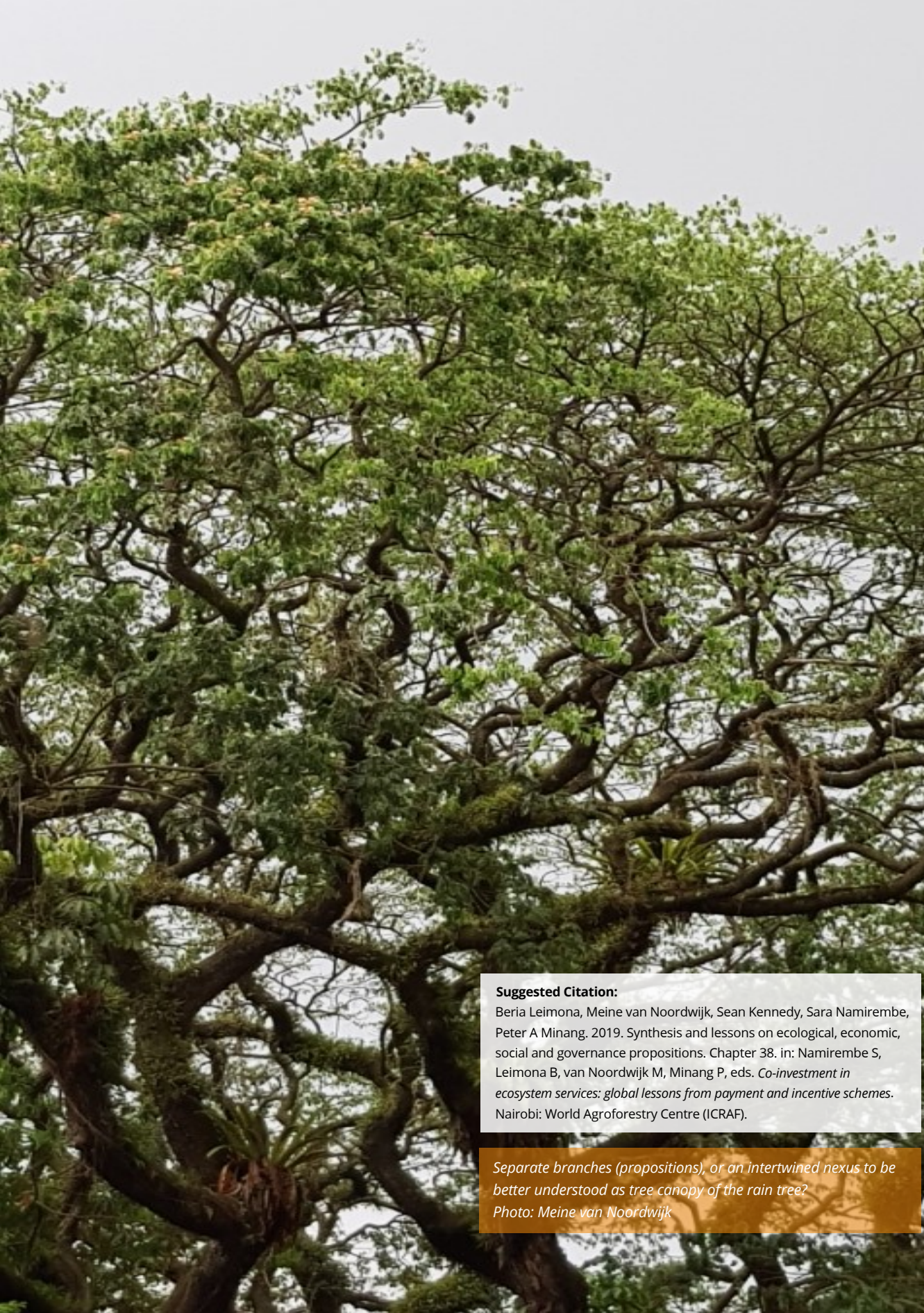

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Separate branches (propositions), or an intertwined nexus to be better understood as tree canopy of the rain tree?
Photo: Meine van Noordwijk

CHAPTER 38

Synthesis and lessons on ecological, economic, social and governance propositions

Beria Leimona, Meine van Noordwijk, Sean Kennedy, Sara Namirembe, Peter A Minang

Highlights

- Ecosystem Services (ES) related to water, landscape beauty and biodiversity depend, beyond basic proportionality to aboveground biomass, on spatial structure of the landscape mosaic
- Economic returns to investment in ES include profitability of land use, social costs and benefits, and the triggering of government services
- Social propositions suggesting respect and local institutions to interact with rights and motivation are modified to include the need for learning, increased representativeness and trust-building across scales
- The two initial governance propositions on synergy across sustainable development goals suggest that public-private coinvestment in stewardship of ES can be strategic
- Nature's Contributions to People (NCP) as recent reframing of the Biodiversity and Ecosystem Services policy domain may obscure more than it clarifies
- Payments for Ecosystem Services primarily refers to an interhuman buyer-seller relationship, while Coinvestment in Environmental Stewardship includes a view on Human Nature relational values

38.1 Introduction

Awareness of the environmental crisis in many parts of the world has raised interest in a simple idea: farmers and other land users can change their decisions and behaviour in ways beneficial to 'downstream' stakeholders if their income is based not only on products they sell, but also on the services they provide or allow Nature to provide. This idea is popularly known as *payments for environmental services* or *payments for ecosystem services*, both abbreviated as PES (for detail in the relationship between these terms, see Chapter 1).

Coins have three sides, although, when flipped, they normally land on either of two sides. These sides generally refer to the authority issuing the coin ('head'), or the numerical value ('tail'). When the metal content of coins still represented its value, a specific marking of the third side referred to a higher authority ('God be with us'), to prevent nibbling off the edges. The three sides of a coin thus represent the rules, incentives and moral motivation ('sticks, carrots or sermons') of environmental policy instruments. When we shift from a pure monetary interpretation of PES to a broader concept of 'incentives', these three sides of the coin still interact. Even more so, when we consider the coinvestment paradigm. The ambiguity of who provides the services, Nature or humans taking care of Nature, is important in the

justification of 'payments' rather than 'coinvestment' as label for the institutions that emerged initially under the PES label.

In the 1990s, a growing sense that purely regulatory (i.e. command and control) approaches to protect environmental quality were failing coincided with high expectations for *market-based* solutions for many aspects of society. Among the developing countries, Costa Rica was a frontrunner, transforming a forest subsidy program to an outcome-based *pago por servicios ambientales* (PES) program in 1997. Elsewhere, similar ideas came up, and the Kyoto Protocol (also in 1997) opened perspectives on global carbon-markets. Compared to past government 'subsidy' schemes, the novelty of PES was supposedly that it was conditional (performance-based), realistic (delivering real benefits to all involved) and voluntary (negotiated, participation based on informed consent). Meanwhile, it became clear that payments have pre-requirements, including clarity on land use rights and tenure, that are not met in large parts of the developing world, especially on the tropical forest margins where major ecosystem services are at stake. The implementation rules for the inclusion of land use in carbon markets that emerged in Marrakesh in 2001 in global climate negotiations, for example, contained many restrictions, safeguards, and complex procedural rules. Since that time, alternative formulations for the basic *incentive* concept have continued to emerge.

