outrun by SEEA EEA (more detailed in SEEA 2012b). SEEA EEA includes ecosystem services in all its details both physically and complementary monetarily. The accounts to be constructed include among others: land accounts, carbon accounts, water accounts, soil and nutrient accounts, forest accounts, and biodiversity accounts. Regarding that, this leaves SEEA EEA with broad margins, which will be looked at in chapter 3.1.

In addition, SEEA EEA will, unlike SEEA CF, explicitly include an economic evaluation. This implies an exhaustive account of costs and benefits visualizing the pros and cons in dealing with biodiversity and ecosystems in monetary values – even when costs and benefits are e.g. of an aesthetic nature, and thus do not actually have market value.

In the following, it will be analyzed to what extent NCA can become relevant for particular elements of supporting the Aichi Targets.

2.4 Basic structures of BIOFIN

Similarly, BIOFIN – as initiative promoting biodiversity finance in developing countries – addresses the economic account of biodiversity protection and its interaction with economic processes. BIOFIN is a global partnership focusing on the fulfillment of the Aichi targets and the biodiversity finance challenge in a comprehensive manner. The initiative provides an innovative methodology enabling countries to measure their current biodiversity expenditures, assess their financial needs in the medium-term and identify the most suitable finance solutions to bridge their national biodiversity finance gaps. BIOFIN aims to develop a methodology for quantifying the biodiversity finance gap at the national level, for improving cost-effectiveness through mainstreaming biodiversity into national development and sectoral planning, and for developing comprehensive national resource mobilizing strategies. The BIOFIN methodology includes two scenarios: Business-as-usual and biodiversity investment. The comparison of both can enable insights into the resources, which a state actually mobilizes for the biodiversity protection in fulfillment of the Aichi Target 20.

BIOFIN, however, is not limited to the question of resource mobilization but it shows various similarities to NCA, as we will see in the following. Thus, BIOFIN ranges in this respect vaguely between the direct question of biodiversity finance and a more general analysis of a preferably effective biodiversity policy especially in economic terms, when the BIOFIN Workbook 2014 declares the following targets:

- Policy and Institutional Review: Analysis of the policy and institutional architecture for biodiversity finance and existing finance solutions.

- Biodiversity Expenditure Review: Analysis of public and private expenditures affecting biodiversity (including harmful expenditures such as subsidies for fossil fuels).

- Finance Needs Assessment: Estimates the investment required to implement national biodiversity plans and achieve national biodiversity targets and results.

- Biodiversity Finance Plan: Analysis of options to optimize current and expand future investments (public, private, national, international, traditional and innovative) in biodiversity management.

- Implementing Finance Solutions: Support the implementation of policy recommendations emerging from BIOFIN, such as the improvement or creation of finance mechanisms and the integration of finance solutions into national planning cycles.

Against this background, the question rises which role BIOFIN can play within the intersection of biodiversity protection and economy next to SEEA. In addition, the possible specification of the intentions and implications of BIOFIN and SEEA must be examined.

3. Elements and implications of NCA for reduced environmental damage and finance mobilization

The different systematic and practical interrelations of Natural Capital Accounting, respectively the SEEA, with biodiversity protection and the mobilization of financial resources for its financing will be analyzed one after another in the following. After that, the role of BIOFIN and possible improvements of BIOFIN by SEEA are examined separately. Generally, it becomes apparent NCA and especially economic instruments can play a very prominent role for effective environmental and biodiversity protection. In order to discuss the relevance of NCA, different levels have to be distinguished, which can be framed as follows (it is a problem that they are frequently all mixed up under the label of "economizing"):

- **Level of legitimation and information**: NCA could significantly increase the acceptancefor biodiversity protection. NCA could contribute to evidence-based policies by monitoring change in natural capital and show challenges. NCA could also provide a database for the reporting of expenditures for biodiversity protection, of the integration into a macroeconomic total account, which is missing at the moment, and revealing harmful subsidies (chapter 3.1)

- **Pricing instruments to address drivers of biodiversity loss**: NCA could reveal the drivers of biodiversity loss (in agriculture, urban planning, etc.) and prepare pricing them, thus supporting the development of certain economic instruments. Pricing of drivers could be achieved through levies, cap-and-trade systems and/ or reducing harmful subsidies.

- **Direct pricing of ecosystems and biodiversity**: For those ecosystem services, which can be well reflected in market prices, pricing of these services could be implemented. Such Payments for Ecosystem Services (PES) could either be paid to the damaging party for refraining from damaging activities, or, the other way around, be paid by a damaging party for the damage done. In the latter case, the payment could be done in form of purchasing a tradable certificate, so-called offsets (chapter 3.4).

- **Level of political targets:** Challenges might occur if NCA is not only limited to legitimation and information and increasing effective environmental policy instruments, but is also used to calculate monetarily (!) the value of advantages and disadvantages (benefits and costs) of biodiversity protection (including aesthetic and health-related issues; see chapter 3.2).

