



Lessons for REDDplus: A comparative analysis of the German discourse on forest functions and the global ecosystem services debate

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ABSTRACT

This paper compares the historic German discourse on forest functions with the current international debate on ecosystem services and analyzes the factors that may have triggered or inhibited the development and the institutionalization of both underlying concepts and subordinate debates. Ultimately, this comparison aims at drawing conclusions for the present debate on the currently negotiated REDDplus mechanism which can be considered as a major effort to upscale payments for environmental services.

Both discourses show some remarkable similarities – despite their diverging spatial foci, cultural backgrounds, and eras of origin. Similarities include the utilitarian concepts of nature used, the functions or services considered, and the ongoing challenge of valuing and monetizing them. However, there are also fundamental differences in regard to property rights and assumptions on the harmony of forest functions, respectively apparent and potential trade-offs between different ecosystem services for which the current discourse promotes market-based governance approaches as the mean of choice to balance competing interests of stakeholders.

In terms of current policy debates as on REDDplus, the focus on one particular ecosystem service – here the mitigation of greenhouse gas emissions – shows significant analogies to the historic forest functions discourse in which timber production was seen as the main function that inherently ensures the delivery of all other functions. With regard to the considerable risks resulting for biodiversity and other ecosystem services from such a mono-functional focus we argue that any market-based approach to REDDplus should be accompanied by comprehensive international and national regulatory policies and foster the implementation of effective safeguards.

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1. Introduction

During the last two decades, the concept of ecosystem services has become a key issue in the discussions on international nature conservation and rural development (Boyd and Banzhaf, 2007). It is still gaining momentum as the exploitation of natural resources, human-

induced land use changes and global greenhouse gas emissions continue at high rates (FAO, 2010). Forests are not only affected, but also play a crucial role for the mitigation of as well as the adaptation to the expected changes (IPCC, 2007; IUFRO, 2009). Fuelled by scientific and public concerns, different international political processes have evolved, in particular the three Rio conventions, to tackle these complex trans-boundary environmental problems.

Links between ecosystems, ecosystem services and human well-being have been globally assessed in the *Millennium Ecosystem Assessment* (2005). It is based on the understanding that physical, chemical and biological processes, comprised under the term 'supporting services', enable ecosystems to provide a plethora of different provisioning, regulating and cultural services, all of which hold socio-economic values for human beings. This provides a core argument for supporting the effective conservation of ecosystems, as their loss would imply significant negative consequences and economic costs for society at different spatial levels (e.g. Costanza et al., 1997; Stern, 2007; TEEB, 2010).

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Many forest ecosystems and the services they provide are at risk, especially in developing countries. The development of a mechanism labeled ‘Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDDplus)’ is currently being pushed forward in the negotiations under the United Nations Framework Convention on Climate Change (UNFCCC). REDDplus has raised many expectations to address and to curb deforestation and unsustainable forest management practices, and also contributed to streamlining the conceptual debate on how to approach these two major issues.

The basic idea of REDDplus builds on the argumentation of the *Millennium Ecosystem Assessment (2005)* that market failure is a main reason for the depletion of forest resources. The intention is to financially compensate developing countries that succeed in reducing their carbon emissions from the forest sector, respectively enhance sequestration, against a reference level that most likely will base on historic deforestation in the respective country. The mechanism is thus designed as a purely performance-based financial mechanism: industrial countries should pay developing countries based on their successful reduction of deforestation and forest degradation. Success or failure will be determined by quantifying one specific service – carbon sequestration – under the assumption that other services will be maintained or even profit as co-benefits. In this regard, it can be considered to be one of the most prominent manifestations of a payment for ecosystem services system (PES) to be found at the international level (Blom et al., 2010).

In this paper we hypothesize that the international discourse on ecosystem services, and also the related sub-discourse on REDDplus, show interesting parallels with as well as some remarkable differences to a much older discourse: the German debate on forest functions that has been influential on forest related discourses in many other countries in the past (cf. Winkel and Werland, in press). Its origins trace back to the period in which national European economies concluded an important step of their transformation to an industrialized society. In Germany, debates on forest functions mainly took place in forest policy and academic circles and were closely linked to the establishment of ‘modern’ forest management during the 19th century, intending to end a long period of intensive forest exploitation and ensure sustainable timber production. These debates have never ceased, although they have changed considerably over time.

Hence, our main objective is to analyze and compare the two discourses on forest functions and ecosystem services in-depth by deriving factors that have triggered or inhibited the development, debates, and institutionalization of the underlying concepts. The results

obtained could provide valuable insights for the present discussion on the valuation of forest ecosystem services and allow for conclusions to be drawn on how to approach the design of REDDplus.

2. Methodological approach

Our methodological approach is inspired by Maarten Hajer’s concept of policy discourses. Hajer (2005: 300) defines discourses as “an ensemble of ideas, concepts and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices” (cf. also Hajer, 1993, 1997). In this paper, we apply this concept on scholarly discourses in order to analyze the abstract ideas and ‘rules’ that organize the debates on forest functions and ecosystem services, respectively. We developed a set of analytical research questions to compare the two discourses and to structure the results of the subsequent literature review:

- What are the origins of the discourses and how did they develop over time?
- What major ideas of nature, society, and governance underlie these concepts? This entails also the question how property rights are considered within the underlying concepts.
- Which forest functions and ecosystem services have been taken into account?
- How did / do the debates influence the general forest and environmental policy discourse?
- What institutional impacts resulted from both debates? This includes instruments and mechanisms that were put into practice.
- What are the most prominent points of critique that were raised about both concepts?