Payment for ecosystem services (PES) is widely recognized as an environmental policy instrument to provide land managers with agreeable (financial or other) incentives to opt for land-use practices that maintain or enhance the level of ecosystem services (ES). In most cases, these ecosystem services have so far been taken for granted and not been actively appreciated by downstream ES beneficiaries. While most PES instruments complement existing policies and do involve additional market functions, public funding and governance generally play a significant role. The terminology of PES is used for a wide range of specific instruments. Some examples include forest owners paid from levies on water or hydropower users, trade in emissions reductions, moral incentives to plant trees, income from ecotourism, and environmental outcome-based contract to reduce sediment loads. More than two decades of theoretical debate and empirical experience with PES have resulted in progress and convergence on initial debates that contrasted a focus on *efficiency* with a focus on *fairness*. Neither of the extremes is viable and managing this specific trade-off well is key to the success of any PES program.

Coinvestment in environmental stewardship was introduced in Chapter 1 as the most basic form of 'Payments for Environmental Services', focussed on an initial investment, rather than dependence on recurrent payments, and an agreement between parties to share their various resources: land, labour, collective action spirit, inputs, output market access, agreement of (local) authorities, and financial capital. In this final chapter we will review the evidence on the practical implementation of this concept in a wide range of contexts.

In our authors' meeting shaping this book, we formulated four groups of propositions, as described in Chapter 1. In this concluding chapter, we will briefly account for the journey across the chapters and then reflect on these four groups of propositions, reviewing the evidence, framing what is ready-for-use and where critical-uncertainties remain.

38.2 Overview of the book

The book started with a review of the basic concepts of ecosystem services[1], connecting upstream and downstream actors and stakeholders. This chapter formulated four groups of propositions covering ecological, economic, social and governance aspects of PES mechanisms and co-investment in environmental stewardship. The four groups of propositions represent the aspects of effectiveness, i.e. enhancement of ES as the main

outputs, efficiency i.e. providing ES with economic use of limited and scarce financial resources, equity and fairness i.e. being inclusive and meeting social norms and governance i.e. balancing the other three aspects through institutions that are transparent and accountable, and yet flexible and open to improvement and learning.

The first cluster of chapters focused on the ***Ecological*** (or *effectiveness*) aspects of PES. Chapters in this cluster introduced classification[2] and quantification[3] of ecosystem services, the various types of trade-offs[4] and approaches to monitoring[5]. The first group of case studies provided background on pilot carbon schemes in Vietnam[6] and East Africa[7], watershed services[8] and biodiversity[9] in East Africa and plans for new efforts to reduce elephant – villager conflicts in Thailand[10].

The second section of the book dealt with ***Economic*** (or *efficiency*) aspects, from various perspectives. From the perspective of landscape stewards ('ES providers'), this section discussed bundling or stacking[11] as a strategy, while the following chapters discussed socio-economic feasibility[12] and a way of quantifying a 'business case' for investors[13]. Experience with scaling up initial efforts looked at placement (use of scarce resources) in relation to social and ecological priorities[14]. The section broadened the debate on 'commodification' of ES by considering eco-certification as a way of reforming existing commodity flows[15]. Efficiency is also key to sustainable financing and long-term involvement of public sector funds[16] and opportunities for a double-win (carbon payments in relation to biodiversity)[17] or even triple-win[18] (also involving watershed functions) in China. Experience with existing and emerging schemes in the Philippines[19] and Mexico[20] formed a bridge to social equity concerns.

The third section of the book had a ***Social*** focus on equity concerns or fairness. It started with exploring how the Common but Differentiated Responsibility (CBDR) catchphrase can connect international to (sub)national scales[21] in the context of sustainability objectives. A review of gender and social equity aspects of early PES initiatives found space for improvement[22]. PES has played a role in conflict resolution[23] but depends on partnership and capacity development[24] as it uses new concepts and mechanisms. Priorities among the various ways of meeting the pro-poor[25] objective were found to depend on local context. A study of conditionality in practice[26] and justice notions in China's largest PES program so far[27] formed a bridge to the last section of the book.

The fourth section on ***Governance*** discussed various ways to balance fairness and efficiency in operational PES programs. The section started with lessons from a cross-border 'split-plot' policy experiment in Mount Elgon[28] and an experience with new institutions building on traditional ones for effective community-based restoration in Indonesia[29]. One chapter reviewed the design and evaluation of payment modalities in Latin America[30], and the following chapter examined the institutional considerations in payments for watershed functions in East Africa[31]. The next chapter considered the way an ES framing has to build on existing, sectoral definitions, policies and institutions but can make connections that do not yet exist[32]. Where new forms of governance are emerging, multi-stakeholder negotiations can be simulated via games to allow a faster and less costly form of experimentation than real-world pilots[33]. The connection between 'groundwater recharge restoration' in an area in India and PES concepts further illustrates the multi-scale complexity of stewardship concepts[34]. The final chapters in this section reviewed the roles of intermediaries[35], institutional sustainability through flexibility[36], and lessons from state-level ES investment in Brazil[37].

Throughout the sections, the close linkages between all aspects (effectiveness, efficiency, equity/fairness, governance) were evident. Here we provide reflections on the four groups of propositions as initially framed in order to examine the validity of existing PES theories and provide practical recommendations for future PES implementation (Fig. 38.1).

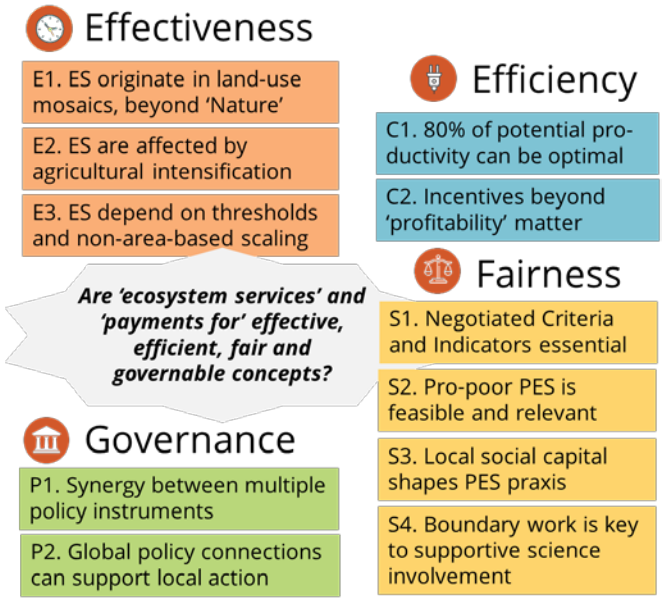

Figure 38.1 The four groups of propositions and an underlying question explored in this book

38.3 Reflections on the ecological propositions

E1: Ecosystem service provision from agricultural landscapes is influenced by the existing combination of land use practices, how they are distributed spatially, how they interact with each other and how this changes over time.

