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Design principles for protected area certificates: a case study on strategic investor groups

Nathalie Meißner[1] · **Etti Winter**[1]

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Abstract Biological capacity of earth is limited. While it is obvious at first glance, it has been ignored for decades. Policy makers attempt to overcome the persistent depletion of the human livelihood base through the establishment of protected areas. However, the financial means to sustainably manage a representative network of protected areas on a global scale do not yet exist, and particularly, private sector investment is extremely modest. One option for increasing private investment flows is the development of a market place for protected area certificates (PACs) issued for geographical areas managed according to social and environmental best practices. This paper utilizes semi-structured expert interviews with 39 German companies to analyze major product and market requirements for the sound implementation of an international certification scheme for PACs. Based on a triangulation approach that combines quantitative and qualitative evaluations with the two-step clustering procedure for strategic investor groups, seven design principles are determined that might encourage voluntary investment funds from the private sector, and thus support the sustainable management of protected areas. Having a look at existing markets for protected areas, one scheme provides a good foundation for the defined design principles: the LifeWeb initiative—an online clearing house for protected area developers and potential investors.

Keywords Biodiversity · Certification · Cluster analysis · Ecosystem services · LifeWeb · Private sector investment · Protected area · Sustainable finance

✉ Nathalie Meißner
meissner@iuw.uni-hannover.de

Etti Winter
winter@iuw.uni-hannover.de

[1] Institute for Environmental Economics and World Trade, Leibniz University Hannover, Königsworther Platz 1, 30167 Hannover, Germany

1 Introduction

Human well-being depends on functioning ecosystems and their multiple provisioning, regulating, cultural and supporting services (Jax 2010). Yet, the world's population growth combined with expanding industrialization leads to a situation in which more and more ecosystems are depleted. In fact, increasing habitat transformation, overexploitation of resources and environmental pollution result in a continuing degradation of ecosystems and their economic value (Duraiappah and Naeem 2005; Ewing et al. 2010). The establishment of protected areas is one possible way to overcome the problem (Bertzky et al. 2012). The International Union for Conservation of Nature (IUCN) classifies protected areas as 'clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values' (Dudley 2008). The broad definition covers not only strictly protected sites, where any human intervention is forbidden, but also covers areas traditionally used by local communities for their livelihoods (Dudley 2008).

Today, funding for the management of protected areas is mainly provided by domestic governments and national states in the context of their official development assistance. However, it is well established that available financial means do not suffice to maintain existing sites, not to mention the conservation of new areas (Emerton et al. 2006; Parker et al. 2012; UNDP 2016). As a result, several conservation programs try to activate private capital (Whelpton and Ferri 2017). From an investor's perspective, direct and indirect benefits achievable from protected areas are not adequately identified and standardized, therefore making it difficult to estimate the quality of conservation projects and the financial risks following thereof (Credit Suisse 2014; Huwleyer et al. 2016; NatureVest and EKO Asset Management Partners 2014; WEF 2013). To reduce the caution of potential investors, landscape certification schemes have recently attracted the attention of science, policy and nonprofit organizations (Kusters 2015; Mallet et al. 2016; Parker et al. 2009; UNDP 2016). Typically, certification schemes aim to demonstrate that products, services and processes conform to specific performance metrics (Corsin et al. 2007). Regarding the establishment and management of protected areas in the broader sense, certification can be used to verify whether social and ecological best practices are being applied and what conservation outcomes have actually been achieved (Bayon 2004; Castka et al. 2016; Karousakis and Brooke 2010; ten Kate et al. 2004; Meijaard et al. 2011).

The idea of cross-sectoral landscape certification schemes is in the very beginning of conceptualization and needs further research as well as empirical evidence obtained from sound pilot projects (Foli et al. 2017; Ghazoul et al. 2011; Mallet et al. 2016; Denier et al. 2015). For this reason, this article looks more closely at the conception of a market place for protected area certificates (PACs) to be understood as an international institution governing the certification of conservation projects and the allocation of conservation finance. The principal idea is that PACs are issued for geographical areas managed in accordance with social and environmental best practices and being consistent with the objectives of the CBD and the United Nations Development Programme (CBD 1992; UNDP 2014). PACs offer a holistic approach to conservation of ecosystems and their multiple benefits. In this respect, money transferred to a certified region can be spent in different ways to safeguard ecosystems and livelihoods. PAC buyers can be single companies, governments, nonprofit organizations or even individuals. The purchase of such certificates may, however, not be confused with the acquisition of real assets and land use rights; acquisition shall be rather interpreted as a safeguard for the best land management

practices. For the most part, companies might use a PAC label for marketing activities signaling their corporate social and environmental responsibility.

Meißner and Grote (2017) identified three key motives for companies to invest in PACs. First, buying PACs would enable companies to establish a unique selling point and thus gain financial benefits. Even if companies do not get a financial return from the protected area itself, they might use a PAC label to gain a price premium for their products, increase their sales volume or at least preserve their revenues in the long term. Second, the investment in PACs is expected to improve the public perception of a company, legitimizing the business of a company and increasing its overall reputation. Third, protected areas support the conservation of ecosystems, avoid resource depletion and reduce ecological risks; all functions together are related to a corporation's dependency on ecosystems. The higher the dependency of a company's business on functioning ecosystems, the higher is its motivation to buy PACs. According to Meißner and Grote (2017), the corporate dependency on ecosystems has the strongest influence on private sector investment. Financial benefits and social legitimacy are evaluated to be necessary, but not sufficient conditions for PAC demand. In fact, there are several corporate environmental responsibility (CER) measures a company could use to receive financial benefits and support legitimating issues. However, currently no mature scheme endorsing sound cross-sectoral management and conservation of landscapes is effective, and thus, PACs might complement existing schemes to better attract private capital. PACs could turn out to be an attractive investment opportunity for those companies being highly dependent on ecosystems (e.g., tourism, retail, food and pharmaceutical industry), given that PACs can contribute to the security of long-term business success.

The main target of this article is to define design principles that are crucial for private companies to invest in PACs, and landscape certification schemes in general. Based on these design principles, the article develops a model that is expected to raise private sector investment in protected areas. Section 2 starts with an overview of conservation finance mechanisms. In Sect. 3, the approach of data collection and data analysis is described. The results of the analysis are presented in Sect. 4. Based on the identified product and market requirements as well as classified PAC investor types, general and investor group-specific design principles for an international PAC market are defined. Section 5 explains the identified PAC design principles in detail and compares the findings with results from previous studies. To account for any bias in the results, sector-specific findings are discussed. The overall concept is presented in Sect. 6, and the article concludes with Sect. 7.