3.1 NCA as statistical information system supporting national accounting and political communication

3.1.1 Chances of NCA regarding legitimation and information

The immediate subject matter of NCA firstly regards legitimation and information is. This can be seen in detail with regard to SEEA as a much elaborated version of NCA. SEEA CF shows the stocks and flows of soil, waters, animals and vegetation and generally resources; however, it also makes damages to nature (as well as protagonists) visible. That can also include e.g. harmful government measures like counterproductive subsidies favoring fossil fuels. This is done by a detailed determination and matching of different levels for environmental goods in general and specifically also for ecosystems, as supply and use, stocks and flows, environmental activities (whereas protection of biodiversity and landscapes form a separate category) and assets. SEEA EEA breaks this down for biodiversity and ecosystems. As said before, it offers a monetary account in addition to the physical account.

SEEA not only motivates to mobilize adequate resources for reaching Aichi Target 20 by depicting expenditures for biodiversity and biodiversity losses, but it also integrates environmental factors into the general National Accounting as mentioned in Aichi Target 2. At the same time, harmful practices like subsidies become visible and the achievement of the termination of the biodiversity loss becomes verifiable (Aichi Targets 3 and 5). It is necessary to keep in mind that SEEA CF aims primarily at depicting nature in physical terms and only registers well-founded market prices.

This indicates the following crucial services regarding legitimacy and information, which can be expected of NCA:

- **NCA could significantly increase acceptance for biodiversity protection.**
- **It could also contribute to evidence-based politics by enabling a monitoring of changes in natural capital and indicating problems.**
- **Additionally, NCA could provide a database for the reporting of expenditures for biodiversity protection,**
- **for the integration into a macroeconomic total account,**
- **and revealing harmful subsidies.**

The SEEA scope is much greater than the one for the obligation to report for the biodiversity finance according to Aichi Target 20. This is due to the included extensive accounts of physical (and partially monetary) variables for most different environmental assets and environmentally relevant financial flows. Accordingly, an application of SEEA comes especially into consideration for those countries that already pursue an approach

like SEEA anyway. The reference to the different Aichi Targets – and to the Paris Agreement on climate change that also includes obligations to create transparency and obligations to report – shows however that in the end all countries are encouraged to build up such a statistical system (also beyond biodiversity). Moreover, the financial flows from developed countries to developing countries can be recorded which seems important regarding development cooperation.

3.1.2 Challenges, the calculation of monetary terms, and the vague concept of harmful subsidies

Regarding the general description of damages of nature and the call for action thereof, concerning political communication, and concerning the fulfillment of the obligation to report to the effect of the Aichi Targets, it is a great benefit to use an approach like SEEA that in spite of all its extensiveness lacks definitely clarity. Above all, three factors are mainly responsible for this vagueness:

- In order to depict developments of ecosystem services a baseline as point of origin is necessary from which the calculation is carried out. SEEA EEA offers a certain flexibility concerning the baseline alone due to the high complexity of the system and the various recorded items. That makes the approach attractive for states. At the same time, the intention to report in detail and to generate transparency could be undermined by setting the baseline a certain way in order to suggest a particularly positive development at the biodiversity.

- Depicting e.g. the used means in different sectors of environmental protection might lead to difficult questions of statistical allocation. Certain state funding pursues several objectives, such as biodiversity protection and climate protection. Double counting must be avoided at SEEA, e.g. the mobilized resources for biodiversity protection on the one hand and for climate protection on the other hand. There might be the danger that the potential double counting simply gets lost within the complexity of the recording.

- Regarding biodiversity, the object of protection itself generates particular difficulties. While greenhouse gas emissions can be easily conceived as homogenous matter (partly with the exception of land use), biodiversity and ecosystems are characterized by their enormously compartmentalized and polymorph nature. This makes them extremely difficult to conceive even on a physical level. Potentially great amounts of data are necessary, and compiling them potentially requires high efforts. Even the physical account, as planned in SEEA CF and with more details in ecosystems planned in SEEA EEA, is therefore creating great challenges.

- Monetary accounting of nature is usually more difficult than its physical accounts. Unfortunately, the methods to determine monetary terms, SEEA CF as well as SEEA EEA, remain unclear. The text seems to presuppose the discourse in economic science on the matter, including its weaknesses rather than adopting it. SEEA CF refers in its discussion of physical accounts the option of combining them with the presentation of monetary terms. However, how exactly this is done is not explained. The same goes for SEEA EEA, with the additional strain that the distinction from problematic economic evaluation (chapter 3.2) remains unclear from the beginning. Furthermore, the difficulty (beyond the general problems of economic evaluation; see next chapter) comes into play that many natural goods do not have a market price. It therefore seems important that users of SEEA CF and SEEA EEA attempt to account thoroughly for those factors, which have a proper market price. This does not include factors like diversity of species or habitats where even physical accounts are incomplete. In contrast, it is more or less possible to name e.g. a market price for drinking water resources (or regarding environmental issues other than biodiversity, for instance the stocks of resources or some likely consequences of climate change).

- Counting biodiversity or ecosystems in monetary terms presupposes that ecosystems species or natural spaces can be substituted. Strictly speaking, there is no such comparability. As mentioned before, concerning the actual definition of policy targets, such shortcomings are more problematic than the statistical visualization for political communication and overall justification of biodiversity protection. An ignorance of the ultimately lacking comparability and substitutability further suggests that natural goods were randomly replaceable by money. This is however not the case because destroyed ecosystems cannot only not be restored exactly in the previous form, but also certain ecosystem services once destroyed even cannot be restored at all, including those that have a crucial or vital importance for human beings. This is an issue, even if market prices are generally feasible for the respective ecosystem.