What we know well enough to act on:

- Ecosystem structure interacts with ecosystem functioning in many aspects simultaneously, e.g. coupling energy balance, water, carbon and nutrient cycling, with above- and belowground biota. The interaction shapes the human benefits derived as 'ecosystem services' of a provisioning, regulating, cultural or supporting type. Much of the ES literature of the past 15 years has focussed on these higher levels of the hierarchy[38] rather than the underlying connections of all aspects of e.g. water or vegetation. The more specific typology developed in RUPES can add clarity.
- Earlier interpretations that ES are exclusively derived from 'Nature' have evolved to recognition of the natural elements in agro- and urban ecosystems – a gradual, rather than binary contrast. Within agro-ecosystems and in forest margin mosaics, a range of land use systems is normally found that differ not only in on-site properties and also in off-site impacts.
- Forest as one of the landscape structures is widely believed to be the most important source of ES, as these relate to trees and aboveground biomass. However, when functions and services are specified, the dichotomy of 'forest' versus 'non-forest' breaks up into a finer-grained mosaic with trees outside forest, agroforestry, other ways of achieving 'perenniality' and 'cycling', and strategically located buffer and filter functions as focus of quantification. with water as most advanced example[39]. Progress has been made in documenting the gradient character of agriculture-forest interfaces, with over 40% of agricultural lands having at least 10% tree cover[40], but 'agroforestry' is only slowly gaining recognition for the multifunctionality it provides[41].

- A range of methods, data sources, scales, value systems on ES quantification exists and continues to emerge in response to context-specific demand of multi-stakeholder negotiations[3,4,5].
- Off-site impacts of land use via 'lateral flows' are the primary reason that spatial distribution of land uses within a landscape matters. Lateral flows involve atmosphere (wind speed and turbulence influenced by vegetation), water (fast overland flows, slower subsurface pathways and slow groundwater release), soil particles, nutrients and pollutants carried in flows of water or wind, fire (with firebreaks an essential part of spatial patterns) or biota (e.g. those involved as pests/diseases or their control, pollinators/seed dispersants, migrating fish or wildlife). Spatial approaches – including the rapid advance of remote sensing, satellite and drone-based observations, and open-access databases – have advantages in terms of data collection, but beyond data on the fraction of the landscape under various types of land cover, spatial configuration (e.g. in riparian zones or distances from rivers) is important for linking 'structure' to 'function' and ES.
- Beyond directly empirical pattern-recognition models, mathematical models that start from a water, energy, nutrient or carbon balance or from meta-population concept of biota are used to relate measured quantities to the value-at-scale desired for informing target audiences.

Critical uncertainties to be resolved:

- Lack of data on differences in social-ecological contexts and stakeholder preferences are key factors that complicate ES quantification across scales as 'human benefits' depend on both humans with their needs and perceptions, and on ecological functions that support them.
- Land cover legends used may not match important functional distinctions on the ground. As such, the interpretation of land cover to land use and the various types of benefits produced are often ambiguous[42,43].
- Models that help with ex ante evaluation of prospects for ES under human decision making scenarios (that means beyond direct extrapolation of existing trends) need to link and depict ecological causal relationships to social agency in an operationalized social-ecological system approach[44,45].
- Important parts of the 'valuation' literature are still focused on the concept of a 'value per unit area' that can be multiplied with a total area to estimate a national scale value of specific types of land use (such as 'forests' or 'agriculture').
- Such an approach is acceptable for C stocks (with limited dependence on lateral flows) but scaling rules for interactions with the hydrological cycle are non-linear and dependent on spatial patterns and edge effects, while for erosion/sedimentation the results at national scale can be a factor 100 or more off when simple area-based scaling is used. Consistent use of scaling rules based on quantitative understanding of lateral flows is still an area for further progress.
- A major attraction of the (over)simplified area-based approach to value is that it is compatible with existing policies for land use planning, taxation and subsidies, while more complex scaling rules easily appear to be less 'transparent' and 'objective'. Progress is to be made on this interface between ecological understanding and the ways policies and institutions currently function.

- One major solution in this issue is subsidiarity or the greater reliance on 'local entities' to determine details, while the 'landscape' as a whole is evaluated for impacts across its boundaries. This is an alternative to top-down 'micro-management'. Opportunities for and limitations of such subsidiarity remain a critical uncertainty; they require that 'conditionality' is based on what really matters, and not on simple 'proxies'.
- One of the most salient uncertainties is in the importance, depending on location on the globe and scale of consideration, of rainfall as an ecosystem service, influenced by ecological infrastructure[46].

E2: Intensification of land use through increased use of external inputs and removal of land cover types that provide key ecological functions in the landscape is associated with degradation of important ES even where the provisioning service is enhanced, but ecological intensification and restoration pathways can reconcile productivity and ES delivery.

What we know well enough to act on:

- Less-intensively managed field edges, scattered woodlots and areas where birds, pollinator insects and biological control agents can survive have been demonstrated to be important for ecological functions in the landscape[47,48,49].
- The case for pollinators has received much research attention[50,51] and requires a combination of maintaining suitable habitat and absence of harmful agrochemicals, with specific attention to pesticides[52].
- Agro-ecology[53] has increasingly been embraced as a way to reduce the hard trade-offs between 'productivity' (provisioning services) and 'regulating' services. Agroforestry as part of the wider agro-ecology concept, positively contributes to ecosystem services and biodiversity[17], and assisted natural regeneration with tree planting accelerates forest restoration[29].
- Degradation of significant ES does not directly lead to beneficiaries' willingness to provide environmental funds that cover incentives for restoring ES, depending on the (perceived) driver of degradation[54] When ES are intangible, ES flows are often considered normal, natural processes. In such cases, ES are often deemed to be free until they have disappeared from the landscape.
- Significant threats to degradation, leading to loss of ES, might trigger an issue-attention-cycle[55] that, when conducted systematically, is able to strongly influence public attitudes and behaviour concerning co-investment and payment for ecosystem services.

Critical uncertainties to be resolved:

- Comprehensive but critical involvement of stakeholders within assessment studies is a major quality characteristic of ES studies that is not easily achieved, balancing the need for global comparability of results with context specificity of 'human benefits derived from well-functioning (agro-) ecosystems as the ES definition suggests.
- The logical connections between various ES indicators that relate to water (whether as provisioning, regulating or cultural service) need to be further strengthened in current approaches that treat these as separate issues; the new 'flow persistence' metric[56,57] that helps in relating flooding risks to upstream infiltration can be an example.