2 Conservation finance mechanisms

The top 3000 listed companies are estimated to be responsible for US$ 2.15 trillion of global environmental externalities in 2008 (UN PRI 2011). In view of that, the parties to the CBD have explored ways to enhance private sector engagement in achieving the overall goals of the Convention (CBD 2014a). There are a growing number of voluntary instruments like payments for ecosystem services, biodiversity offsets, green bonds, ecolabeling, deforestation-free supply chains, all intending to mitigate business' impacts on the environment (Parker et al. 2012; Smit et al. 2015; Vatn et al. 2011). However, the gap between available funds and the estimated amount of conservation finance remains significant. In the following section, we look at the different schemes and their use by private companies by inspecting a scheme's performance from the perspective of a private

investor. We broadly distinguish three types of payments: payments for ecosystem services based on the beneficiary pays principle, biodiversity offsets derived from the polluter pays principle and payments being relatively flexible, scalable and cross-sectoral with a focus on a geographical area unit, such as the LifeWeb and Verified Conservation Area (VCA).

2.1 Payments for ecosystem services (PES)

The basic idea behind PES is that users of ecosystem services pay landholders or stewards of ecosystems for the benefits they obtain through precautionary land management practices (Karousakis and Brooke 2010; Wunder 2005). Based on the beneficiary pays principle, PES transform external values of ecosystem services into payments for the conservation of ecosystems (Engel et al. 2008; Wunder 2007). The application of PES is manifold, ranging from small local projects to international conservation schemes (Farley and Costanza 2010; Karousakis and Brooke 2010). The diversity of PES contracts is due to the many design options, such as the class of ecosystem services to be protected or the payment and monitoring methods applied (Carius 2012; Wegner 2016). Particularly in developing countries, the desired environmental outcome is often linked to social goals, namely poverty alleviation and rural development (Corbera et al. 2007; Corbera and Pascual 2012). Considering the flexibility of PES schemes, they constitute an instrument to sustainably finance protected areas in the broader sense (Turpie et al. 2008; Wendland et al. 2010). At a local level, a growing number of companies pay for the benefits they obtain from the conservation of ecosystems, particularly if the service is tangible, for example the conservation of a water body (Bellyer-Domingo et al. 2016; IIED 2007; Mwangi 2008; Perrot-Maître 2006; Stanton et al. 2010). On an international level, however, companies' voluntary payments for the provision of ecosystem services and biodiversity conservation are rather limited (Ezzine-de-Blas et al. 2016; Karousakis and Brooke 2010). This particularly concerns more intangible global public goods as biodiversity, where benefits are not directly linked to individual commercial goods and services (Namirembe et al. 2014).

The international PES market is developing toward more cross-sectoral area-based programs and is led by the REDD+ (Reducing Emissions from Deforestation and Forest Degradation) initiative. This development has caused controversies regarding the principal understanding of PES and its role in international politics (Angelsen 2017; Angelsen et al. 2017; Fletcher and Büscher 2017; Fletcher et al. 2017). In addition to earning carbon credits, REDD+ has a focus on sustainable forest management, biodiversity conservation and the protection of rural livelihoods. The fact that most projects are currently financed by the public sector has opened a recent discourse on 'governmentality.' This discourse is concerned with reward and penalty instruments that can cause leakage effects (migration to less monitored areas) and increase inequality among local landholders (Gebra and Agrawal 2017). The improvement in the conservation status compared to the baseline scenario, known as additionality, is one of the core concepts of carbon finance (Valtin 2011). However, in jurisdictional landscape approaches assessing additionality is more difficult, but also becomes less critical compared to project-based local programs (The REDD Desk 2017). Besides public finance, investments in REDD+ projects come from companies that specifically strive to gain carbon neutrality. Multinational companies also show interest in REDD+ projects, particularly for marketing and branding purposes to improve their public relations (Bernard et al. 2012; Clenaghan et al. 2009; Zadek et al. 2012). A recent study on private demand for REDD+ credits found that co-benefits such as biodiversity conservation and community development are more important than carbon offset credits when corporate social responsibility motivations play a role (Laing et al. 2016).

2.2 Biodiversity offsets

In contrast to PES, biodiversity markets are based on the polluter pays principle offering companies the opportunity to offset their negative impacts on biodiversity through the acquisition of biodiversity credits (Alvarado-Quesada et al. 2014). The Business and Biodiversity Offsets Programme (BBOP) defines biodiversity offsets as 'measurable conservation outcomes of actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken' (BBOP 2016). Following the mitigation hierarchy, offsetting the impact on biodiversity should not be the first resort. In fact, before acquiring biodiversity offsets, measures should be taken to avoid and minimize negative impacts on nature (BBOP 2012, 2016). We distinguish between on-site offsetting where the damage occurred and off-site compensation on another site, but with equal or greater biodiversity value. The overall goal is the same: no net loss of biodiversity (Blom et al. 2008). Biodiversity offsets can originate from one-off voluntary payments or legally mandated systems such as wetland mitigation banking in the USA (Bishop et al. 2008). They support the development of new protected areas and allow filling the funding gaps of existing ones (Githiru et al. 2015; Pilgrim and Bennun 2014). Regarding the acquisition of biodiversity offsets, the financial volume of voluntary offsets falls considerably behind the volume in mandatory schemes (GNF 2014). Yet, the number of companies voluntarily acquiring biodiversity offsets is increasing, as commitment is expected to indicate good corporate governance to the outside (Ecosystem Marketplace 2013). In total, the market is estimated to include at least 187,000 hectares of land under conservation management (Madsen et al. 2011).

2.3 Area-based conservation schemes

Demonstrating that the management of geographical areas conforms to social and ecological best practices that lead to certain results, area-based certificates are expected to raise private sector investment in protected areas (Credit Suisse 2014; Meijaard et al. 2011). A closer look at existing environmental standards and good practices suggests that area-based concepts or landscape approaches jointly considering the provision of ecosystem services, biodiversity conservation and poverty alleviation are obtaining a growing importance beyond single-product and carbon-centered projects (ISEAL 2013; Peters-Stanley et al. 2013). This involves, for example, the revised Climate Community Biodiversity Standard (CCBA), the Climate Bond Standard, the Gold Standards initiative on smallholder climate smart agriculture, the FSC Small and Low-Intensity Managed Forests (SLIMF) certification and also the REDD+ Social and Environmental Standards.

At the international level, the LifeWeb initiative established as part of CBD's 'Programme of Work on Protected Areas' (PoWPA) demonstrates how payments for protected areas can be distributed on a global scale. The LifeWeb online platform provides a clearing house in which project developers, national states and communities convey their funding needs and potential donors get information about conservation projects including objectives and expected results, the timeframe of the project, social and ecological contributions as well as the institutional context. If donors find a project they want to support, they can individually decide about the donation volume. However, the current LifeWeb does not provide monitoring and verification mechanisms for matched projects (CBD 2012, 2014b). This lack of credibility may explain the stagnant demand for LifeWeb projects. Other small

initiatives are currently organizing; one example is the Verified Conservation Area (VCA), an initiative originally funded by the Dutch government and taking a focus on the certification of land management plans. VCA has started its pilot program with the first projects being registered and seeking for funding (Hamrick 2014; VCA 2015).

Summing up our analysis of conservation finance schemes and looking at the results of related studies, it can be realized that from an investor's perspective current markets offer few salable conservation projects with precisely identified and standardized financial and ecosystem benefits (Credit Suisse 2014; NatureVest and EKO Asset Management Partners 2014; WEF 2013). It can be further concluded that verification and third-party certification of a project's real social and environmental impact might reduce the current caution of the emerging group of impact investors, who are particularly interested in scalable projects at the landscape level (Bayon 2004; Credit Suisse 2014; ten Kate et al. 2004; Supply Change 2016).