These questions were applied to both concepts, using a snowball procedure for the identification of relevant literature: As for the German debates on forest functions, we have mainly analyzed seminal forest policy textbooks (Table 1) and have included further literature referred to in these books. In addition, more recent analytical literature on the forest functions concept was integrated as well. As for the ecosystem services debate, our central starting point was the *Millennium Ecosystem Assessment (2005)* that has brought the ecosystem services concept to the fore of the science and policy agendas. Additionally, we evaluated seminal ecosystem services literature cited in the Millennium Assessment and selected influential peer-reviewed papers on ecosystem services. Given the extreme longitudinal range of the forest functions debate and the amount of literature available on both concepts, we had to select and

Table 1
Forest functions in selected German forest policy textbooks.

Author	Overall terminology	Forest services/functions described
Schwappach, 1894	Forests important for 1) national economy (direct-material profits and employment); 2) immaterial benefits of the forests	Material: timber and non-timber (‘secondary’) profits; Non-material: Climate (temperature, precipitation, wind), water (rivers, erosion; also wind erosion), importance for health
Endres, 1922	Welfare effects of the forest (separated from timber production)	Welfare effects: climate (temperature, humidity, hail, water, precipitation), mechanical, hygienic, esthetical
Weber, 1926	National economic tasks of forests, collective welfare services and individual needs (fulfilled by forestry)	Welfare services of forests: effects on climate, water, mechanical effects (erosion etc.), effects on human health and well-being
Dieterich, 1953	Forest functions	Resource, labor, income, asset, forest area,
Hasel, 1971	Forest functions	Protective: water, air, climate, noise and radiation emissions, soil; utilization: resource, income, labor, reserve, asset; recreational function and area function
Krott, 1985	Forest functions as the object of critical rationalist analysis	Normative-ontological, empirical-analytical (needs- and system-oriented, descriptive), interest-based
Burschel, 1994	Timber production → result of forestry, recreation and protective functions → forest effects	Recreation, protection, and utilization functions
Blum et al., 1996	Forest effects vs. services provided by forestry	Forest effects are also generated by unmanaged forests (e.g. water and soil protection, recreation), services result from active management (e.g., timber, labor, carbon sink, avalanche protection)
BMVEL, 2001; Bastian and Schreiber, 1994	Functions and potentials of forests	Productive (resources and area), ecological (pedologic, hydrological, meteorological, biological), social (psychological, knowledge, recreational)

accordingly not every important source could be used. However, we are confident that our literature base is sufficiently large to mirror the main elements of both discourses.

3. Results

3.1. The German debate on forest functions

3.1.1. Historical development

The idea that forests should satisfy a broad variety of societal demands can be traced to the beginning of the 19th century (Riegert and Bader, 2010), when scholars began to discuss forest benefits in the realms of water, climate, and even health care. During the second half of the 19th and the beginning of the 20th century, first efforts were made to assess 'forest effects and functions' (e.g. Schwappach, 1894; Endres, 1922). In these early debates, however, the term 'function' was seldom used. Instead, authors employed different terms such as 'material profits and immaterial benefits' (Schwappach, 1894), 'national economic tasks', 'collective welfare services' or 'individual needs' (Weber, 1926) and 'welfare effects' (Endres, 1922) (cf. Table 1). Later on these concepts were literally re-invented, especially after WWII when Dieterich (1953) coined the term 'forest function' in his influential 'forest function doctrine'. Hasel (1971) further broadened Dieterich's concept by adding protective and recreational functions. In doing so, he laid the foundation for today's definition of sustainability in the German forest sector which aims at equally considering ecologic, economic and social aspects, and is thus well in line with the concept of sustainability established around the UNCED in Rio (Volz, 2006).

3.1.2. Major ideas of nature, society and governance

The long time-span and the multitude of authors make it difficult to derive comprehensive "major ideas" in this discourse. As an approach, we found Krott's (1985) categorization to be very helpful for this endeavor. Here a 'normative-ontological', an 'empirical-analytical', and an 'interest-based' understanding using forest functions as an expression of the diverse and often contradictory societal interests are distinguished. Early literature on forest functions can be characterized as ontological-normative based on the available knowledge, disciplinary discourses, and 'common sense' of the time; this is often already expressed in the respective title, e.g. Zwielerlein (1806): "On the large influence of woodlands on culture and fortune of states". Later, modernist enlightenment paradigms of forest science triggered a 'rationalist' and empirical-analytical perspective on nature and society, e.g. by scholars as Lehr (1887) who criticized the early protagonists of forest 'multifunctionalism' for being guided by "hot romantic feelings" that could not withstand a "cool multi-perspective consideration" (Riegert and Bader, 2010).