E3: A threshold spatial and temporal scale determines if land use changes generate realistic and measurable outcome, and how well a land use status is buffered against minor changes in the future.

What we know well enough to act on:

- Many ecosystem services are linked with buffer and filter functions in the agro-ecosystem[58]. Buffers reduce variability from what it would be if external forces are directly translated to internal system components, while filters separate components from a carrier flow. Many ES are derived from flows or movement in the landscape (or interception of undesirable transport) or water, soil particles and nutrients, animals, or fire.
- Filters typically have limits in how much they can absorb before there is a break-through, leading to non-linear responses and risks in temporal scaling of, for example 'sediment delivery ratio's', if research does not recognize the underlying pattern[59].
- The choice of scale tends to depend mainly on the data types and forms available. Primary ES quantification data at finer scales provides contextual insights about the ecological, economic, and social values of ES to a particular community, household, or system in a manner informative to effective policy choices. However, wider scale quantification, such as regional levels, tend to utilise secondary data, which is relatively easy to access and less costly.
- There is a growing use of models in ES trade-offs. Five common approaches or model types that have the capacity to integrate various forms of knowledge (i.e., participation and engagement) include system dynamics (e.g., FALLOW model), Bayesian networks (e.g., ARIES; www.ariesonline.org), agent-based models (e.g., MIMES[60,61]; LUDAS[45,62]; LUCES[63]), coupled-component models (e.g., InVEST[64,65]) and expert systems such as the Toolkit for Ecosystem Services Site-based Assessment (TESSA)[66].
- A quantitative review of recent ES literature showed a diversity of approaches[2,4] and a need to select methods for specific purposes[67].

Critical uncertainties to be resolved:

- Scaling ES measurements geographically and across actors' interests remains a daunting task in ES quantification. ES quantities must be standardized to harmonize the different measurement units from various ecosystems and to scale up the values. ES preferences also differ between stakeholders at different institutional scales.
- Local and external stakeholders exhibit differing perceptions regarding the ways that landscapes should be managed. These perceptions typically align with the stakeholders' specific interests.
- There may be a need for reconstructing the underlying logic and 'knowledge chain' from process-level understanding, via spatial manifestations to net human benefits across scales and human decision-making[68].
- A survey of ES mapping studies revealed that most published ES quantification relates to regional scales with little focus on local scales and thresholds or non-linearities in the underlying scaling relations.

38.4 Reflections on the Economic propositions

C1: An ES-friendly production system can, through generic co-investment, expect to achieve 80 percent of production potential; beyond that, there is likely to be a stronger trade-off that can be influenced by economic incentives.

What we know well enough to act on:

- ES quantification is driven by economic rewards that do not fully reflect the full ecological and social value of ecosystems. Specifically, the ecological functions that regenerate ecosystem services are not fully captured in the existing quantification methods and subsequent valuations
- The direct payment for carbon is small and seen as a bonus rather than as determinant of profitability[7].
- Providing payment as an incentive for upfront investment for initial participation and change practices is more effective than providing compensation for the total forgone opportunity cost. Thus, it is essential for PES participants to gain additional benefits from other sustainability aspects coming from the schemes[7,8]
- Restoration efforts must strike a balance between the public good (e.g. CO_2 sequestration and ecosystem restoration) and short-term individual economic benefits (livelihood improvement) when tree products cannot yet be harvested[9].
- To maximize efficiency, payments would have to equal the marginal benefits from service providers as 'output-based payment'. Due to the challenges in measuring marginal benefits, most payment schemes in practice adopt 'input-based payments' which are based on the costs of ecosystem service provision rather than the values of ES ecosystem services (e.g., paying for inputs such as the number of trees planted or working hours spent for clearing exotic species).
- When their proximity to wildlife, particularly elephants, generates income, villagers may come to view elephants as a valuable resource, not as a pest. Such a change in attitude would be another external benefit leading to a future reduction in human-elephant conflict[10].
- Land managers (including landowners and users) make their land-use decisions based on the anticipated benefits and the evidence available to them concerning the risks and uncertainties associated with the practices. Anticipated benefits are often associated with demand for products for either subsistence or commercial purposes[11]

Critical uncertainties to be resolved:

- Some argue that payment should consist of the total economic value (TEV) of ecosystem service flows. However, an efficiency argument suggests that this may use scarce public funding on something that might have happened anyway.
- The 80% of yield potential that can be obtained without unduly burdening ES serves as a starting point for local refinement but has a wide confidence interval that remains to be tested and challenged with context-specific data.
- As the value of ecosystem resources is inherently difficult to measure, the PES payment should be calculated based on the villagers' opportunity cost, rather than estimate the monetary value of the benefits. As this approach raises the possibility that villagers will be compensated at a rate less than the TEV, such an approach raises questions regarding the relationship between efficiency and fairness.

C2: Decisions for shifting towards ES-friendly production systems are only partially driven by financial considerations and prices of goods and services.

What we know well enough to act on:

- The valuation of ecosystem services is highly context-specific and has to be guided by the perspectives and requirements of beneficiaries.
- Quantification and valuation of ES is a crucial step in deciding remedial actions for emerging environmental problems such as climate change. Quantification and valuation of ES informs the rights to use and invest in natural capital based on value to various beneficiaries, including governments, multilateral markets, and farmers.
- The utility of economic valuation is limited when applied to ecological functions and their interactions in agroforestry such as pollination, disease and pest control, resilience, species diversity, and habitat.
- The social value of the ES, such as livelihood dependence and cultural services, are often not accounted for in economic valuation. However, social values are vital in defining ecological quantities for payments.
- Quantification of value implies assigning numbers to a particular ES. However, specific methods for valuation exclude the quantification step. For provisioning services and C-stock change a simple multiplication of total area and value per area unit may work, but regulating and cultural services generally have more complex scaling rules where the value per unit area depends on the area involved
- A 'bundle of incentives including forest land titles, financial support, and technical support for agroforestry development will be sufficient to change local farmers' attitudes positively, and thus behaviour, toward forest protection and sustainable agriculture. In turn, this will promote enhanced landscape carbon stock (and associated environmental services) as well as improved local livelihoods in the long run.
- As long as interventions respect local institutions, motivation, and aspirations specific to gender and youth, interventions that have knowledge, rights or market access as starting point can trigger enhanced environmental stewardship (Fig. 38.2), with local ES issues (esp. water related ones) more likely to be effective than global teleconnections around climate and biodiversity.