3 Methods and data

To identify design principles that are critical for landscape certification schemes such as REDD+, VCA and PAC, we use the results from Meißner and Grote (2017) on key motives for private PAC. The design principles should cover major product and market requirements in general, as well as specific criteria requested by individual strategic investor groups. The data are derived from expert interviews conducted with 39 German companies. In total, 253 companies that are characterized by a detailed CER strategy as well as a business that highly impacts nature were invited to participate in the survey. The database of companies is displayed in Table 1.

First, companies listed in the Top 100 in terms of annual turnover were selected. Second, environmental networks were used to account for medium-sized and small companies. In addition, we focused on companies from the food industry and tourism sector that are underrepresented both in the Top 100 and in the environmental networks, and are expected to have a strong dependence on and thus interest in functioning ecosystems. The industry sectors of the interviewed companies are displayed in Fig. 1. The survey was conducted in the period from August 2012 to January 2013. At the time of the

Table 1 Databases for the identification of survey participants

Database	General description	Share (%)
Top 100	The 100 largest German companies in 2011 in terms of annual turnover (SZ 2011)	20
Environmental networks	Members of the German Association of Environmental Management (B.A.U.M. 2012) and the Environmental Partnership in Hamburg (Umwelt Partnerschaft 2012)	60
Top 100 food	The 100 largest German suppliers in the food retail sector in 2011 in terms of annual turnover (LZ 2012)	10
Tourism industry	Companies that are awarded the TourCert CSR tourism label (TourCert 2012) or companies offering offsets for air travel emissions that meet the requirements of the gold standard (Atmosfair 2012)	10

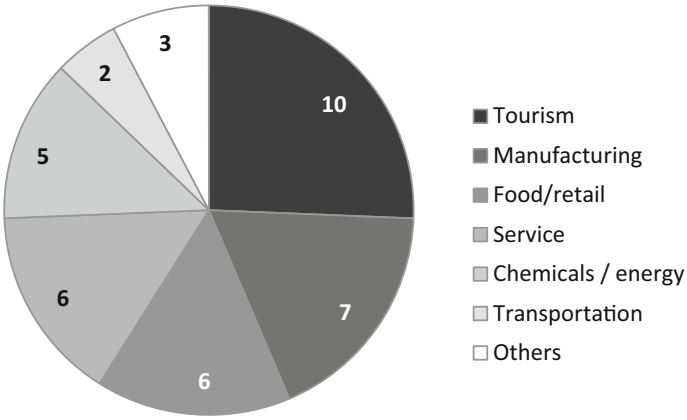

Fig. 1 No. of companies interviewed by sector

survey, the interviewees were the companies' CER experts, and the majority had the authority to make decisions on environmental investments (63%).

The questionnaire consists of three parts. Initially, experts were asked about general enterprise data and their company's CER engagement. In the second part of the interview, different CER drivers were discussed openly and experts were invited to quantify the importance of different drivers for ecosystem protection and conservation [for more details on motives for private PAC investment, see Meißner and Grote (2017)]. In the last part of the interview, the idea of an international market for PACs was introduced. The discussion of the market framework was followed by the question if companies would be willing to invest in PACs. In addition, they were asked to evaluate the importance of different product and market requirements on a seven-point Likert scale. The selection of product and market requirements is based on a two-stage approach. First, an initial set of criteria was developed based on the literature review. Afterward, five test interviews were conducted to validate the completeness and comprehensibility of criteria.

Descriptive statistics and qualitative content analysis are combined to examine the data gathered during the expert interviews and identify product and market requirements that are crucial for the companies to acquire PACs. First, the importance of different criteria is evaluated based on the experts' ranking. Second, a summative approach of qualitative content analysis that consists of counting and comparison of key words followed by an interpretation of the underlying context (Hsieh and Shannon 2005) is used to explore certain requirements in more detail.

Based on key motives for PAC demand, we apply a two-step cluster analysis with log-likelihood distance measure to identify strategic investor groups using both categorical and continuous data (Garson 2012). As a rule, investor groups are characterized by internal cohesion and external isolation (Cormack 1971). The number of clusters is determined by the Bayesian information criterion (Schwarz 1978). To adjust the final number of extracted clusters, we use the silhouette coefficient of the model, the relative contribution of clustering variables to the estimation of PAC investment types as well as the meaningfulness of the cluster solution (Backhaus et al. 2003; Garson 2012; Kaufman and Rousseeuw 1990). The homogeneity of clusters is evaluated according to the F value that displays the ratio of the within-group variance of one variable to the total variance of the whole sample. Aiming to label the extracted clusters, t values are examined that indicate if a clustering variable is

over-/underrepresented in comparison with the overall data set. Typically, two-step cluster analyses are based on large data sets. For small samples, the method shows a strong dependence upon the sequence of observations (Garson 2012). Thus, a robustness check of the cluster solution is compiled, including a randomization of cases and a comparison of strategic groups with those resulting from hierarchical algorithms. As hierarchical algorithms are not applicable for categorical data, in these cases, the sample is divided into corresponding pre-clusters.

4 Results

In total, 46% of the experts said that their company would currently not buy PACS, 39% would do so to support the management of protected areas, and 15% were undecided about PAC investment. Figure 2 displays the decision on PAC investment according to the industry sector.

4.1 Market framework

To learn more about the required PAC market framework, ten different product and market requirements were discussed during the expert interviews. The interviewees were asked to quantify the criteria on a seven-point Likert scale with the end points '1: not important' and '7: extremely important.' The mean values and standard deviations as well as the top box results are shown in Table 2. Transparency of the certification system has been identified as crucial condition for PAC demand by almost all experts, followed by the traceability of certificates, the credibility of certification bodies and project developers, the installation of a supervisory body and substantial monitoring efforts—that all relate to the credibility of certificates. About three quarters of experts emphasized the importance of the origin and additionality of certificates for their investment decision. In contrast, the development of a trading system and the expectation of positive price developments are of minor importance.