The line between the scientific promoters of forest multifunctionality (as ontological normative axioms) on the one side and the 'cool' empiricists on the other became even more obvious in the discussions about the forest function doctrine. Dieterich (1953) pointed out that forest functions have to be balanced in order to generate a maximum amount of benefits for society. His core argument is that the state, represented by the forest services and the "academically educated forester", is responsible for balancing the different forest functions. Dieterich assumed that foresters are able to make a fair balance between different forest functions, and harmonize them in order to maximize common welfare. Thus, foresters act as "merchants when selling timber or other forest products, but not when fulfilling their main duty to sustainably cultivate the forest having a long-term perspective", i.e. to manage the forest "with due regard to the forest's nature, holistically, and economically" (Dieterich, 1968: 66ff). Hence, forest functions were strongly associated with a state-centered government paradigm in which the technically skilful forest services were assigned the task to secure the common welfare, despite the

large variety of individual interests (Ruppert-Winkel and Winkel, 2009). Accordingly, those promoting this approach implicitly assigned property rights to the public, advocating for regulatory state supervision, or at least for comprehensive and responsible forest management that bears in mind public interests.

Towards the end of the 20th century, forest economists and forest owners increasingly pointed out the additional burdens and reduced revenues incurred by forest enterprises when delivering forest functions for the entire society (Volz, 1989, 1991, 1998). This notion stood in contrast to the established paradigm of a harmonizability of forest functions via forest management. Most studies analyzing these 'burdens' implicitly assigned the property rights resulting from forest functions to forest enterprises (cf. the literature overview in Moog and Oesten, 2001; Küppers and Dieter, 2008; critical on this automatism see Volz, 2000; Winkel, 2007). Thus, they promoted a transfer of rights regarding potential future payments for ecological and social functions to forest owners – a main characteristic and trend, which is consistent with the shift from a state government to a more market-oriented governance of forests from the 1990s onwards. The hegemony of the forest function doctrine in Germany further eroded when Burschel (1994) kicked off an academic discussion on this issue by claiming that active forest management was only justified by the provision of timber, as actually most other functions such as recreation and protection were 'forest effects' fulfilled by the forest itself. Blum et al. (1996) proposed to distinguish between the effects of forests on the one hand, and the 'services' performed by forestry on the other. Eventually, many forest scientists and practitioners who implicitly assumed that all forest functions were 'services' of forest management opposed this. It was Mantau (1997) who eventually pointed out that such a differentiation depends on the socially constructed assignment of property rights, and thus revealed the 'normative-ontological' character of this debate.

3.1.3. Forest functions taken into account

As Hasel (1971) noted, the functions and benefits attributed to forests and forestry respond to important societal demands at certain times, as well as to scientific and academic debates. Throughout the decades, a tripartite set of functions can be identified: First, there is the ability of forests to deliver resources, especially timber and fuel wood. Secondly, a set of 'protective' functions can be identified, e.g. the beneficial effects of forests on soils, water, and climate. Finally, 'social' functions (referring to the importance of forests for recreation and cultural values) entered the debate. The terminology used by authors from different times and the functions they attributed to the forests and forestry are presented in Table 1.

3.1.4. Influence on the overall forest and environmental policy discourse

As previously mentioned, scholars already assessed the role of forests for climate, soil, and water protection during the 19th century. This relates to the discursive power of these protective and cultural forest functions for legitimizing 'progressive', regulated forest management for sustainable timber production that serves the demands of a rapidly industrializing and urbanizing society. As Endres (1927: 441) noted: "[these functions] are the strongest invisible power that works for the protection of the forest. It is so much easier to persuade a nation that the forests must be cultivated and properly managed in order that they can protect homeland and landscape from threats caused by the forces of nature [...] than to simply change the public opinion that forests can deliver timber at all times even without proper management". Interestingly, in these debates contemporary forest scientists often neglected historical forest 'functions' related to the pre-industrialized agrarian society such as pig feeding, cattle grazing, usage of litter, and fuel wood. This may be explained by the argument that these functions stood in conflict to the ruling paradigm of progressive, 'regulated' forest management with a stronger emphasis on industrial timber production (Hasel, 1971). Consequently, 'modern' forest

laws prohibited such uses since 1830, accompanied by a repaying of servitudes. Hence, Winkel (2007: 176) spoke about a de facto “monofunctionalization” of forest management at that time – ironically in parallel to the scientific ‘detection’ of protective and cultural forest functions.

After WWII, Dieterich's doctrine and the subsequently derived ‘wake water paradigm’ – the notion that all forest functions are financed and thus delivered in the wake water of forests managed for timber production, and the assumption that this can be done without compromising the timber production orientation (Rupf, 1960: 32) – became very influential for the hegemonic contemporary German concept of multifunctional forests and multipurpose forestry. The forest sector constructed the image of forests being managed not only for sustainable timber supply, but also for protective and recreational forest functions, with considerable impact on policy rhetoric and institutions. Krott (1985: 14) even labeled such functions a “combat term” in the controversy between the forest sector and the environmental movement: The claim to manage forests in a multifunctional manner was not only used to shield the forest sector against new demands stated e.g. by nature conservation actors, but also to legitimize forest subsidies in a time period when German forestry became less profitable; until today the ‘functionality’ of forests plays a key role in the current forest policy debates on forest management and conservation.