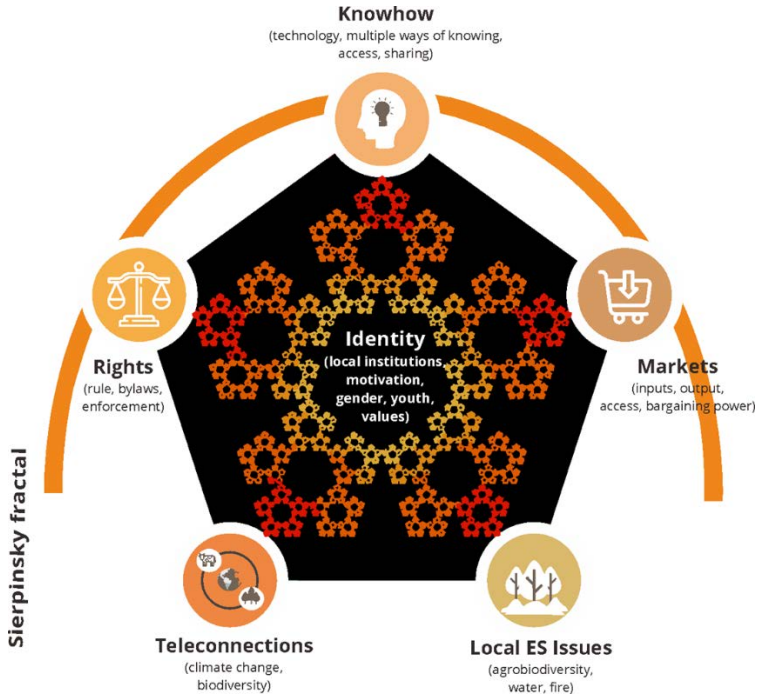

Figure 38.2 Key relationships between local identity and its external determinants of options for livelihoods and change, as a playing field in which PES (or coinvestment) interacts with many other forces

Critical uncertainties to be resolved:

- The biggest challenge for PES pilot programs may be how to ensure effective investment in ES. Investment in ES will be easier where there are direct users of ESs and if those users recognize the link between the actions undertaken by the service providers and incremental tangible benefits as in the case of upstream service providers and downstream service buyers of watershed protection. Without such clarity, it will be challenging to convince buyers/investors of the expected benefits of the reasons to buy or invest in the services.
- Many private sector actors are unwilling to pay for recurrent ecosystem services because they believe this to be the responsibility of the public sector, or they foresee no tangible benefits for their organization[10].
- Buyers' willingness to pay (WTP) and the price for which providers are willing to accept contracts (WTA) indicates the current market value per unit of ES. However, this may be a poor estimate of the real value to humanity, given the many market failures involved.
- The extent to which economic value accounts for the full range of ES values (ecological, cultural, and social) remains widely contested. The relevant ecological information that markets gather and apply tends to be contingent and particularly marginal. The focus has mainly been on the end product (e.g., the ultimate ecological service) with little attention to the intrinsic ecological functions generating these services.

38.5 Reflections on the Social proposition

S1: Voluntary and mutually agreed PES criteria and indicators are essential in ensuring performance.

What we know well enough to act on:

- Participatory ('negotiation support') approaches have contributed to local landscape management, with or without explicitly PES mechanism. Participatory methods are increasingly likely to be used to improve the reliability of data and to ensure the relevance of outcomes to decision-makers. These methods are mainly applicable for quantifying provisioning and cultural (social) ES such as local-livelihood-based forest uses, quantities of traditional medicines, and local social networks around ES. Participatory quantification is equated to group deliberation
- Indigenous structures are often championed for their role in sustainable natural resource management. However, indigenous hierarchical social structures do not necessarily fit performance-based activities, which require an open and democratic way of working together.
- Members of cooperatives must be able to participate equally and fairly in performance-based activities. Horizontal linkages are needed to allow members to discuss any matter that will help to improve the performance of restoration activities and the cooperative.
- The design of PES must have the community's consent before the start and allow adjustments to be made by the local community that fit their needs, aspirations, and preferences. A specific voluntary carbon market scheme[9] showed that it could trigger autonomous development as the community has a strong sense of ownership.
- The example of restoration of groundwater recharge structures in India[34] suggest that lack of visibility of groundwater flows is a hindrance to the local understanding, and management, of this part of the hydrological cycle. Groundwater supply to wells is easily appreciated as 'provisioning service' to the farmers benefitting from groundwater recharge, but its dependence on the wider system needs a more refined understanding. Otherwise, attempts to 'scale up' early successes can easily lead to failure for all.

Critical uncertainties to be resolved:

- Social values such as such as rights, cultural attachments, communal value, spiritual values, indigenous and communal identity, and livelihood sharing/networks are complex and often deeply rooted in traditions and beliefs that are difficult to define. As such, social values have received the least attention in ES quantification. These social and evolutionary values lack price tags that could be captured in the economic framework.
- Participatory methods exploring expert opinion and stakeholder knowledge systems and preferences have, as of yet, received little attention in ES quantification. However, it is increasingly recognized that the valuation of ecosystem services is highly context-specific and has to be guided by the perspectives and requirements of beneficiaries if the ES definition based on 'benefits people derive' is to be taken seriously.
- Coinvestment in Stewardship (CIS) appears to fit smaller-scale transactions better and minimizes the need for strict PES pre-conditions to enhance participation and distribution of benefits (arguments of fairness). Some authors argue that the co-investment paradigm creates a basis of respect and relationship that allows the commodification paradigm to develop by involving various stakeholders through its openness. CIS offers opportunities to include different perspectives in managing the agroforestry-mosaic landscapes for

both economic and environmental objectives that have been often neglected by policymakers and PES-buyers who consider ES-benefits from forests only[6].

S2 Implementing PES can increase poverty among poor segments of society who are disproportionally vulnerable to loss or lack of ES.

What we know well enough to act on:

- Negative livelihood and conservation effects of current PES include, in some cases, increasing income inequality and conflicts between participating and non-participating landowners, displacement of settlements and livestock to areas outside the PES-targeted zones, and increased land-use and human-wildlife conflicts[9].
- Equity outcomes need to be evaluated throughout the lifecycle of a PES project. PES projects need to adopt specific procedures to enable equity.

Critical uncertainties to be resolved:

- Many PES forms reduce income inequality among the participants but do widen the income disparity between participating and non-participating households. Furthermore, due to the common exclusion of women from land ownership and the non-transparent nature of land subdivision, land-based PES projects have excluded the majority of landless poor and women from cash payments[9].
- The nature and type of institutional arrangements are key to ensuring the effectiveness of PES programs. Multi-stakeholder approaches, collective action, and transparency make programs more acceptable to all actors.

S3: When envisaged beyond an ES commodification mechanism, PES has the potential for enhancing social capitals among community members, internally and externally.