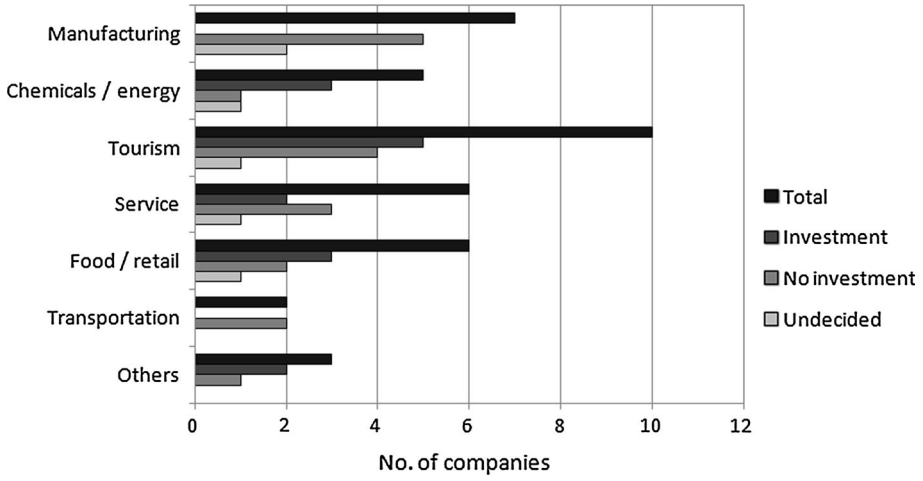

Fig. 2 Decision on PAC investment according to industry sector

Table 2 Required PAC market framework ($N = 38$)

Variable	Design principle	Explanation	Mean	SD	Top box % (Score 5–7)
Transparency	Transparent	Transparent certification scheme	6.66	0.63	97.4
Traceability	Credible	Certificates can be assigned to protected areas	6.53	1.37	94.7
Certification body	Credible	Credible and trustworthy certification body	6.53	1.01	94.7
Project developer	Credible	Credible and trustworthy project developer	6.53	1.20	92.1
Supervisory body	Credible	Installation of a supervisory body	6.43	1.14	91.9
Monitoring	Credible	Frequent monitoring of protected area management and conservation outcome	6.08	1.32	89.2
Origin	Flexible	Possibility to choose the geographical origin of the protected area	5.27	1.94	75.7
Additionality	Efficient	Improvement in the conservation status of ecosystems compared to the baseline scenario	5.39	1.77	72.7
Trade	–	Development of a PAC trading system	3.43	2.21	32.4
Price	–	Expectation of positive PAC price developments	2.97	1.94	24.3

Being asked what type of project developer would be preferred for the establishment and management of protected areas, experts named private companies. Private companies are expected to be close to the customer ensuring high availability and fast processes. Furthermore, private companies could be flexibly chosen according to the expertise required in a certain protected area. Local and German NGOs are evaluated to be trustworthy and credible project developers as well. In comparison with international NGOs, the regional alternatives are being more transparent with respect to land management practices. NGOs from the country of origin are also appreciated because of their local expertise, while German NGOs would have a better reputation in the public, at least in Germany. Some experts think that collaboration between local and German NGOs would

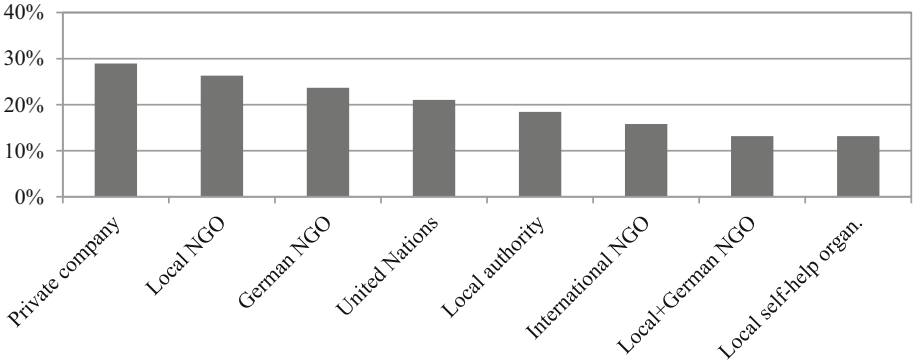

Fig. 3 Who should establish and manage protected areas? ($N = 38$). *Note* Multiple answers were possible

provide optimal conditions for the establishment and management of protected areas. An overview of all named project developers is given in Fig. 3.

All experts agree on the importance of a supervisory body responsible for the registration of projects, issuance of certificates and accreditation of certification bodies in the PAC market. Preferred supervisory body is the United Nations. First, an international authority would be required to cope with international projects; second, the United Nations is already experienced in supervising the global mechanisms of the Kyoto protocol. NGOs are also seen as adequate supervisors. Experts appreciate NGOs working faster than public authorities and usually being more transparent than private companies. In case of European and German authorities, a better adaptation to culture specific requirements of investors is expected. Figure 4 summarizes the results for proposed supervisory bodies.

4.2 PAC investor types

The factor corporate dependency on ecosystems has the biggest influence on private PAC investment (Meißner and Grote 2017). For the two-step cluster analysis with log-likelihood distance measure, we use two clustering variables to describe the corporate dependency on ecosystems. The variable *business risks* describe companies' exposure to business risks that stem from the depletion of ecosystems evaluated on a seven-point Likert scale. The variable *ecosystem* measures the importance of functioning ecosystems for the business of a company calculated as the average value companies appoint to four ecosystem benefits that go beyond climate change and water safety: food security, scenic beauty, cultural services and biodiversity conservation. In addition, we consider the categorical variable *business case* to cluster strategic investor groups. We suppose that PAC investment not only relies on the corporate dependency on ecosystems, but also whether companies can forward certification costs to their customers. An overview of the clustering variables and their value range are given in Table 3. Due to incomplete data records, six interviews were not used for the analysis. According to Formann (1984), a sample size of at least 2^k, preferably 5×2^k, is needed to ensure valid cluster solutions with $k =$ number of clustering variables. With 33 interviews and three clustering variables, the data set is hence suitable for cluster analysis.

Before running the two-step cluster analysis, the sample is divided into two pre-clusters of investing and non-investing companies. In the following, companies that stated to be

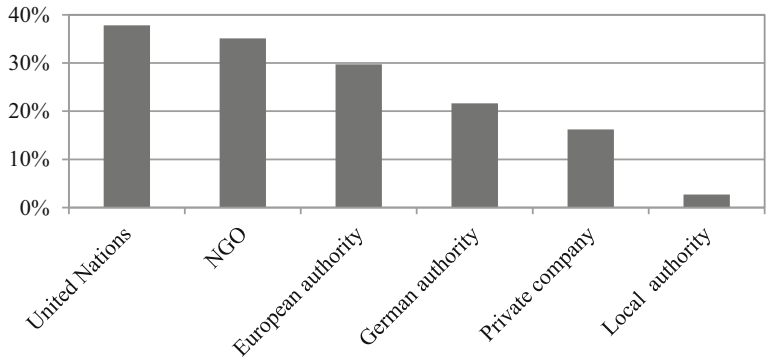

Fig. 4 Who should supervise the international PAC market? ($N = 37$). *Note* Multiple answers were possible

Table 3 Clustering variables

Variable	Explanation
Ecosystem	Importance of functioning ecosystems for the business of a company Seven-point scale: '1: unimportant' to '7: extremely important'
Business risks	Exposure to risks that stem from the depletion of ecosystems Seven-point scale: '1: no risk' to '7: very high risk'
Business case	Development of a business case for PACs Yes: a business case for PACs exists No: no business case for PACs exists

willing to invest in PACs and companies that admitted having no incentive to buy PACs are analyzed separately. According to the Bayesian information criterion, two clusters should be extracted for both subsamples. In the four-cluster solution, the categorical variable business case is used to separate investor groups. The corresponding mean values and standard deviations for the two continuous variables business risks and ecosystem are displayed in Table 4.