3.1.5. Institutional changes and implemented instruments

More than a century of academic discourses and research on forest functions and related policy debates left their traces: today, multifunctionality of forests and forestry are indispensable elements in all German-speaking forest-related laws. In addition, the forest services of many German federal states have inventoried and mapped different forest functions since the 1980s. These maps are used as an important information source to mediate internal and external conflicts, e.g. in regional development planning procedures (Krott, 1985). However, on the operational level forest services still predominantly apply criteria and indicators that are strongly linked to timber production, e.g. forest growth, standing volume or annual cut. Different forest functions are also addressed in the edicts that regulate forest subsidies, but the de facto spending concentrates on activities related to timber production (e.g. forests roads) and afforestation (cf. Krause et al., 2007).

3.1.6. Most prominent critique

The presented classifications of forests functions mirror the contemporary forest policy discourses and debates as well as the specific perspectives of their creators; accordingly, they are susceptible to criticism. Especially Dieterich's doctrine has often been criticized for being normative (Glück, 1976, 1983; Heeg, 1973), and Krott (1985) even labeled it a core emblem of the normative-ontological forest policy paradigm (see above). The concept was much blamed for the widely interpreted understanding that all forest functions were financed and delivered in the wake water of timber production (cf. Glück, 1982). In a similar manner, the ‘silvicentrist’ character of the concept has often been criticized because it disregards the nature of the functions that are actively demanded by society; instead it pretends a harmony between the different objectives, concealing the diverging stakeholder claims and the resulting conflicts (Glück and Pleschberger, 1982).

Another major point of concern was that the discourse did not trigger the implementation of an effective reward system for societal services provided by forest enterprises. Two central arguments for rejecting such claims were frequently used: the difficulty to differentiate between ‘extraordinary’ (and financially compensated by society) and ‘regular’ services (to be performed without financial compensation), and unresolved problems of attributing prices to non-market services (Winkel et al., 2005).

3.2. The current international discourse on ecosystem services

3.2.1. Historical development of the international discourse

Although awareness of the benefits provided by nature dates back to Plato (Salzman, 2005), the contemporary concept of ecosystem services originated in the USA in the 1970s. A first classification of environmental services was undertaken in the ‘Study of Critical Environmental Problems’ (SCEP, 1970). It included most of the services that would later be classified as regulating and supporting services, e.g. pest control, insect pollination, climate regulation, soil retention and flood control (Mooney and Ehrlich, 1997). A few years later, the first study monetizing ‘nature's services’ appeared (Westman, 1977). The term ‘ecosystem services’ first emerged in a publication of Ehrlich and Ehrlich (1981). In Europe, de Groot (1987) and de Groot et al. (2002) developed similar concepts. The main idea of these works was to raise people's interest in conservation by pointing to the benefits of nature to society.

In a seminal paper, Costanza et al. (1997) tried to estimate the global economic value of 17 different ecosystem services and presented the frequently contested figure of approx. 33 trillion US\$ per year which at that time significantly exceeded the global economic performance. In the same year, Daily's book on ‘Nature's Services’ (Daily, 1997) established the ecological basis of the concept (Ruhl et al., 2007). A milestone regarding the discourse on ecosystem services has been the release of the Millennium Ecosystem Assessment (2005), because it links the complex environmental context with human activities and stresses the science-based need to politically act and react. Since then, ecosystem services research has become a firmly established cross-cutting issue in ecological economics, conservation biology, ecology, and other disciplines (Schaich et al., 2010).

3.2.2. Major ideas of nature, society, and governance

The ecosystem services concept as expressed in the Millennium Ecosystem Assessment conceptualizes ecosystems (the term used for the realm of nature) and society as two distinct spheres (Millennium Ecosystem Assessment, 2003). Expressing a utilitarian perspective, nature is seen as a fixed stock of capital that can, with limitations, provide a variety of benefits to people (Costanza and Daly, 1992). Thus, ecosystem services are the bridge linking nature and society. Ecosystems contribute to human well-being by means of the services they provide, with society as a whole being the main beneficiary of ecosystems. Ecosystem services can be described on different spatial and temporal scales and their reception by people is highly dependent on perceptions and values that are predominantly shaped by their cultural context. Thus, discussions on ecosystem services typically draw on cases from a regional scale, although the Millennium Ecosystem Assessment highlights general trends. The core of this anthropocentric perspective lies in the appreciation held by at least parts of society.

The Millennium Ecosystem Assessment approach pursues different objectives. At first, it aims at revealing the broad spectrum of benefits provided by ecosystems. On this basis, it assesses the extent to which these benefits are at risk and identifies trends and activities resulting in a deprivation of public welfare, e.g. of exploitation or degradation by people harming or destroying ecosystems. The central objective of the approach, however, is to raise awareness regarding the necessity to manage ecosystems in a manner that sustains the provision of benefits. Based on rather optimistic views regarding the feasibility to manage and govern nature sustainably, the discourse on ecosystem services often illustrates concrete management options or even gives recommendations for political instruments. In accordance with the context-specific assessment of services and well-being, the vision of governance draws on stakeholder participation and measures designed for particular contexts, also addressing issues like power relations or access to resources.