What we know well enough to act on:

- Some ES require (nearly) complete compliance with ES-friendly land uses, for example water quality in a lake with respect to all inflows, and depend on strong collective action, usually
- underpinned by multi-stakeholder governance involving representatives of landowners, government, private sector, and intermediary organisations[9].
- Other ES are approximately proportional to the area under ES-friendly land use (*e.g.*, carbon stocks) and can be addressed either at individual or collectively level forms of PES depending on local preference[69]
- Existing local institutions may build on and reinforce inequality in resource access[70]; before they can support current PES agenda's new structures within the local institutional and cultural framework may have to emerge to support current needs[29].
- If presented well time-bound financial incentives can inducing lasting changes in behaviour where they convey social approval of conservation-oriented behaviour[71]
- The effectiveness of PES in resource-conflict resolution can be enhanced by broadening the conceptualization and application of the schemes from technical market-based approaches to those incorporating key principles including equity, representation and participation[23].

Critical uncertainties to be resolved:

- Institutional reform for PES has so far been approached in a 'trial and error' mode of local learning, as there is little generic guidance to rely on,
- Studies that compared individual and collective forms of PES have recorded strong preferences either way; analysis of cultural, historical and economic backgrounds of such preferences is incomplete[72,73,74].
- Access to the required new knowledge and skills to benefit from partnerships in ecosystem management projects relies on case-by-case links to research institutions that can enhance the accessibility of existing data, methods, and capacity.

S4: PES requires boundary work, involving partners willing to go beyond their institutional roles and safe space, through investment, capacity building, and facilitating engagements.

What we know well enough to act on:

- The literature identifies three main roles for intermediaries: 1) negotiation and contract; 2) serve as a clearinghouse, and 3) monitor to ensure compliance. A process of negotiation and contact is needed between service providers and service buyers[10].
- Local resource user institutions and intermediary boundary organizations are critical to active community involvement in PES schemes[4,19,24].
- PES intermediaries not only facilitate transactions but also link PES to broader development agenda. PES intermediary must accommodate various interests of actors in the landscape. Non-government actors are more flexible to act as intermediaries[35].

Critical uncertainties to be resolved:

- Within the carbon market there is a discourse on 'carbon cowboys' and profiteers cheating on local communities[75], but most of the literature so far assumes that PES brokers are 'honest': under what conditions is such assumption a risk for local communities?
- What can be done to strengthen local communities to respond to entrepreneurs (Box 38.1)?

Box 38.1 Are forest-managing communities prepared for 'Buaya timbul' entrepreneurs?

They had come from higher up the mountain, where the landscape they farmed became a National Park. They had been given land by the customary ('adat') leaders to establish a village with spacious home-plots and wide streets; each family had a mixed agroforest garden, with the local nutmeg, clove, durian, Canarium and timber trees, coconut palms, rattan, bamboo and other forest products. Beyond these plots there was still forest in which they could expand in future. Because some had stayed behind in the mountain, they were regarded as a 'dusun' or subvillage. They learned that the land was not only controlled by the customary laws but was also considered to be state forest land. When neighbouring forest was given out for logging concessions or conversion to oil palm, they felt insecure about their own status. Luckily, forest authorities were keen to establish a first example in the province of 'community-based forest management', as part of a national policy commitment. They could not apply for the 'village forest' scheme as they were a Dusun, however. Two farmer groups were formed that were each given a Community Forest

Management (HKM) contract to manage part of the landscape adjacent to the village. Some of this was already used for agroforestry gardens, but another part was still forest where all could cater for their needs. It was, however, only accessible by foot or, more recently, motorbike trails. The process of getting the HKM agreements had only taken two years, but now, two years later, a big problem had emerged.

They had not been able to get a forest management plan (five-yearly, with annual operational plans) approved, but the forestry extension agent had suggested that they engage with a forest plantation company (let's call them 'Elefantino'), who proposed to develop a 120 ha plantation of the fast growing Sengon trees that can be harvested after 5 or 6 years. As 'land owners' they would get a 30% share in the final yield while direct labour costs for land clearing and planting would be paid for. One of the groups didn't trust the representatives of Elefantino, but the other went along. No formal contract was signed, but there would be a pilot 4 ha to get started. Two problems emerged: while group B had agreed, the pilot was actually developed on the land managed by group A. Also, the area cleared was on the edge of the HKM area; they understood that the company planned to develop a 4 km road (over whose land?) to be able to harvest. The farmers who engaged with the pilot received less than half of the money they had been promised, although the work had been hard, clearing forest with still a good number of trees. Because the forestry extension agent had not helped them to deal with the company, the farmer groups complained and the agent was transferred to another post. The new extension agent helped them focus on activities that could bring the two farmer groups together. They found a YouTube video on the techniques for growing Vanilla and that's what they now all tried. The wounds of their encounter with Elefantino and the rift between the two groups in the village, however, were still open.

Then, some visitors came and after hearing the story, remembered the old song of 'Buaya timbul', describing a sneaky crocodile man showing up in the moonlight, and warning not to trust the sweet words spoken. They became curious about this and started to search YouTube for a video on how to deal with 'Buaya Timbul' entrepreneurs. This is what they found … . Please help to complete the story, as there appears to be a gap in accessible material on such a topic.

38.6 Reflections on multi-scale (polycentric) governance of socio-ecological systems

P1: Leveraging multiple policy instruments, with a mutual 'do-not-harm' at the interface, is a necessary pathway for eliciting ES enhancement and delivery.

What we know well enough to act on:

- The 'policy mix' may include antagonistic and synergistic effects within each of the three basic components of public policy (regulations, incentives and motivation) that influence how net effects are perceived and acted upon (Figure 38.3)
- The way PES programs are implemented and understood can differ substantially from how they are designed and analysed[76,77]
- The nature and type of institutional arrangements are key to ensuring the effectiveness of PES programs. Multi-stakeholder approaches, collective action, and transparency make programs more acceptable to all actors[9].

- Conditional tenure agreements in watershed protection forest can reduce conflict and provide real incentives[14].
- Although current policy and the legal environment are conducive for wildlife PES, policy harmonization is required because of challenges brought about by multiple and sometimes conflicting sectoral statutes and policies on wildlife, land, and tourism.
- With limited and almost non-existent basic information and data on biophysical mapping and ES, including lack of capacity of the government in the process of developing and implementing PES, external funding and investment are still essential.
- It is cumbersome to standardize contextual ES information across various regions, especially where certain ES that are valuable in specific contexts are not necessarily cherished in other contexts.