- Particular difficulties occur, if a prognosis of future conditions is required. This would usually be necessary if NCA is supposed to provide the basis for policy decisions, because then it is important to determine which kind of future state is triggered by a policy measure. NCA however does not provide such prognosis in itself, because its focus lies in determining a status quo in comparison with a former condition, depicting stocks and flows. There is no way of changing that because future developments of complex entities such as ecosystems are notoriously uncertain. This is where a mathematical system like NCA hits rock bottom. Numerical values cannot be assigned per se to uncertain future events because the probability of occurrence and for instance the possible extent of damage cannot exactly be determined. If, for example, simply no probability can be indicated about how a certain condition of a certain species or of a certain ecosystem

affects my personal life expectancy, then one cannot reasonably evaluate this by mathematical means.

- Even regardingprocesses, which are easy to account for, SEEA CF leaves many margins for appreciation that would have to be used in favor of the environment. For instance, SEEA CF does not clarify whether environmentally harmful subsidies really have to be depicted and what can be regarded as such. Despite the considerable length of SEEA CF, a central category for environmental and biodiversity protection remains vague. On the other hand, this allows users of SEEA CF room to consistently unveil environmentally harmful subsidies. It seems important to list subsidies, which have a negative relevance for biodiversity and ecosystems (for the given example) comprehensively. These subsidies are especially those that pave the way for drivers of biodiversity loss, such as conventional agriculture and intensive livestock farming that is based on concentrated fodder (instead of pastoral farming). It pushes for the continuous expansion of settlement areas on undeveloped territory, motorized private transport, and climate change that is also harmful to biodiversity. It does not matter whether subsidies are granted by means of direct payments, tax exemption or in any other way.

As an element of political communication and of fulfillment of the obligations to report, SEEA should therefore not be seen as a signum of absolute precision. However, due to the still high information value, and the environmental policies and biodiversity policy in particular, which will gain a valuable basis, it does not appear problematic for those purposes.

3.2 NCA as a basis for economic evaluation/ cost-benefit analysis on biodiversity

Greater challenges arise when NCA is linked to the notion of an economic evaluation or a cost-benefit analysis. Economic evaluations envisage the monetary assessment and weighing of all advantages and disadvantages or costs and benefits of decisions for different concerns or the different parties involved respectively. This goes beyond merely depicting single, primarily physical stock sizes, as has been shown above, because this is purely descriptive and will not cover all politically relevant aspects: Regarding biodiversity, lost or gained years of life or aesthetic issues, but also ecosystem services without market price are e.g. not included. SEEA partially provides data for economic evaluation, and therefore for an adequate target finding in biodiversity protection. It is however only one of several objectives of SEEA EEA, while it is not in the program of SEEA CF at all. The data of SEEA CF would also not be sufficient, to conduct a comprehensive economic evaluation, because it primarily presents physical variables and only adds monetary variables where they are easily accessible.

At first impression, economic evaluation of biodiversity is particularly appealing because NCA regarding biodiversity reaches its limits quicker than with physically accounting for other environmental problems. However, SEEA EEA is facing various difficulties if aiming at an economic evaluation. As said before, the correct physical collection of data already faces challenges, not to mention monetary data collection in biodiversity, as many ecosystem services do not have a market price at all. SEEA as a statistical information system is allowed some gaps, if its purpose is just to show the great relevance of biodiversity protection in general and to report on biodiversity finance. If meaning to establish authoritatively and comprehensively an optimum political target balancing all (!) relevant costs and benefits, those gaps become a problem.

From the economic point of view, the condition at which the equilibrium of costs and benefits is at its optimum is called efficient. This is also referred to as welfare optimum. The equilibrium is reached by making all (or most) of the costs and benefits count by converting them into a monetary value. Regarding biodiversity protection, cost-benefit analysis is supposed to determine the extent of the necessary protection. The determination of costs and benefits is based on factual preferences of the society. The extent of the required finances for biodiversity protection, however, would not automatically follow from the result of a cost-benefit analysis. As aforementioned, at that point the question remains to what extent the determined effective target is pursued by specific state activity or rather by a regulation of the damaging parties.

Economic evaluation and economic instruments should not be confused with each other. Economic instruments serve to direct human behavior as a means of political governance towards in this case environmental protection or rather nature conservation. This is done through monetary incentives. Prices can be set or influenced by fees, subsidies, cap-and-trade systems or the reduction of harmful subsidies. The alleged optimal price for an environmental good, which is then turned into an economic instrument, can theoretically be determined by an economic evaluation. This connection is however not an inevitable one as we will see in the next chapter. The economic evaluation as a method leads to hardly solvable basic and application problems (Spangenberg/ Settele 2010; Spangenberg/ van Haaren/ Settele 2014; Ekardt/ Hennig 2015; Unmüßig 2014):

- As implied, one problem of the economic evaluation of nature conservation is the immense amount of data that would be necessary to calculate the costs and benefits of different options of dealing with the nature due to its polymorph character. This is not the case for nature as a whole; even concerning single areas, this is questionable. Furthermore (as mentioned earlier), it is difficult to count ecosystems and their services, since they cannot really be substituted or restored (and the problem of uncertainty occurs once again).