The instrumental complements of the approach are market-based instruments, especially ‘payments for ecosystem services’ (PES) schemes. In contrast to state-centered governance approaches, such economic policy instruments are seen as a promising alternative to regulatory policies and as means for the regulation of conflicts resulting from the various dynamic demands on forests. Accordingly, PES are understood as a concept that aims to discursively combine utilitarian ideas of green environmentalism and liberal, market-based policy approaches.

3.2.3. Services taken into account

According to the *Millennium Ecosystem Assessment (2005)*, ecosystem services are distinguished into provisioning, regulating, and cultural services that directly affect the well-being of people, and supporting services that are necessary to maintain all other services. Within this framework, the vast amount of tangible and non-tangible benefits derived from forests can be taken into account and the interactions of management and service provision can be identified. Provisioning services are the classic forest products, including timber and fuel-wood as well as non-wood forest products; the supply of fresh water and the conservation of genetic resources are also included. Less tangible benefits are conceptualized as regulating and cultural services. Regulating services result from ecosystem functions, e.g. watershed protection, erosion control, climate protection and bioregulation (pollination, pest control etc.). Cultural services are defined as “nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences” (*Millennium Ecosystem Assessment, 2003: 58*). Cultural services of forest ecosystems comprise recreation and tourism, educational uses, spiritual and religious values, aesthetic appreciation or cultural heritage. The supporting services enable the supply of provisioning, regulating or cultural services, e.g. soil formation, photosynthesis and primary production as well as nutrient and water cycling.

The *Millennium Ecosystem Assessment (2005)* defined the role of biodiversity as the basic requisite for the provisioning of ecosystem services. Biodiversity is therefore seen as a response variable to human-induced change and as a dependent variable that influences ecosystem processes and hence directly or indirectly alters service provision. In contrast to this common view that ecosystem services “are generated by the biodiversity present in natural ecosystems” (*Chapin et al., 2000: 240*) supported by the Millennium Ecosystem Assessment, a different approach evolved that aims at integrating biodiversity via the classification of habitat services into the scheme of ecosystem goods and services (*de Groot et al., 2002*).

3.2.4. Influence on the overall forest and environmental policy discourse

After the Millennium Ecosystem Assessment was published in 2005, the concept of ecosystem services has rapidly shifted “from an academic backwater to the mainstream of conservation and environmental policy” (*Redford and Adams, 2009: 785*). The influence on the recent global discourse on environmental policy ever increases as the approach provides a consistent framework to promote the value of natural capital and thus the need to conserve ecosystems. However, the foundation for merging the concept from academia into international environmental policies was laid at the United Nations Conference on Environment and Development in Rio in 1992. Here, the Rio conventions were established, but besides concluding on the so-called *forest principles* it was impossible to install a convention that solely focuses on the conflictive crosscutting issues associated to forests and the use of their ecosystem services (*Bernstein, 2001*); instead the dialogue on forest related issues was held under the predecessors of the United Nations Forum on Forests (UNFF) – the Intergovernmental Panel on Forests (IPF) and the Intergovernmental Forum on Forests. However, it took until 2007 to integrate the

perspective on ecosystem services in this forum in its non-legally binding instrument on forests.

One major achievement of the increasing debate on ecosystem services after the release of the Millennium Ecosystem Assessment was the initiation of the G8 and five major development countries to establish a global research initiative on ‘The Economics of Ecosystems and Biodiversity’ (TEEB) with the objective to assess the global values of biodiversity and ecosystem services. The TEEB reports, published since 2009 (e.g. *Kumar, 2010*), were tailored in separate publications for all policy-relevant stakeholder groups, such as decision-makers, business, science and citizens. In 2010, another major milestone in international environmental policy was forced by the follow-up processes of the Millennium Ecosystem Assessment and the growing number of sub-global assessments: The negotiations on the implementation of a science-policy interface succeeded in the establishment of an ‘Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)’ by the Parties to the Convention on Biological Diversity (CBD). IPBES is supposed to work in a similar manner as the Intergovernmental Panel on Climate Change (IPCC), and to thereby support political processes. Activities include the assembly of reliable information and data, as well as synthesizing and analyzing the available knowledge to inform political decision-makers about the conservation and development of ecosystem services and biodiversity worldwide. Other international initiatives as for example the Forest Stewardship Council (FSC) also picked up the concept, and work on integrating key ecosystem services into its certification schemes (*FSC, 2010*).

So far, the political impact unfolded by the ecosystem services approach has been limited to global and national policy levels; representative examples are the discussions and negotiations on REDDplus under the UNFCCC, the CBD programmes of work on forests and on protected areas or the establishment of national forest programmes in many countries. Especially REDDplus currently receives much public attention as it is a puzzle piece of the international discourse on the mitigation of climate change and perceived as a promising approach to curb the problems associated to unsustainable use of forests and land use changes in developing countries. In contrast, the sub-national and local levels, where many decisions on ecosystem services degradation or enhancement are implemented, are not yet reached sufficiently.