The distribution functions indicate that ecosystems are of similar importance for all companies classified as investors. The exposure to business risks, though, is varied within clusters 1 and 2. The silhouette coefficient for the subsample *investors* equals 0.4 indicating weak evidence for the cluster model. To improve the model fit, the number of clusters is increased. Results show that the investor group's silhouette coefficient reaches its maximum if four clusters are extracted. With a value of 0.6, the model fit is good and cases cannot be located closer to their cluster center. For the subsample *non-investors*, the distribution functions show that cluster 3 and cluster 4 are well separated in terms of ecosystem importance. However, comparable to the initial solution for investors, the exposure to ecological risks is widely dispersed within clusters. The initial silhouette coefficient for the subsample *non-investors* equals 0.6. Assuming furthermore that business risks do also play an important role in differentiating non-investing companies, the number of clusters is increased. The maximum silhouette coefficient of 0.7 is reached with the extraction of three clusters. Consolidating the results, four investing and three non-investing clusters are identified. The mean cluster centers and standard deviations of the seven-cluster solution as well as the F and t values of the clustering variables are shown in Tables 5 and 6. According to the Kruskal–Wallis test, there is a significant difference ($p < 0.01$) in the mean levels of the cluster groups for all indicators.

Table 4 Four-cluster solution: mean values with standard deviations in parentheses

	Business case	Ecosystem	Business risks	No. of companies
Investors				
Cluster 1	Yes	5.00 (0.67)	3.13 (2.53)	8
Cluster 2	No	5.40 (1.10)	3.00 (2.83)	5
Non-investors				
Cluster 3	No	2.67 (1.35)	2.88 (2.31)	16
Cluster 4	Yes	5.88 (0.48)	4.75 (2.22)	4

Table 5 Investors: mean values with standard deviations in parentheses

Variables	Investors				
		Business case = yes		Business case = no	
		Leaders (A)	Economic risk mitigators (B)	Risk mitigators (C)	Environmentalists (D)
Ecosystem	5.15 (0.84)	5.00 (0.87)	5.00 (0.25)	5.13 (0.18)	5.58 (1.51)
F value	0.59	0.24	0.02	0.01	0.71
t value	0.51	0.59	0.59	0.66	0.92
Business risks	3.08 (2.53)	1.40 (0.89)	6.00 (1.00)	6.00 (1.41)	1.00 (0.00)
F value	1.10	0.14	0.18	0.35	0.00
t value	− 0.08	− 0.72	1.21	1.21	− 0.89
Number of companies	13	5	3	2	3

Table 6 Non-investors: mean values with standard deviations in parentheses

Variables	Non-investors			
		Business case = yes	Business case = no	
		Skeptics (X)	Restricted beneficiaries (Y)	Free riders (Z)
Ecosystem	3.31 (1.79)	5.88 (0.48)	2.19 (1.18)	4.13 (0.43)
F value	1.01	0.07	0.44	0.06
t value	− 0.36	1.08	− 0.99	0.10
Business risks	3.25 (2.36)	4.75 (2.22)	1.67 (0.78)	6.50 (1.00)
F value	0.98	0.87	0.11	0.18
t value	0.06	0.68	− 0.61	1.42
Number of companies	20	4	12	4

In the first column of each table, the *F* and *t* values are displayed resulting from a comparison of the pre-cluster data with the overall sample of expert interviews. In the remaining columns, data of specific investor types are compared with the overall sample. The two subgroups *investors* and *non-investors* are nearly homogeneous as all *F*-values are smaller or close to 1. Investors tend to score the value of functioning ecosystems higher than the overall sample ($t = 0.51$), while non-investors have smaller ratings for functioning ecosystems ($t = -0.36$). On average, there are no strong differences regarding the business risks investors ($t = -0.08$) and non-investors ($t = 0.06$) feel exposed to.

Among investors, companies within strategic group A feel less exposed to ecological risks ($t = -0.72$). Nevertheless, these *leaders* have already developed a business case that allows them to implement PACs into their existing product portfolio of eco-friendly solutions. Both strategic groups B and C cluster companies that have a strong focus on risk mitigation when it comes to environmental commitment ($t = 1.21$). Companies in group B

are named *economic risk mitigators* because they have the possibility to forward a part of the occurring certification costs to their customers. For companies belonging to group C, the term *economic* is skipped; we call them *risk mitigators* as they should bear all the occurring costs by themselves. The last group D of investing companies is labeled *environmentalists*. These companies feel neither directly exposed to ecological risks ($t = -0.89$) nor do they have any viable business model for environmental compensation schemes. They aim to invest in PACs because they highly appreciate the value of functioning ecosystems ($t = 0.92$).

Besides the four groups of investing companies, we identify three different types of non-investors. Companies of group X have already developed their own business case for environmental compensation measures. At the same time, they highly appreciate the benefits of ecosystems ($t = 1.08$). Nonetheless, *skeptics* do not have an incentive to invest in PACs. It is therefore assumed that companies of group X are not convinced from the proposed certification scheme in general. *Restricted beneficiaries* that are part of group Y have no incentive to invest in PACs as they scarcely rely on the outcomes of ecosystems. As a result, they accord little appreciation to functioning ecosystems ($t = -0.99$) and indicate small ratings for business risks ($t = -0.61$). Companies within strategic group Z perceive the highest exposure to ecological business risks within the pre-cluster of non-investors ($t = 1.42$). Since they are not willing to invest in PACs, they are defined as *free riders*. Figure 5 displays the different investor types according to the clustering variables ecosystem, business risks and business case. While the black markers represent the strategic groups, the white markers define combinations of variables that do not exist in the sample.

5 PAC design principles

The identified product and market requirements and strategic investor groups support the identification of PAC design principles that are essential to attract voluntary investment from private companies. Based on the defined product and market requirements discussed

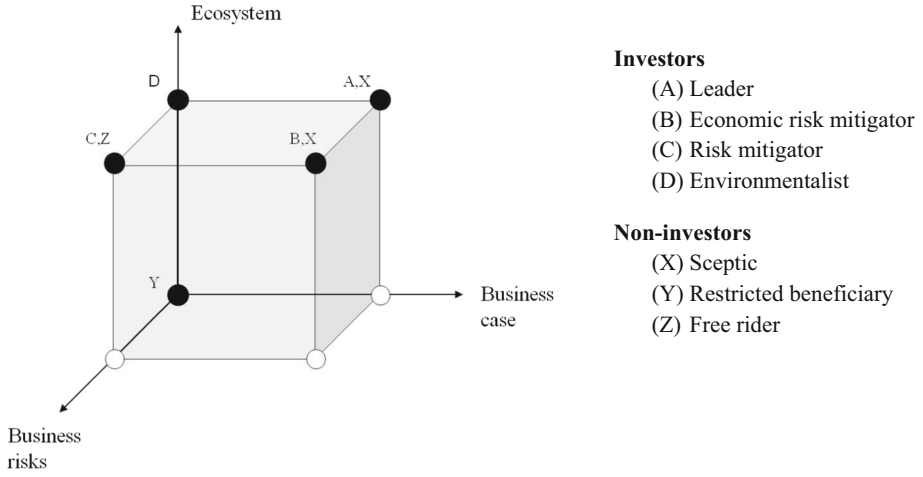

Fig. 5 Strategic investor groups

in Sect. 4.1, four general design principles can be defined when it comes to the desired PAC market framework. The developed taxonomy of companies in Sect. 4.2 can be used to formulate three further design principles that apply for specific investor types. In the following paragraphs, the design principles are explained in detail. In addition, the findings are compared with results from previous studies, and ideas are shared on how to consider the design principles within the conceptualization of a PAC market. To account for any bias in the results, sector-specific findings are discussed.