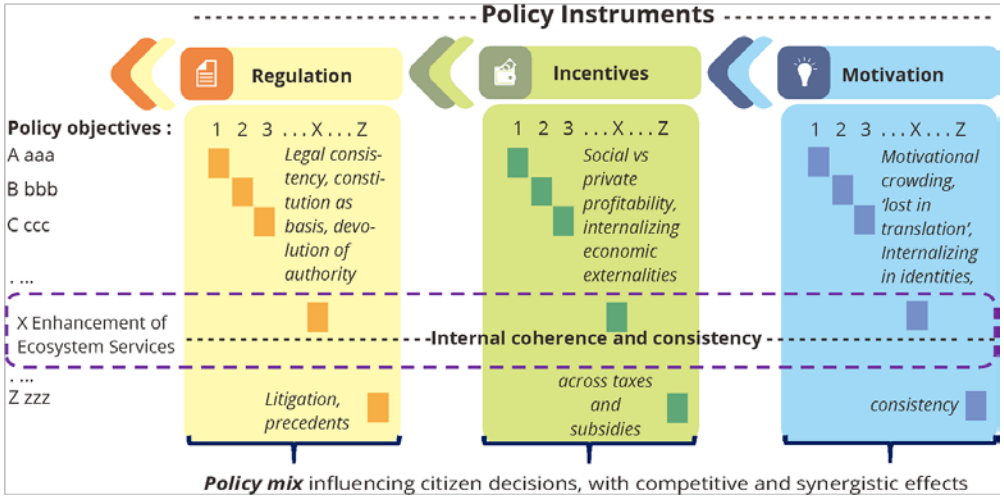

Figure 38.3 Interactions within and across the three basic policy instruments (regulation, incentives, motivation, also known as sticks, carrots and sermons) across multiple public policy objectives, with the 'policy mix' ultimately influencing citizen decisions, depending on its consistency, local implementation and reinterpretation

Critical uncertainties to be resolved:

- Private sector (user-financed) schemes can operate effectively without external financial support, provided markets for tourism are not disrupted. However, the risk to tourism market disruption does exist and may occur as a result of the volatility of the tourism industry and its high susceptibility to political, economic, and environmental shocks[9].
- Publicly funded PES schemes require continued government funding and support from intermediary organisations to ensure long-term project viability[9].
- Even though they are recognized, there is no market value assigned to social services (e.g., communal livelihoods, rights, spiritual values). Thus, there is often an absence of deliberate efforts to quantify these services because their economic values have gained little institutional support.
- Compliance with conservation laws would also be enhanced if governments focused more on creating positive incentives to comply rather than simply imposing penalties for non-compliance. Governments can strengthen PES schemes by improving legal tools to create sufficient demand for conservation services[10].

- Providing some form of incentive for buyers of ecosystem services can enhance the viability of the programs. These incentives could come in the form of tax credits or deductions for contributions and national campaigns to support the programs. A national campaign could advertise the program and suggest modest payments. Aggregation of modest payments could then add up to significant amounts that could go into a fund for multiple PES programs.

P2 Enabling global framework and public policy are necessary to support sustainability and potential upscale of PES.

What we know well enough to act on:

- The shaping of global communities' attitudes towards reducing impacts of climate change is likely to remain sufficiently focused upon promoting co-investment and payment for ecosystem services as parts of the environmental and conservation agendas.
- National policies need to be developed, and co-investment schemes have to be initiated together with the private sector. Government policies with incentives for farmers to render ecosystem services can be part of a national strategy to implement the sustainable development goals (SDGs)[7].
- Evidence reveals that ES that are easily scaled up to a global level (e.g., carbon stocks and biodiversity) often draw attention in developing quantification methods. This is driven by internationally legitimized PES schemes that seek to harmonize ES quantification nationally and globally. Highly context-specific ES, such as cultural services or social services, are reportedly difficult to upscale.
- Where global comparability supports efficiency concepts of primarily global, external stakeholders, local fine-tuning may be essential for local stakeholders and their perceptions of fairness.
- Permanence is a concern in PES implementation because most PES schemes are contractually limited in time. Service provision would end when the payments are terminated[10].

Critical uncertainties to be resolved:

- Sustainability goals of PES, which combine social and environmental objectives in addition to its performance-based characteristic, imply the high complexity of its on-the-ground implementations. Concerns on the scalability of co-investment for ecosystem services has been strong as practitioners and decision-makers have realized the financial and non-financial cost for achieving significant progress on PES.
- National policies and regulations on ES and PES have been developed in some countries. Challenges cover translating contextual and specific on-the-ground experiences into generally and uniformly written-down national guidelines and regulations.
- The challenge of scaling ES across global, national, and local levels is that the process does not transform linearly. Various global agreements on ES quantification (e.g., Aichi agreements), land restoration, and carbon-emission reduction under the UNFCCC are often broad and require standardized values across regions. While national and global ES quantification needs include green accounting targets for human welfare especially at the local level, this often remains a complex task
- Analysis[78] of how early, comprehensive perspectives of 'political economy' thinkers on 'the value of everything' came to be narrowed to a financial (monetary) currency that underrates public investment and favours private interests, supports a critical perspective

on the framing of PES[79]. Emphasis on the 'flows' of ES rather than the underpinning stocks (capital) remains a fundamental challenge in communicating urgency of changes in developmental pathways[80].

- The recent political trend in important parts of the world towards withdrawal from global planetary responsibility implies that 'fear' has become a multipronged arena[81]: fear for the planet, fear for those in power who don't want to be criticized, fear to speak one's mind and organize, fear to step out of social and political structures of the past. An effective way of countering this trend is urgent.

38.7 Discussion and Future Steps

More than two decades of theoretical debates and empirical experiences on payment for ecosystem services have resulted some important and critical points of progress in many perspectives. However, there is still work to be done. Despite growing awareness of the importance of moving beyond the traditional emphasis on economic approaches ES valuation, social and cultural ES values remain difficult to define and measure. As a result, these non-economic ES remain undervalued in PES design. It may well be that a shift in terminology (for example from PES to Coinvestment) is needed to convey the inclusive nature (economic, social, ecological) of what these instruments try to achieve. Two aspects of current debate have bearings to the ongoing PES / coinvestment debate[82]: 1) the reframing of ES as Nature's Contributions to People (who would 'pay' for that? Who wants to coinvest in it?), and 2) the way 'instrumental' values are understood to be part of a broader set of 'relational' values.

Nature's Contributions to People and/or Ecosystem Services

In the past years there has been a fundamental challenge to the way 'Ecosystem Services' are conceptualized. Within the Intergovernmental Science-Policy Panel on Biodiversity and Ecosystem Services (IPBES)[83], a new way of describing the relationship between 'Humans' and 'Nature' emerged[84], that considers Nature's Contributions to People (NCP) as a more inclusive term[85,86,87]. This assertion as such has been countered by authors who played a big role in popularizing the ES concept[88]. The juxtaposition of an ES and NCP-based framing has led to considerable debate in the science-policy communities[89], discussing a paradox in participation and inclusiveness between on the one hand IPBES' demand for diversity and on the other hand its aim of achieving consensus[90].