3.2.5. Resulting institutional changes and implemented instruments

As mentioned before, it was not possible to agree on a global convention on forests. Such a top-down governance approach with a focus on the links between ecosystems and their services could have possibly avoided some of the current coordination problems resulting from the dealing of forest issues in different international fora with specific objectives and mandates, own “negotiation languages” (particularly in the UNFCCC) and uneven public attention. On the national level, however, several instruments targeting forest ecosystem services have already been implemented during the last decades. Here, the ecosystem services concept has proven to be suitable to identify, account for, value and display the trade-offs of services between different land-use scenarios. On this basis, insights can be derived for developing market-based instruments aiming at generating incentives for maintaining certain ecosystem services.

Most national PES focus on carbon sequestration, watershed protection, biodiversity conservation, recreation and landscape beauty (*Sengupta and Maginnis, 2005*). Examples include PES schemes where national governments make direct payments to rural communities or farmers (*Echevarria, 2002; Munoz-Pina et al., 2008; Pagiola, 2008*) or where private enterprises and NGOs act as buyers and sellers of ES provisioning by forests. A review carried out by *Landell-Mills and Porras (2002)* revealed that over 300 examples of such payment schemes for forest ecosystem services have been established

worldwide. The implementation of PES became popular in the context of forests due to arising opportunities to link forest conservation with rural development and poverty alleviation (Sedjo et al., 2007). PES schemes offer perspectives for sustainable development and long-term protection of forests, given that the full range of services provided can be valued and is adequately reflected in the amount of payments made.

Carbon sequestration is actually the most prominent forest ecosystem services; the global carbon markets have passed the stage of a 'niche market' and are growing with tremendous speed (Capoor and Ambrosi, 2009). So far, most forest related carbon projects are traded in voluntary carbon markets. Except for New Zealand, the global forestry sector is still excluded from the manifold mechanisms of compliance carbon markets but this is subject to ongoing political discussions and might change in the future, e.g. if the REDDplus mechanism will be designed as a part of the carbon compliance markets.

3.2.6. Most prominent critique

The concept of ecosystem services has been rapidly adopted, often without much critical discussion across the spectrum of conservation policy debate. Recently however, a growing body of literature has raised critical questions (Gómez-Baggethun et al., 2010). Concerns and general critiques have been expressed, mainly regarding the utilitarian view towards nature, the use of PES, and conceptual shortcomings.

Opponents argue that a purely utilitarian view on the economic benefits of ecosystems may weaken non-economic justifications of nature conservation and thus be counterproductive in the long-run (McCauley, 2006). Moreover, it has been pointed out that a utilitarian framing includes only those services that deliver tangible benefits for society today or, hypothetically, in the future. Therefore, the concept neglects all ecosystem services whose use and value is still unclear (Plieninger et al., 2010). The commoditization of ecosystem services through market-based instruments has been criticized as a "neo-liberalization of natural resources", e.g. by Robertson (2004: 363) who suggested that markets for ecosystem services support "capitalist relations of power and accumulation". Moreover, the question of who owns the right to ecosystem services is challenging (Salzman, 2005; Tovey, 2008). Are the values from ecosystems a common right for all or property to be traded by landowners? Should farmers be considered as polluters that need to be regulated? Or are they potential providers of ecosystem services who deserve payments for service delivery? In addition, Redford and Adams (2009) expressed concerns that poorly designed instruments may inflate single ecosystem services at the risk of other services that are not marketable (cf. also Volz, 2003), e.g. the market-driven promotion of bioenergy which results in collateral damages to biodiversity, soil conservation, and food provision. Enhancing ecosystem services in a 'bundle' (Raudsepp-Hearne et al., 2010) has been the exception thus far (Redford and Adams, 2009).

Conceptual shortcomings comprise different issues (Menzel and Teng, 2010; Redford and Adams, 2009; Wallace, 2007). For instance, the concept erroneously assumes that all ecosystems are benign and ignores possible negative services such as disease or drought, and there are many uncertainties regarding the permanence of ecosystem services delivery, e.g. carbon sequestered in ecosystems. Furthermore, the currently used classification systems mix processes (means) for achieving services and the services themselves (ends). This limits their contribution to decisions concerning biodiversity and involves a risk of double counting. Another argument is that specific services may be provided more efficiently through technical means (e.g. artificial flood protection) rather than through ecosystems; therefore, ecosystem services delivery may be a weak argument for nature conservation.

4. Discussion

4.1. Genesis, similarities and differences of the two discourses

The comparison of the discourses on forest functions and ecosystem services revealed pronounced parallels and differences, despite their diverging spatial foci and historical background (Table 2). Both discourses share and are criticized for their utilitarian perspectives of nature in general and forests specifically. In sum, the 21st century policy debates on ecosystem services actually seem to resume old debates of the 19th and 20th century when academic discussions evolved between the promoters of conceptualizing forest benefits for society as a whole and scholars who criticized forest welfare effects as a romantic idea. However, there are also significant differences that may be explained by the fundamentally distinct cultural and socio-historic backgrounds of the two discourses: The German discourse on forest functions seems to be more routed in a Continental European understanding of a strong and just welfare state, based on comprehensive and well-defined property rights for forest lands. It was seen as the job of well educated (state) forest service staff to balance forest management in a manner that multiple functions will be delivered; during the second half of the 20th century, existing and potential conflicts between forest functions were "mitigated" conceptually through the forest function doctrine and the wake water paradigm, and later through the mapping of forest functions. The ecosystem services discourse, on the opposite, puts goods and services and thus market terminology in the focus. In this sense it mirrors well a more pluralist understanding of decision making, and an optimistic notion towards the role of market governance in a liberal economy (Norgaard, 2010), which may be connected to its origin in the United States of the 1970th and 1980th, and is thus probably linked to the more liberal interpretation of capitalism in the Anglo-Saxon context, as well as to the rise of economical liberalism during that time.