- A special problem is caused, as implied above, by cost factors and benefit factors without existing prices at real markets. In such cases, economists try to deter-

mine a hypothetical willingness to pay – for example, for the beauty of a landscape or the life years gained due to the enhanced quality of the environment. Whatever the method of enquiring or observing the willingness to pay is: In the end, the determination of how much someone would pay for his or her own life or for the absence of violent conflicts about resources always contains a fictive and therefore not sufficiently informative element. Observations of a "morality of the markets" can hardly help here. This means that the value of the nature's beauty is for instance determined by the price people are willing to pay for a property in the countryside. The related information is far too selective and far too vague (and related to a far too small population group) to deduce preferences for concrete species and ecosystems. Using the reinstatement costs instead can help in this regard only occasionally; because on the one hand this might not depict the entire damage and on the other hand a lot of things cannot be restored (e.g. in cases of death). Moreover, the ability to pay is naturally restricted by the willingness to pay – the consequence is that a billionaire's interests in big-game hunting would weigh massively more than the interests of people from a developing country in preserving their basis of life with regard to their subsistence farming.

- The cost-benefit analysis further privileges the preferences of currently living human beings since future generations cannot yet express or confirm their preferences through purchase decisions with their financial capital. If, however, the preferences of future generations are taken into account, this happens inevitably completely hypothetically and undermines the empirical approach of the cost-benefit analysis. Furthermore, economics wants to set up a huge discount for future preferences in comparison to current preferences. From the legal and ethical point of view however, this is not convincing, since a person simply does not have less value just because he or she lives in the future.

- The addressed questions of the ability to pay and discounting can be generalized even further. A central problem of economic evaluations is that they are partly contrary to the constitutional framework of liberal democracies. This framework consists of certain rights especially on freedoms, elementary preconditions of freedom (like life, health, and subsistence) and conditions encouraging freedom. Freedom in a liberal democracy is not however only the freedom of financially strong consumers and the decisions are usually not made as a situational plebiscite as it would comply with the cost-benefit analysis. In reality, representative democratic decision systems have proven successful in organizing themselves as well as enhancing the rationality of decisions. With this, the cost-benefit analysis is hardly consistent.

Therefore, the targets for nature conservation cannot be calculated by economic evaluations. The targets for nature protection are rather political and legal requirements as

they are normed for instance within the CBD. Since human beings are existentially dependent on stable ecosystems, nature conservation policy also has a basis in human rights. In addition, the protection of biodiversity and of ecosystems shows strong interrelations with other policy fields based on human rights like climate protection.

3.3 NCA as a basis for economic instruments pricing the drivers of biodiversity loss – pricing damages (with taxes or cap-and-trade schemes), reducing harmful subsidies, mobilizing finance

3.3.1 NCA, pricing, subsidies, and biodiversity finance

As mentioned, it is often assumed that economic instruments have to be rejected if economic evaluation is rejected. However, economic instruments do not require a target finding only or primarily based on economic evaluation. It is possible to conceptualize the determination of that (nature conservation) target as a political-legal decision – and subsequently use economic policy instruments like charges or cap-and-trade schemes for the implementation of this target. Because, as will be shown below, there is a lot of evidence that such instruments promote an effective protection of the biodiversity (as well as an effective environmental protection). Within the field of nature conservation, both economic instruments are possible that are

- either directly attached to the biodiversity and protect it that way (chapter 3.4)
- or attached to the drivers of nature destruction that increase the costs of using these drivers and thus have a positive effect on nature conservation (chapter 3.3).

Under the headline of nature protection through economic instruments, one thinks first of directly pricing biodiversity. That this is however not necessarily reasonable is shown in the following.

NCA can support the use of economic policy instruments of nature conservation in multiple ways:

1. **First, by means of political communication NCA directs the attention towards the needed action of nature conservation (see above), which in fact also requires effective measures.** Furthermore, NCA outlines damages that must be "compensated" – even though this compensation should not be taken literally, precisely because the comprehensive economic evaluation does not work. Consequently, this study does not talk of "internalizing external costs". This terminology suggests that all social pros and cons of a decision, which does not have a market value in and by itself, can be integrated into a market price. This is the matter of economic evaluation, which has just been indicated as a challenge.

Problems already occur in depicting physical accounts of biodiversity and ecosystems, as well as in monetary accounting, even if market prices with regard to environmental goods are already established (chapter 3.1). Therefore, the big advantage of NCA for pricing drivers of biodiversity loss (through levies, cap-and-trade systems or eliminating harmful subsidies) does not include *calculating* the appropriate values for pricing. In short, NCA will not lead to replacing politics with math. However, NCA can show very clearly where there is need for action with regard to e.g. negative developments in biodiversity, climate, nitrogen cycles in the soil, waters etc. – which originate especially in fossil fuels.

2. **Furthermore, harmful subsidies can become transparent, therefore preparing their redirection.** To use NCA as foundation, harmful subsidies (see chapter 3.1) have to be included consistently into NCA. This however is not really a separate task; it is much rather one way of fostering the pricing of drivers of biodiversity loss. Below, there will be a closer look at the analogue steering effects of said instruments.