1. *PACs should be credible*

Overall, product and market criteria relating to the credibility of certificates are of high importance for most companies of the study. Companies must be certain that their investment has a positive impact on ecosystem sustainability, measures are following defined standards, and any leakages have been avoided. More specifically, the development of certified areas does not lead to an increased depletion of ecosystems in neighboring areas not falling under the certification scheme. Credibility as a prerequisite for certification is generally accepted (Bratrich et al. 2004; Bräuer et al. 2006; Giovannucci and Ponte 2005; ISEAL 2013; WWF 2006). In fact, companies that strive to use the marketing potential of PACs to gain social legitimacy need to be sure that their investment has a real impact on nature. Any non-credible marketing activities could easily damage corporate reputation (Jahn et al. 2005; Klewes and Wreschniok 2010). Scientists agree that the credibility of schemes can be enhanced if certification is provided by independent third parties, and regular monitoring, reporting and verification activities are in place (Anders et al. 2010; Bayon 2004; Eden 2009; Karousakis and Brooke 2010; ten Kate et al. 2004). In a survey asking about demand for land-based carbon projects conducted by the Climate, Community & Biodiversity Alliance together with Conservation International (CCBA 2012), companies said that they would rely on professional partners to handle local management issues. Big commodity buyers also reported to get involved at a local level to secure the profitability of projects, and smaller projects are deemed to offer more visible benefits, ownership and risk control on the ground (Laing et al. 2016). In our study, experts trust private companies, local and German NGOs when it comes to the development and management of projects. However, they also indicate the necessity of third-party monitoring, reporting and verification of conservation projects to strengthen the credibility of PACs. Concerning international schemes, accreditation of third parties to the PAC standard should be granted by an international organization such as the United Nations. Taking all the requirements related to the credibility principle into account is a complex and expensive task. One option to reduce transaction costs is checking no more than a sample of PAC projects instead of monitoring all projects continuously. Being further embedded within a jurisdictional landscape approach, newly developed landscape rating tools (CCBA 2017) can inform investors about general policy and governance enabling conditions for their investments, which can be taken as a proxy indicator for credibility. Finally, predicting local stakeholders' responses to conservation interventions by means of participatory tools could enable impact assessment of different interventions prior to project implementation and thus allows comparison of alternative cost–benefit scenarios (Travers et al. 2016).

2. *PACs should be transparent*

It is not only important for companies to get sufficient information about the applied certification scheme, but information should be easy to understand. 97% of the interviewed companies stated that any certification scheme needs to be transparent. There is broad

consensus about the significance of transparency in certification schemes and monitoring, reporting and verification procedures (CCBA 2012; European Commission 2010; Fry 2011; Ugarte et al. 2013). Often, transparency is a necessary condition for the credibility of standards (ISEAL 2013; KfW 2012). Regarding the PAC market, procedural guidance for the certification of protected areas including indicative timelines as well as environmental and social objectives should be clearly defined and accessible to the public. Furthermore, information about the actual certification process and its outcome should be made available so that PAC buyers, the local community and other stakeholders have the possibility to continuously track the status of respective protected areas and express any concerns if necessary. Basically, a transparent process from the first validation of geographical areas until the final issuance of PACs is required to enhance private sector investment. Access to information on the certification process in the course of activities could be provided online, which would reduce the costs of information procurement. The offer of PACs is primarily aimed at private companies, and PAC markets should therefore be built upon governance structures similar to those in private companies, such as product standards and controlling. As existing standards require substantial effort and finance, they are presenting a major entry barrier (Laing et al. 2016); a coordination with public institutions might, however, scale up impact and reduce transaction costs of PACs (Tayleur et al. 2016).

3. *PACs should be efficient*

Albers et al. (2017) define economic efficiency of conservation projects as pathway to the highest level of conservation benefits for a given expenditure level; the authors stress that local people's actions must be considered from the beginning of conservation planning to achieve efficient outcomes and avoid leakage effects. Around three quarters of the interviewed companies would only invest in PACs if the criterion of additionality is met. Thus, the conservation status of ecosystems due to the certified development and management of protected areas must be improved compared to the absence of PACs. The additionality requirement has provoked the debate on the applicability for small areas managed by communities. According to Wunder (2005), smallholders are often too poor to significantly damage ecosystems, and consequently, transforming their land into protected areas creates little or even zero additionality. On the contrary, recent studies show that smallholders and small-scale fishers significantly contribute to degrading protected areas, clearing forest lands and overexploiting natural resources, indicating plenty of scope for additionality (Gronau et al. 2017; Tweddle et al. 2015; Valbuena et al. 2014).

In the context of the additionality criterion, there is much debate about 'pro-poor conservation' and the trade-offs and synergies of biodiversity conservation and poverty alleviation (Adams et al. 2004; Kaimowitz and Sheil 2007; Roe and Elliott 2006; Sachs and Reid 2006; Wunder 2008) as well as about the 'poverty–environment trap' (Barrett 2008; Gray 2011). In fact, only 18% of the companies stated to consider PACs as an additional source of income for the local poor. While PES schemes are not necessarily designed as pro-poor (Engel et al. 2008), they can have positive impacts on poverty reduction (Milder et al. 2010; Pagiola et al. 2005). However, this typically comes at the cost of environmental efficiency (Wunder and Börner 2013). The same applies for PACs. Developing an international market for PACs, the main goal is to meet the demand of private companies. Yet, a new issue of project demand is sustainably sourced commodities or deforestation-free supply chains. This perspective gives more space for benefit sharing as projects generate returns from sustainable landscape management such as diversified agroforestry systems and wetlands (Altieri and Toledo 2011; Laing et al. 2016). For this reason, most certified projects should focus on the efficient conservation of ecosystems,

and agroecosystems in particular; but this must not come at the cost of socioeconomic best practices. Whenever possible, projects need to be complemented with social benefits for the local people (Albers et al. 2017).