As our analysis has shown, society's needs and demands of forests and their priorities are well reflected in the discourses of the respective time periods. In the German forest functions debate, the initially strong focus on timber production was subsequently widened once the societal support for this productive function decreased. However, the promoters of ecological and social forest functions struggled for decades to integrate these ideas. Finally, the introduction of new functions to the discourse did not result in a comprehensive recognition by any means, but rather in the heavily disputed 'wake water paradigm' although scholars had already begun during the 1940s to define, measure, and value the potentials of nature and landscapes (Grünwald and Bastian, 2010): Except for concerted subsidies for extraordinary ecological and social services of enterprises and local approaches such as contractual nature conservation or 'eco points' for compensation measures, a true rewarding of societal services or at least a compensation of additional expenses has not yet been implemented. The two central arguments for rejecting such claims are the difficulty to differentiate between regular forest management and truly additional benefits generated by specific activities on the one hand, and the unresolved problem of attributing adequate prices to non-market services on the other. This will remain a challenge because the calculated values for ecosystem services exceed by far what is considered a chargeable price (e.g. Elsasser, 2001). In this context, societies' image of ecosystem services as infinitely available 'public goods' has to change in the sense that they still need to be convinced to pay for what they are used to consume for free.

There is a notable difference regarding both concepts when it comes to the notion of conflicts between functions or ecosystem services. The German forest function doctrine and related wake water paradigm tend to downplay tradeoffs between different forest functions. This view was supported by the underlying assumption of a harmonic interplay between the different economic, ecological and

Table 2
Comparison of the two discourses regarding their history, major ideas and the services and functions taken into account.

Category of comparison	German discourse on forest functionality 19th and 20th century	International discourse on ecosystem services late 20th century until today
Historical development	<ul style="list-style-type: none"> – Roots in the beginning of the 19th century. Lasted until the end of the 20th century – Discourse history mirrors important developments of society and forest science – Initial focus on protection functions of managed forests, wider conceptualization after WW II 	<ul style="list-style-type: none"> – Origin in the USA, 1970 first ecosystem services (ES) classification – Milestone: publication by Constanza et al. (1997) on global value of ES – Milestone: Millennium Ecosystem Assessment (2005) provides detailed classification of ES
Major ideas of nature, society and governance	<ul style="list-style-type: none"> – Ontological-normative: nature is manageable, (state) forest services and experts balance forest functions for common welfare (state-centered government); alleged harmony between functions – Empirical-analytical: only measurable and marketable forest functions are accepted – Interest-based analytical perspective: forest functions express societal interests 	<ul style="list-style-type: none"> – Conceptualization of nature and society as two different spheres. Ecosystems provide a variety of benefits to society; thus ES link the spheres. – Human influence on the provision of ES is neglected (except for negative impacts). – Governance: predominantly market-based; PES as an approach to correct global market failures responsible for unsustainable land use (changes)
Forest functions / ecosystem services taken into account	<p>Functions respond to societal demands of the time:</p> <ol style="list-style-type: none"> 1. production functions (mainly timber) 2. protective functions (e.g. on soils, water, climate) 3. social functions (recreation & cultural values) 	<ul style="list-style-type: none"> – Provisioning services (timber, fuel wood, non-timber forest products) – Regulating services (e.g. water, climate, bioregulation) – Cultural services (non-material benefits, e.g., spiritual values, recreation, education etc) – Supporting services (necessary to maintain all other services)
Discursive “functioning” and influence on the overall forest and environmental policy discourse	<ul style="list-style-type: none"> – During 19th century: protection functions legitimizes progressive regulated forest management for timber production – From 1960 onwards: broadly conceptualised forest functions trigger development of multifunctional forest management, but also protect forest sector from environmentalists’ influence and legitimize forest subsidies 	<ul style="list-style-type: none"> – ES as crucial legitimization for ecosystem conservation and sustainable management – rapid development to mainstream of conservation and environmental policies at international and national level – Broadening of discourse into other disciplines (e.g., economics, efforts to value and market ES) – Taken up by many relevant institutions (e.g. FSC) – Much impact on international and national level – Development of economic instruments such as emission trading schemes, voluntary markets for ES or the Life Web initiative under the CBD – Many examples of national and regional PES (e.g. Costa Rica, USA, Mexico)
Resulting institutional changes and implemented instruments	<ul style="list-style-type: none"> – Strong influence on legislation, manifested in practically all forest laws of German speaking countries (national and subnational level (including Austria and Switzerland), – Influential on forest planning and subsidies regulations, less influential on operational level of forest management 	<ul style="list-style-type: none"> – Utilitarian view on nature – Different criticism regarding the sale of ES through market-based mechanisms – Conceptual shortcomings
Most prominent critique	<ul style="list-style-type: none"> – Normativity and subjective character of forest function typologies – Silvicentrist character of overall concept – ‘Wake water paradigm’, no differentiation between ‘forest effects’ and ‘forestry services’ 	