3. **Additionally, by using economic instruments not only the drivers of damages can be governed, but also the means for the biodiversity financing can be raised which shall be documented by the NCA.**

3.3.2 NCA and the potential of pricing drivers for biodiversity conservation – fossil fuels as major driver of biodiversity losses (and further environmental problems)

The explanation of the effectiveness of the economic policy instruments in terms of biodiversity conservation requires the knowledge of several central governance problems. The findings of NCA can show precisely that there are governance problems and biodiversity is not quite the success story. Many of the problems are linked to the fact that regulatory law is ill suited to push back the large mass of nature impairments in total – and that precisely this large quantity of impairments is constituting the biggest problem (on the problems and the following proposals for action in detail Ekardt 2016).

- Governance instruments cannot solve a problem per se, if their determined content requirements are not too weak in relation to the respective problem that is to be solved, e.g. the eradication of the biodiversity losses. If, for example, the agriculture is widely spared from regulations, it is likely to be insufficient (substantial deficits).

- Furthermore, the implementation of biodiversity laws must be effective. Concerning the regulatory law, there are structural limitations in view of relevant sectors such as agriculture, because the authorities have to control a great number of small individual transactions (enforcement deficits).

- The typical way of regulatory law to engage in specific activities, sites or geographical spaces, can likewise have the effect that problems like the biodiversity or nature impairments are merely relocated to other geographical spaces or shifted into other sectors as long as there are no broad identical regulations created for all states and all sectors. The biodiversity protection as a global task as conceptualized by the CBD obviously cannot be managed by just shifting problems (displacement effects).

- If particular sites are optimized by regulatory law e.g. with regard to the agriculture, the danger still exists that strained fields, areas or plants continuously come into existence, either directly by a regulation or indirectly by the increasing wealth of the modern world. As a result, this increase compensates for improvements that have been achieved as an improvement at the particular site (rebound effect).

- These fundamental governance problems are intensified in view of nature protection by the known fact: The exact measurement, calculation and detectability of any particular utilization of ecosystems is difficult due to a high heterogeneity and complexity of the object as well as long chains of causes. Thus, scopes for approaches and reactions appear which are not adequate to the problem (problem of mappability).

Economic instruments are especially suitable to eradicate these governance problems (also) in the case of biodiversity protection. Although that does not necessarily apply to the direct pricing of the biodiversity (see chapter 3.4). However, it does apply to the increase of costs of the drivers of biodiversity losses. **If the costs of harmful factors like imported animal feed, mineral fertilizers or chemical synthetic pesticides, fossil fuels, and building materials are significantly increased, they will be used less. Whether the price effect is achieved primarily by levies, certificate markets or changes in the subsidy system, for example, the agricultural subsidies practiced by many states, is secondary in terms of the ecological effectiveness.** All these options increase the costs of the factors harmful to nature, if they function well. This can be done largely without enforcement problems, and rebound and displacement effects become unlikely if the price increase is applied across sectors and on large geographical scales. It is particularly effective in order to avoid displacement effects and problems of competitiveness to apply comparable instruments in parallel in a number of states (and additionally to introduce border adjustments towards countries that do not establish comparable rules: Ekardt 2016). A main objective of development cooperation could be to support as many countries as possible in building institutions while at the same time entering into serious pricing, including to phase-out harmful subsidies.

In order to avoid enforcement problems (and by that means reaching the Aichi Targets), it is recommended to always address governance units that are easily measureable. This

at the same time also results in an easier implementation than with command-and-control approaches (if that is ignored, there is also the risk of enforcement problems with economic instruments). For example, the overuse of a resource like fossil fuels is not only of considerable ecological relevance; it can also easily be determined. If the price of this resource is increased as a possible key element of an ecological financial reform, the mineral fertilization as a driver being harmful to nature becomes unattractive. Due to its dependency on oil, mineral fertilization is at also a climate problem. This example shows that an increase in the costs of environmental damaging actions can often reduce several environmental problems simultaneously. The biodiversity issue bears reference not only to climate protection, but also to the nitrogen (surplus) problem or to the conservation and the improved recirculation of the vital but finite (fertilizer) resource phosphorus. That way, pressure on biodiversity and the ecosystems is immensely reduced. By increasing the prices of fossil fuels, climate change is inhibited; moreover, mobility, residential development, agriculture, and nutrition are gradually led into a nature- and climate-compatible direction, further away from increasing motorized private transport. This will lead awayfrom a diet with a high share of animal products, which account for more than three quarters of the agrarian land use (note that animal farming with external animal feed is much more harmful in terms of climate and biodiversity protection, than traditional pastoral farming often practiced in developing countries).

3.3.3 Does biodiversity conservation require additional pricing tools?

It can be reasonable in terms of biodiversity to price further noxious agents along with fossil fuels, which must be equally well accountable governance units and also ecologically central and a necessary addition to fossil fuel pricing. With regard to climate protection, it must be taken into consideration that approaching fossil fuels alone does not address all greenhouse gases and that due to decreasing harvests this could partly contradict the (concerning the biodiversity protection) preferred decline in land use. Though the emissions of livestock farming, for example, could be easily integrated in an upstream emissions trading that extensively prices the fossil fuels, the other emissions from land use however cannot easily be integrated due to the problems of mappability. Thus, a reasonable supplementary approach must naturally respond to such governance problems and therefore, in its core it must again be a quantity control approach. Such an approach should again address easily measurable governance units. Two obvious candidates are the pricing of the intensive agriculture as such or the pricing of the resource phosphorus. If the pricing of intensive agriculture is increased, emissions from fossil fuels decrease and the urge to occupy more land is reduced at the same time. This would therefore promote climate protection as well as environmental protection in general, also beyond the fossil fuel aspect. If the tax is designed progressively, the small rural structures and – in combination with a taxation on fossil fuel – the organic farming (as they traditionally appear in many developing countries) would be supported which

would have again a positive effect on the biodiversity. In addition, the agricultural subsidies in many states should be fundamentally transformed in line with a gradual shift towards a long-term extensive organic agriculture. As it is always the case, the revenue of such governance approaches could and should (for the purpose of acceptance) flow back to the people (more about that below).