4. *PACs should be flexible*

Needs of companies are varied. If companies buy PACs to satisfy the demand of their customers and gain direct financial benefits, individual requirements become even more important. In fact, three quarters of the interviewed companies appreciate having the opportunity to choose the area they invest in. Furthermore, it is important that the investment volume can be determined in a flexible manner. Small- and medium-sized enterprises raised the concern that they are not able to provide the financial means for the management of one area alone. Other companies stated to prefer investing in different conservation projects at the same time. In many cases, flexibility is described as a measure to increase private sector investment in biodiversity conservation (Bishop et al. 2008; Bräuer et al. 2006; Cortex Consultants 2009; ten Kate et al. 2004). Nevertheless, studies lack to explain how flexibility can be transformed into concrete design principles for area-based certificates. In addition to the free selection of the location and type of protected areas, we recommend developing PACs on the basis of small area units, which means issuing many certificates per landscape area. At the same time, individual PACs may also have different requirements related to monitoring, reporting and verification and the related costs. The smaller the area unit, the smaller the PAC price and the more flexible investments can be made. This does not mean that companies want to trade PACs. On the contrary, once bought, companies would keep the certificates for themselves or their customers. Consequently, neither the establishment of a trading system nor the expectation of positive price developments does play an important role for private sector investment. The flexibility principle of PACs presents a strategic element to supply the various demands for conservation projects without compromising the ability of future certification schemes to set more stringent standards.

5. *Leaders: PACs should be easily and quickly accessible*

Although their business is not directly threatened by the depletion of ecosystems, leaders are willing to invest in innovative solutions that allow them to extend their eco-friendly product portfolio. Companies classified as leaders would invest in PACs due to their customer demand. Basically, they would buy PACs whenever there is a direct inquiry from their customers. For example, investment fund providers and sustainability agencies are identified to be leaders. They act as intermediaries by offering their customers certificates that allow them to offset their ecological footprint. For them, a PAC market must be easily and quickly accessible. Only if fast administrative processes are ensured, can they satisfy the needs of their customers on demand. McMillan (2002) emphasizes the importance that buyers and sellers get together and exchange information about goods and prices. He points out the fact that markets can only work efficiently if information is evenly distributed. The development of such an 'investment-ready' structure is also stressed by Bayon (2004) as well as by Lambooy and Levashova (2011) in the context of environmental markets. To facilitate easy and quick access to PACs, we suggest establishing an online clearing house similar to the LifeWeb initiative. Such a platform would allow project developers to promote their conservation activities and potential investors to get all the information they need. An integrated online purchasing system would further lead to a situation in which companies can satisfy the PAC demand of their customers from anywhere at any time.

6. *(Economic) risk mitigators: PACs should be dividable into different categories*

Risk mitigators see environmental investment as a necessary condition to sustain their business; companies identified as risk mitigators are, for example, food producers and retailers. Due to their agricultural supply chains, these companies strongly depend on the services and raw materials provided by healthy ecosystems. Tourist operators are an example of economic risk mitigators. On the one hand, they have a special interest in ecosystems because they want to improve tourists' experiences. On the other hand, they can also forward a part of the occurring investment costs to customers willing to offset their travel-based impact on nature. In comparison with leaders that focus on customers' needs, (economic) risk mitigators choose PACs according to their potential to minimize business risks. Thus, uniform bundling of ecosystem benefits into one certificate as a mean to reduce transaction costs and monetize abstract benefits such as biodiversity conservation (Deal et al. 2012; Landell-Mills and Porras 2002; Robertson and Wunder 2005; Wendland et al. 2010) constitutes a disadvantage for (economic) risk mitigators. For them, it is of great importance to know the exact influence protected areas are expected to have on their long-term business success. In the recent literature, it is widely acknowledged that main goals must be clearly defined for every conservation project (Karousakis and Brooke 2010; ten Kate et al. 2004; WBCSD 2010). This is also important for PACs. We propose to classify PAC goals according to ecosystem benefit categories (e.g., carbon sequestration, water-related services, food security, scenic beauty, biodiversity conservation). Doing so, investors can directly see what kind and what level of ecosystem benefits are provided. Together with other project data such as the country of PAC origin and overall investment volume, this information may be stored in a database that will allow companies to easily find projects relevant to their needs.

7. *Environmentalists: PACs should be of global importance*

Environmentalists are hardly affected by ecological risks. Nonetheless, they highly appreciate functioning ecosystems. Companies that belong to the investor group of environmentalists would only support those conservation projects that they think to be the most valuable. For them, it is important to understand the added value of PACs compared to single-product and carbon-centered certification schemes and corporate donations. Environmentalists are not found in specific sectors. Moreover, commitment to the environment is a result of the opinion of internal stakeholders (e.g., shareholders, management and employees). Previous studies emphasize the importance to evaluate the net benefit of environmental projects (Bräuer et al. 2006; Karpowicz et al. 2009; Lambooy and Levashova 2011). Regarding PACs, the market needs to provide a detailed description of the ecosystem benefits of protected areas that are considered for certification, and point to global impacts on nature.

Looking at the non-investing companies, the group of skeptics might be persuaded to buy PACs in the long run. Currently, their main reason to decide against PAC investment is that they question the credibility of the certification scheme. They doubt that PACs can mitigate their individual ecological business risks and are uncertain if their customers would pay a price premium for PACs. When the market is well-established and high-quality projects are developed, skeptics may likely turn to leaders or economic risk mitigators. However, neither restricted beneficiaries nor free riders will play a part in the PAC market. While the business of restricted beneficiaries does hardly depend on functioning ecosystems, free riders will only invest in ecosystem sustainability if they must comply with mandatory regulations. Restricted beneficiaries are companies in the manufacturing,

transport and logistics as well as in the service sector. These companies are not confronted with strong eco-dependencies and thus show little appreciation for ecosystem benefits. Free riders, on the contrary, can be found in all sectors. In a similar manner to environmentalists, free riding is estimated to evolve from the personal attitude of internal stakeholders toward nature.

6 The PAC market concept

The suggested conception of an international PAC market considers seven design principles derived from the sample of interviewed German companies. In addition, it considers principal criteria on good governance advocated by international commitments. Having a look at existing markets for protected areas, the LifeWeb initiative hosted by CBD corresponds to four out of the seven derived principles for PACs. First, the LifeWeb initiative is very *transparent* (principle 2). The online platform provides investors with details on current projects, including information about objectives and expected results, the timeframe, social and ecological contributions and the institutional context. The provided information meets the requirements of companies categorized as environmentalists that are looking for certificates with *global importance* (principle 7). Furthermore, the initiative facilitates *flexible* (principle 4) funding. Investors can individually decide about the investment volume. The aggregated amount and the missing investment for each suggested conservation project can then be viewed on the Web site of the initiative. (Economic) risk mitigators also have the possibility to filter protected areas according to *different categories* (principle 6) so that they can easily find LifeWeb projects relevant to their needs. This includes the country, funding status, ecosystem benefits, the year in which the project was submitted and the total amount of required funding (CBD 2014b).

However, the current LifeWeb does not provide any certification system for the supplied projects. Once projects have been matched, they are not further monitored and neither management practices nor project outcomes are verified. This contrasts with the *credibility* and *efficiency* criteria (principles 1 and 3) requested by all identified investor types. Regarding the international PAC market concept, we recommend building upon the LifeWeb initiative and establish an additional category of certified conservation projects that issue landscape certificates. The PAC standard could be based upon the following globally accepted standards: CBD's Ecosystem Approach, the SAFA guidelines of the Food and Agricultural Organization (FAO) of the United Nations; REDD+ Social and Environmental Standards; FSC certification for well managed forests; the Gold Standard's Land Use & Forest Framework; or the Verified Conservation Areas (VCA) currently under development. Regarding the local project level, a governance model like the Community-Based Natural Resources Management (CBNRM) approach is advised; CBNRM relies on the principles of subsidiarity and free, prior and informed consent (FPIC) transferring authority to local institutions (Roe et al. 2009; Sperling and de Kock 2010).