social objectives and demands. This represents a notable difference to the ecosystem services concept as introduced by the [Millennium Ecosystem Assessment \(2005\)](#), which is aware of the potential trade-offs between different services ([Raudsepp-Hearne et al., 2010](#)) within a given site as well as between different levels (local, regional and global) ([Rodriguez et al., 2006](#)). The concept of ecosystem services can be seen as an effort to mitigate the many trade-offs in forest management resulting from the ever dominant focus on timber and fuel wood in order to promote other vital and diminishing services. To accomplish this, there is a tendency to create markets, with the underlying belief of their omnipotence and the hope that they contribute to balance divergent stakeholder interests.

Finally, we briefly look at the political legitimization both concepts offer for their ‘political environment’. As our analysis has revealed, both concepts are not only dealt with in isolated debates within the “academic ivory tower”, but are linked to changing political environments, including crucial questions regarding the assignment of property rights and political power. In that sense, the market notion of the ecosystem services approach may be telling as for the question which actors and activities are empowered by this very fundamental approach (e.g., private versus state actors). Looking at practical implementation, however, renders both concepts as basically state driven (see below). In other words, although the more paternalistic state rhetoric with the forest services being the guardians of all forest functions has been replaced by market rhetoric, but it is still the public sector that has a considerable role in implementing policy instruments.

4.2. Implications for REDDplus

As one of the main objectives of this comparison was to draw conclusions from the achieved results for current forest policy developments, it stands to reason to look especially at the current REDDplus negotiations. In light of the extremely complex post-Kyoto climate negotiations under the UNFCCC, REDDplus remarks one of the few sparks of hope; due to the remarkable political will and high expectations of industrial and developing countries, as well as NGOs and the business sector, the negotiations on this mechanism have experienced a rapid development in only five years ([Streck et al., 2008](#)). The original idea to keep it simple has already been abandoned, along with the assumption that reducing emissions from deforestation and forest degradation would be generally beneficial for biodiversity and other ecosystem services ([Pistorius et al., 2011](#)). Its implementation is expected to mobilize unprecedented funding for different forest-related activities, but many questions are still unresolved, e.g. whether it will be a pure market-based or a fund approach ([Angelsen, 2008](#); [Parker et al., 2009](#)). However, this is not the single source of the different concerns which have entered the discussions: as many PES REDDplus also targets the currently most prominent service in the forest context – the mitigation of greenhouse gas emissions. To focus on the ecosystem service of carbon storage is very tempting because, in contrast to most other services it is comparably well quantifiable and the climate change alerted public seems to be willing to pay for this services due to its global impact. This decreases

the mentioned difficulties of attributing a price and mobilizing significant funding via artificial markets.

However, many scientists and other stakeholders are skeptic regarding such a focus on one single ecosystem service (e.g. Miles and Kapos, 2008; Pistorius et al., 2011). The underlying assumption is that the financing of this one service will inherently ensure the financing and the maintenance/delivery of all other ecosystem services ('piggy-backing'). This focus on carbon mitigation is very reminiscent of the 'wake water paradigm', especially in light of the expressed concerns on environmental risks by scientists and conservationists (Pistorius et al., 2011). Although safeguards are proposed to cope with these risks, their effectiveness remains uncertain and highly depends on the national implementation of REDDplus policies in beneficiary countries. Having the debate on forest functions in mind, it appears not wise to focus policies and policy instruments as PES or the REDDplus mechanism on optimization of the short-term delivery of a single service potentially at the expense of many others.

With regard to governance, both, state-centered and market-based approaches have significant shortcomings, e.g. in terms of the participation of stakeholders as a means to legitimize policies and policy instruments. Often it is not in the interest of the key stakeholders to facilitate lengthy and complicated participatory processes with uncertain outcome. However, the resulting lack of legitimization and broad acceptance by other relevant stakeholders jeopardizes a successful implementation and the effectiveness of the mechanism. This underlines the value of early identification of relevant stakeholders and their involvement regarding the settlement of existing conflicts and the avoidance of new ones. 'Silvicentrism' as in the German forest function discourse or 'ecocentrism', as a scenario for the future of the ecosystem services discourse, cannot meet the objective of a balanced delivery of ecological, economic and social benefits.

For REDDplus, simultaneously drawing on different governance modes such as regulation, markets, and participatory networks may be the best approach. Public authorities have the responsibility to set the frameworks and develop coherent policies according to the national circumstances, including effective safeguards for ecosystem services and livelihoods. At the same time, they should pursue participatory stakeholder approaches allowing for engagement and benefit sharing, e.g. by carefully designed national PES. Once national strategies are implemented in respective policies, government authorities should take the active role of being watchdogs and adjust the impacts of market-based instruments by utilizing regulatory policy instruments and other safeguards if necessary. As the Clean Development Mechanism has shown, such (artificial) markets tend to need considerable efforts and continuous readjustments in order to become effective. This sounds easier than it is, but as Baumol and Oates (1975) noted decades ago: "man's influence on the quality of the environment depends on two things: the damage he does and the effort devoted to undoing that damage."

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