3.3.4 Biodiversity conservation, distributional effects, developing countries, and practical experience

The use of economic instruments of biodiversity protection requires relevant price levels. If prices are only slightly increased, the effect will often remain limited, particularly in developed countries. NCA could again provide transparency by showing the grave character of environmental damages, thus making far-reaching countermeasures justifiable. At the same time, as aforementioned, financial resources can be mobilized that way, (e.g.) in order to finance protective measures in favor of the biodiversity. However, precisely for this reason some critics argue against economic environmental policy instruments – not only regarding nature conservation – that from a distributional perspective would turn to the disadvantage of people with low income (which would especially cause problems in developing countries). But any further inaction in environmental and nature protection would also have disadvantageous effects especially for people with low income and last but not least for future generations.These disadvantages even tend to be clearly greater. Moreover, apart from financing ecological concerns (which perhaps might not be as high as indicated above), the revenues of environmental-economic instruments could partially be used (beside resource mobilization) to compensate for particular social hardships by increased transfer payments. If industrialized countries and developing countries operate alongside concerning pricing, generated profits could for example (connected with requirements for the use) benefit developing countries the most or completely. Furthermore, not only the economic instruments but also other environmental measures have distributional effects, as well as many other political measures that do not primarily pursue distributional concerns.

Examples of consistent and ambitious pricing of fossil fuels are not in place so far (pricing of fossil fuels, however insufficiently, is done in a lot of countries, including the EU emissions trading scheme; more detailed on that and especially on the construction deficits of EU ETS which could easily be avoided Ekardt 2016). Industrialized and developing countries are bound by international law to change this finding in order to stay within the temperature limit in article 2 paragraph 1 of the Paris Agreement. The objectives of the CBD, mentioned at the beginning of this study, require equally quick action. This is, as explained, most promising by using economic instruments – for which NCA could provide the basis.

3.4 NCA as a basis for economic instruments pricing biodiversity – payments for ecosystem services and offsets

Using economic instruments on drivers that are harmful to biodiversity therefore promises both an ecologically beneficial effect and at the same time the mobilization of financial means for the biodiversity protection. **The resource mobilization effect (but not always the ecological effect) can be achieved as well, if not the drivers of biodiversity loss are priced, but if the biodiversity or the ecosystems are directly priced respectively**, no matter if the price is created by a political decision or by an economic evaluation (which can be disputed, see chapter 3.2). This would happen, for example, if the compensation measures for ecosystem interferences were turned into tradable goods. Primarily, this can be experienced as a desirable valorization of nature. In many states like Germany, these approaches are already implemented. It is ostensibly a logical conclusion from NCA or SEEA EEA, because the allegedly exactly calculated value of ecosystems would be translated into pricing. Some of the related issues will be discussed in the following. The considerable potential will be shown at the end of the chapter.

A problem that can however hardly be solved in this context is the problem of conceivability or of mappability described above. As described in chapter 3.1, there are already many problems with physically accounting biodiversity and ecosystems with NCA. Biodiversity and ecosystems raise the problem that there is no evident given exchangeability, measurability and comparability. On the contrary, biodiversity and ecosystems are highly heterogeneous variables, which latently escape exact physical accounting. In any case, an adequate appreciation of all ecosystems would imply a huge effort. When it comes to future developments, the problem of uncertainty occurs as well. Accounting in monetary terms is even more difficult. If ecosystems are directly assigned an economic value, this is possible at most on a small scale due to the aforementioned difficult conceivability and the heterogeneity. Then, however, rebound and displacement effects are precisely not avoided since an overarching increase of the price of nature will probably not take place, but will be restricted to individual cases only due to the overly large efforts. Moreover, the approving authorities could even develop an interest in nature impairments in order to finance measures of nature protection, which can heat up further rebound effects and enforcement deficits.

Evaluations of tradeable compensation measures for anthropogenic impairments with nature (offsetting) can serve as illustration for what has been said either (more detailed on the following examples Ekardt/ Hennig 2015). In Germany, this is done by means of an “eco account”, which adds a market and trade component to the impact regulation. Wetland Banking, which is practiced in the US, is a similar example. Banking is based on the idea that compensation does not need to be directly done by the interfering party itself in the exact location, but can also be done by means of compensation from a “bank”. There, it has been “put” by a different party (that implements a nature conservation measure in a different location, or subjects an area to nature conserva-

tion). Therefore offsets create basically a more or less abstract compensation for damages done in a different place. Creating these kinds of abstractions of biodiversity or habitats require the determination of value, questions of comparability, reliability and execution of compensation measures. This leads to the substantial general problems of economic instruments directly focusing on ecosystems, which are based on a seemingly exact and reliable case-by-case execution. Each approach is not as promising because of the just mentioned challenges as a pricing of the drivers would be (which could also present a sort of offsetting, if implemented through a cap-and-trade system – however, regarding drivers instead of ecosystems).