To attract significant funding from companies identified as leaders, we further suggest expanding the current LifeWeb Web site and installing a click and buy system for online certificate orders. This would ensure *easy and quick access* (principle 5) to PACs. In addition, categorizing certified areas according to the sector of a company could be of value. Entering their sector, companies could directly be forwarded to projects that minimize their ecological business risk (e.g., sustainable management of national parks for tourist operators). This would further simplify the identification of relevant projects for

companies that have dealt only little with ecosystem sustainability so far. Figure 6 illustrates the proposed 'LifeWeb+' system including independent third-party certification as a major extension to the original LifeWeb.

The recommended 'LifeWeb+' system could comprise a portfolio of different financial products addressing companies' different risk attitudes end returns of investment expectations, for example green bonds and derivatives (Mandel et al. 2010). A green bond is a debt security issued to raise capital to support climate-related and environmental projects. The World Bank and KfW Group, for example, are emitting green bonds to raise capital for large-scale renewable energy projects (ICMA 2016; KfW 2015; World Bank 2015). Most green bond issuances to date have been based on the full faith and credit of the issuer principle, meaning that interest and repayment do not depend on the cash flow of the project; however, impact investors often accept a lower level of return in exchange for a bond that is 'mission-aligned' (DuPont et al. 2015). More recently issued bonds are targeting smaller biodiversity conservation projects through 'wildlife impact bonds'; one example is the Rhino Impact Bonds mechanism financing site-based Rhinoceros conservation (UNDP 2016). Eligible projects must improve the protection of wildlife and reduce the risk of extinction and biodiversity loss. If a project succeeds, investors are repaid by the government or by an aid agency; in case the project fails, the interest and at least part of the capital are lost (UNDP 2016). PACs could be interpreted as a category of impact bonds with a focus on the investment in sustainable landscape management certification, and PACs might be issued by organizations partnering with the LifeWeb initiative of CBD such as GEF or nonprofit organizations like WWF. To provide up-front capital for conservation projects and to ensure efficient outcomes at the same time, certificates could be issued for different levels of a landscape's progress toward achieving sustainability standard (Mallet et al. 2016); a practice reflecting unequal risk–return profiles of different investor types and therefore responds to the flexibility requirement of PACs.

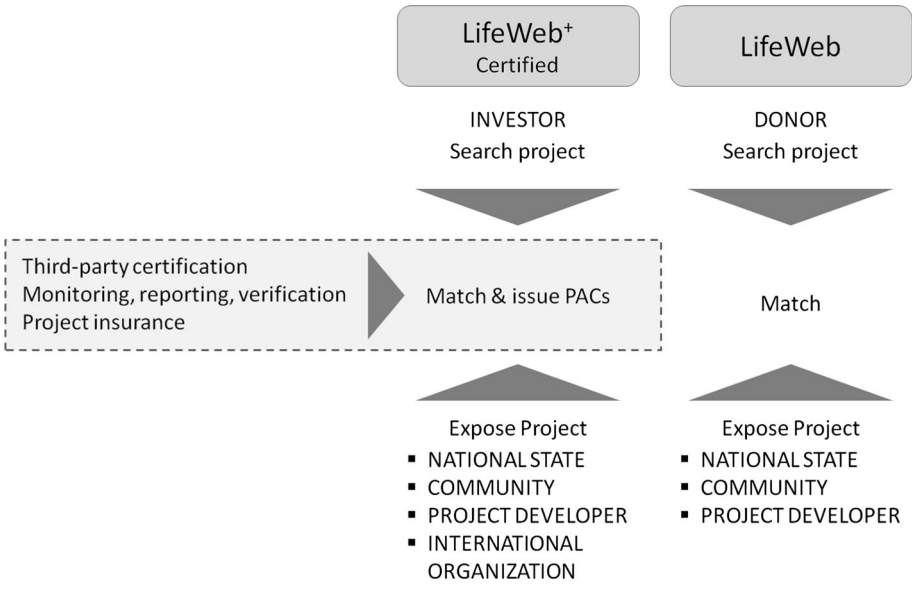

Fig. 6 Platform of the proposed extended LifeWeb+

7 Conclusion

The main target of this article was to define design principles that are crucial for private companies to invest in PACs. Summarizing general as well as investor type specific product and market requirements, seven PAC design principles have been identified. The four general design principles comprise credibility, transparency, efficiency and flexibility and are prioritized by all business sectors. In addition, we could cluster three types of investors giving precedence to different PAC attributes. Market leaders prefer easy and quick access to PACs, companies aimed at mitigating risks claim the importance of ecosystem benefit categories, and environmentalists highlight the global importance of certified conservation projects. Altogether, the seven principles encourage a holistic market concept for landscape certificates that can boost private sector investment in protected areas in a flexible way. A closer look at existing market schemes for the funding of protected areas and their surroundings reveals that one scheme provides a good foundation for the implementation of the seven design principles: the LifeWeb initiative hosted by CBD. For the development of a PAC market, we recommend a 'LifeWeb+' system, which should include independent third-party certification as a major extension to the original LifeWeb.

Considering governance issues, the results achieved from 'collective action' and 'common knowledge' research evidently identified several advantages of local governance and co-management models compared to top-down and external control mechanisms (Berkes 2009; Ishihara and Pascual 2012; Reed et al. 2016). Community-based approaches are supposed to reduce the transaction costs of monitoring and surveillance through nurturing social capital and local leadership, and several case studies from the developing world demonstrate that these approaches have been effective in natural resource management [see, for example, Crona et al. (2017) and Baynes et al. (2015)].

However, in the context of managing global public goods like protected areas, a system is needed that consolidates the multiple and often competing interests of different players. The suggested LifeWeb+ relies on a well-established international institution and thus might represent a starting point for the development of a market for conservation finance via PACs; moreover, the extended system addresses a couple of aspects missing in current systems, but was identified to be critical to increase private sector investment.

The focus of this paper is on the demand side of a PAC market. The question was how must certificates look like to attract private sector investment? The supply side of PACs was only partly considered by giving first recommendations on how to comply with the identified design principles. A detailed analysis of the project developers' side was not conducted. Besides the analysis of applicable management approaches for protected areas (e.g., multistakeholder involvement, participatory planning, self-monitoring), an important next step would be to assess the transaction costs of meeting the different design principles of the PAC scheme. Comparing the transaction costs with the willingness to pay of private investors would provide useful information for evaluating the overall feasibility of the recommended LifeWeb+ system and identifying the most important design principles to set off.

Coming to the same conclusions as suggested by Mallet et al. (2016), the concept of holistic landscape approaches is in a very explorative phase and future research on different pilot landscape certification systems is highly recommended to test different producer support systems, verification models, and performance and outcome metrics.

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