Payments for Ecosystem Services (PES) count as economic instruments as well, which directly allocate a price to biodiversity. PES are very often voluntary payments between at least one supplier of additional ecosystem services and aligned protection or conservation measures ("seller") and at least one profiteer of the measure ("buyer"). In contrast to the polluter-pays principle, PES does not always require the party causing environmental damage to pay, but the user of an ecosystem service (if including the paying of a polluter as PES, it can also be regarded as offsetting). One example is the direct payment to farmers who refrain from using fertilizers in proximity to water conservation areas. This way, water users compensate them. The evaluation of PES is essentially dependent on different details of implementation, such as the willingness to substitute a respective service, the availability of respective finance, the evaluation itself and the actual additionality of implemented measures with their enforcement, their monitoring and their durability. Especially, they can only be considered if there is a clearly distinguishable ecosystem service of the PES.

The upcoming regime on the protection of forest areas in global climate policy (REDD+), which is currently discussed, is a special case of PES.[6] Functioning forest ecosystems contribute considerably to climate conservation by storing immense amounts of greenhouse gases. REDD+ therefore serves as climate and biodiversity instrument at the same time. The key element of the instrument aims at financially recognizing efforts to conserve, develop and if possible expand forest areas in the global South, or alternatively recognize the contribution to prevent climate change financially. The idea of REDD+ to include emission reductions from land use, which are hard to measure, in an instrument such as emissions trading seems rather equivocal. It is remarkable that REDD+ gives priority to the protection of rainforests and the various functions of forest ecosystems, which had been missing before. In the context of REDD+, the support of monocultures (e.g. palm oil plantations) has to be prevented. Furthermore, the needs of indigenous peoples have to be considered in any future REDD+ instrument.

[6] REDD = „Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries". The "plus" was added during the negotiations and indicated that this is not only an instrument reacting to forest degradation, but also contains a component proactively addressing sustainable forest management and forest conservation in general.

On the other hand, the direct pricing of concrete ecosystem services by means of PES or offsets is possible, if they are separable and tangible. If, for instance, water is used, this can be attached to a usage fee. The same applies to the visit of a national park. In this regard, the results of SEEA EEA regarding Biodiversity Accounts and Ecosystem Accounts (see chapter 2.3 and 3.1) are helpful. It is crucial to mention that it is not essential to set the exact price reflecting the value of an ecosystem service, for making direct pricing of ecosystems effective with regard to creating an ecological behavioral incentive and mobilize resources. The general recognition that water removal (e.g. in a developing country with water scarcity) should be limited is obvious looking at SEEA data on resource stocks and flows. In addition, the ecosystem service is in itself relatively easy to define. Considering this, effective pricing of clearly defined single ecosystem services is similar to pricing drivers of biodiversity loss (see chapter 3.3).

Thereby, financial means could be mobilized also for the conservation of the respective national park or the maintenance of the respective water (on details see Lange/ Krull 2014). There is a crucial similarity between PES, Biodiversity Offsets and fees for using ecosystem services on the one hand and pricing drivers on the other: In each case, someone has to pay the price (and will most probably try to get refunded elsewhere, e.g. by customers). Mobilizing resources, which will not create costs for anyone, is unthinkable.

3.5 BIOFIN: Critical assessment and possible extensions and concretions by means of SEEA

As shown, SEEA can contribute to an appropriate accounting of the interactions between biodiversity and economic factors in the sense of better biodiversity protection and mobilizing resources. SEEA as a method is a more precise variation of the approach outlined in the BIOFIN Workbook. SEEA and BIOFIN are at first sight hard to compare because SEEA is generally much more detailed by having a defined array of steps for procedures and pursues a broader substantial range – because it goes beyond questions of biodiversity. However, at closer look, the approach of BIOFIN is just as broad, if compared to SEEA EEA, regarding biodiversity conservation, even though is does not provide as many details. Implementing SEEA in a state could overcome this (with benefits not only for biodiversity conservation). This way, SEEA could provide details for any implementation level of BIOFIN.

BIOFIN Workbook 1A asks for policy and practice drivers of biodiversity and ecosystem change while 1B explores the institutions. These alone are easier to implement using SEEA, because SEEA shows stakeholders and their activities in detail. It could address challenges more in depth as is insinuated in SEEA; we are e.g. not only looking at political and economic power structures, or knowledge and values. Furthermore, calculating the true costs of the existing status quo becomes easier. Finally, the necessary biodiversity expenditures can be thoroughly determined using BIOFIN Workbook 1 C.

BIOFIN Workbook 2 is based on a basic assumption, which is, as mentioned earlier, problematic: the implementation of an ambitious biodiversity strategy is above all (very) costly. But BIOFIN Workbook 3 also clarifies that cost reducing measures are also included when defining: „A finance mechanism can be any mechanisms, strategy, approach, tool or instrument that either generates revenue, or else reduces or avoids costs.“ Whether this includes only costs of biodiversity support or also reimbursement remains vague. SEEA could help the latter considerably if (see above) reimbursement does not imply an exact estimate of damages. The impression is however that cost efficiency e.g. of administration is the BIOFIN focus. A carbon tax is given as example, but only as means of fundraising and not as elimination of a damaging impact on biodiversity. At the same time, there is no general objection to further developing BIOFIN for that purpose.

It is worth rethinking whether having relatively similar approaches in international cooperation like BIOFIN and e.g. the World Bank initiative WAVES (Wealth Accounting and the Valuation of Ecosystem Services) is really helpful to reach the objectives. Prima facie, problems of WAVE commence in the emphasis in the name, which is the economic evaluation considered problematic. As shown, the idea that economic evaluation presents the necessary starting point of economic pricing and mobilizing resources is not valid. Instead, the advantages of NCA and SEEA should always be kept in mind, without taking on the burden of frictions within economic evaluation. In the end, WAVE and BIOFIN might have different intentions. WAVE generally targets continuous work and distribution in the context of SEEA, while BIOFIN prioritizes biodiversity financing. Therefore, one will not be able to substitute the other. It might however still be possible to reach a better harmonization if BIOFIN was oriented consistently towards SEEA.

4. Recommendations: Development cooperation and biodiversity finance

4.1 NCA, biodiversity protection and domestic resource mobilization strategies

After all that, NCA is a crucial aid of effective biodiversity protection and fundraising to support it. Several findings can be formulated. These are the in chapter 3 announced findings on the usefulness of NCA and some additional aspects:

- NCA can significantly increase the acceptancy for biodiversity protection. NCA could contribute to evidence-based policies by monitoring change in natural capital and show issues. NCA could also provide a database for the reporting of expenditures for biodiversity protection, of the integration into a macroeconomic total account, which is missing at the moment and revealing harmful subsidies. In order to do so, all direct and indirect drivers of biodiversity loss have to be depicted in more detail than SEEA requires.

- NCA can reveal the biodiversity loss and its drivers (in agriculture, urban planning, etc.) and prepare pricing them, thus supporting the development of certain economic instruments. Pricing of drivers could be achieved through levies, cap-and-trade systems and/ or reducing harmful subsidies.

- For those ecosystem services which can be well reflected in market prices, pricing of these services can be implemented. Such Payments for Ecosystem Services (PES) can either be paid to the damaging party for refraining from damaging activities, or, the other way around, be paid by a damaging party for the damage done. In the latter case, the payment can be done in form of purchasing a tradable certificate, so called offsets. To do so, monetary relevance of damages to nature has to be found, where they are generally measurable in market prices. This however needs to be done more consistently than is required in SEEA as NCA standard (chapter 3.4).

- Challenges occur if NCA is not only limited to legitimation and information and increasing effective environmental policy instruments, but is also used to calculate monetarily (!) the value of advantages and disadvantages of biodiversity protection (including aesthetic and health-related issues; see chapter 3.2).

- The pricing of noxious agents (by means of charges or cap-and-trade schemes) proves to be the most effective instrument of biodiversity protection. Looking at instruments, addressing noxious agents in biodiversity will automatically link to other environmental problems such as climate change, damaged nitrogen cycles, soil degradation or water pollution. In every case, pricing fossil fuels is the most reasonable core approach of an ecological finance reform. This includes reducing harmful subsidies.

- As shown, instruments might achieve biodiversity protection and fundraising at once. This includes the finding that a consistent pricing of noxious agents will limit the necessity to acquire further resources.

- SEEA as most convincing NCA standard should be strengthened and comprehensively implemented. This is relevant for all environmental policies not limited to biodiversity protection.

4.2 The general role of international development cooperation for biodiversity finance

Regarding the situation of developing countries, international cooperation merits attention in the following additional aspects:

- Building structures like SEEA and establishing pricing instruments requires support in building institutional structures, however without neglecting that industrialized countries are at the very beginning of decreasing their ecological footprints.

- The solution for global environmental problems (climate change, biodiversity losses and more) requires action from industrialized and (!) developing countries. Pricing noxious agents such as fossil fuels and taking them systematically off the market in as many industrialized and developing countries as possible is a centerpiece.

- At the same time, this could raise resources in favor of the developing countries, not only for biodiversity protection, but also in creating social compensation for pricing for economically weak demographic groups. This would happen distinctly when revenues of pricing systems from as many countries as possible would be made available to developing countries under certain conditions.

- NCA as an instrument should be taken into account more frequently, e.g. as first step of developing a biodiversity strategy in a country. This would imply more cooperation among initiatives, which work on either NCA or financing of biodiversity on a global level, particularly BIOFIN and WAVES. A concrete suggestion is to include a chapter on NCA in the BIOFIN Handbook as well as adopting SEEA classifications to add substantial background to BIOFIN. Cooperation with partner countries should be significantly increased in order to create synergies. The BMZ should work on networking more strongly with these initiatives with the objective to better use synergies, particularly in the context of BMZ's activities in the WAVES program.

- Germany could assume a leading role in implementing the above listed proposals. A realistic display of German success and failure regarding biodiversity protection and sustainability in general is preferable and rather useful than

harming (= big institutional, intellectual and technical capacities, meanwhile maintaining a much too big ecological footprint).

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