To be effective as a 'Boundary object' a conceptual framework needs to reconcile three core characteristics[91]: interpretive flexibility, material and organisational structure, and the recognition of dissention. Meeting information needs and the work requirements of all individuals, groups and communities puts limits to interpretive flexibility, but recognition of dissention (analysis of the functional diversity of perspectives) is key to progress towards clarity in local context. The discussions within IPBES about acceptable plurality of frameworks has an interesting parallel with the discussions after the Millennium Ecosystem Assessment when alternative ways of representation were forced into the single ES mould[92]. A follow-up study[93] found that six 'novelty' claims for the NCP framing relative to existing ES interpretation and practice were overstatements, but that there were five aspects in which the NCP framing adds value: embracing diverse worldviews, context-specific perspectives, relational values, fuzzy and fluid reporting categories and groups, inclusive language and framing.

In practice, the primary change between existing ES classifications and the NCP terminology is that the categories of 'provisioning', 'regulating' and 'cultural' services are now described as three partially overlapping categories (Material, Regulating, Non-material NCP's). Material and Regulating NCP's (1-14,18) are the basis of '***Instrumental value***' concepts, the Non-material NCP's (15-18) as '***relational values***'[94]

Whether or not 'fuzzy and fluid reporting categories and groups' is an advantage may depend on the perspective. Those working on national accounting need to minimize ambiguity and have enough challenges with the existing reporting categories[95]. Where 'the devil is in the detail', it may of interest to compare (Table 38.1) the list of 18 NCP's with the list of 25 entities that emerged in the RUPES work in 2005 and was described in Chapter 2

Table 38.1 Three categories (Regulating: R; Material: M; Non-Material: Non-M;) of Nature's Contributions to People (NCP) as listed by Diaz et al. 2018 (graphically, here represented as fractions) in relation to the RUPES typology presented in Chapter 2[2]

Nature's Contributions to People[54]	R	M	Non-M	RUPES list[2,96]
Habitat creation and maintenance	0.9		0.1	B1 (Core habitat) B2 (Mosaic habitat) B5 (*ex situ* habitat)
Pollination and dispersal of seeds and other propagules	0.9		0.1	B4 (Restoration propagules)
Regulation of air quality	0.9		0.1	W7 (Microclimate)
Regulation of climate	0.9		0.1	G1 (Forest C stock) G2 (Non-forest C stock) G3 (Restocking) G5 (Nitrous oxide)
Regulation of ocean acidification	0.9		0.1	--
Regulation of freshwater quantity, location and timing	0.9		0.1	W1 (Transmission), W2 (Flow buffering), W3 (Dry season flows)
Regulation of freshwater and coastal water quality	0.9		0.1	W4 (Water quality)
Formation, protection and decontamination of soils and sediments	0.9		0.1	W5 (Landslides) W6 (Erosion)
Regulation of hazards and extreme events	0.9		0.1	W8 (Coastal hazards/
Regulation of organisms detrimental to humans	0.9		0.1	B7 (Pest control)
Energy		0.7	0.3	P1 (Renewables) P2 (Non-renewables)
Food and feed		0.7	0.3	P1 (Renewables) P4 (Pollination
Materials and assistance		0.7	0.3	P1 (Renewables)
Medicinal, biochemical and genetic resources		0.7	0.3	P1 (Renewables)
Learning and inspiration		0.2	0.8	B6 (ecotourism)
Physical and psychological experiences		0.2	0.8	B6 (ecotourism)
Supporting identities		0.2	0.8	--
Maintenance of options	0.33	0.33	0.33	--
Not-explicitly mentioned				B3 (ecology. connectivity) W9 (ecological. rainfall infrastructure) P3 (Nutrient & water supply to crops)

The NCP list may not sufficiently cover B3 (ecological connectivity of habitats), W9 (ecological rainfall infrastructure) and P3 (supporting water and nutrient supply to crops). Three of the NCP's were not mentioned in the RUPES list:

- NCP5 (Ocean acidification, e.g. as cause of coral reef demise; avoiding acidification is linked to G1, G2 and G3)
- NCP17 (Supporting identities) – Relevant as part of any landscape/livescape approach and more specifically within the 2007 UN Declaration on the Rights of Indigenous

Peoples, but with limits to the levels of resource extraction that are claimed to be historical rights but may exceed what is sustainable from a biological perspective.

- NCP18 (Maintenance of options) -- When a time-frame of evaluation shifts to 20-50 years 'option values', that are not yet fully explored or identified may well be the most important aspect of biodiversity[97], beyond persistence of the status quo, but it is inherently difficult to assess, other than trying to maximize diversity.

The latter two are certainly interesting aspects of Human – Nature interactions, but there may be challenges to their operationalization as basis for PES-type arrangements. The Malaysian minister of primary industries describes the oil palm as Nature's gift to Humankind, and key to the economic options and identity of the inhabitants of his country. Crops derived from nature are seen as a historical NCP, and the Minister expresses a relational value of gratitude (to Nature elsewhere) but does not prevent the negative effects of growing palms on domestic nature that others worry about. When told this story environmentalists elsewhere reject this NCP claim as 'political' – but 'supporting identities' has to be based on self-identification if we want to avoid strongly normative and discriminatory classification systems. A further challenge to an NCP language comes when the categorical terms of NCPs may obfuscate rather than clarify debates, where greater precision is needed to sort out debates and conflicts. Lowland farmers on Java using excessive amounts of groundwater for their rice production and reducing water availability for urban users, happily describe their groundwater supply as 'gift of nature', claiming a historical right to use whatever they want (a position that indeed existing law appears to support).

It is not clear what the NCP perspective on PES is, unless one accepts ES and NCP to be largely synonyms, as some have stated to be the case. PES need clarity (not fuzziness) on what services are the basis of 'results-based' incentive mechanisms, how they relate to a cascade from ecological structure and function[98], on what human activity can counter existing threats and what constitutes 'stewardship'. Clarity is specifically needed where the 'identity of consumers' is linked to the 'identity of producers' in forms of eco-certification of globally traded commodities[99].

Instrumental as specific form of relational values

There probably is merit in a distinction between 'instrumental' and 'relational' values of nature to people, as the types of criteria and indicators used will differ[100]. However, instrumental values may be best understood to be a sub-set of 'relational' ones, rather than as a different category. The 'ecosystem service' language refers to 'servants', the personalized (Mother) Nature providing 'Gifts' that can be appropriated without indications of consent that of a (spoilt?) child[101]. The metaphors used to describe the Nature-Human relationship are all based on Human-Human interactions. A recent study[102] of multiple conceptualizations of nature in more than 60 languages as key to inclusivity and legitimacy in global environmental governance identified three clusters: inclusive conceptualizations where humans are viewed as an integral component of nature; non-inclusive conceptualizations where humans are separate from nature; and deifying conceptualizations where nature is understood and experienced within a spiritual dimension. These three clusters match main groups in a wider listing of terms (Figure 38.3).

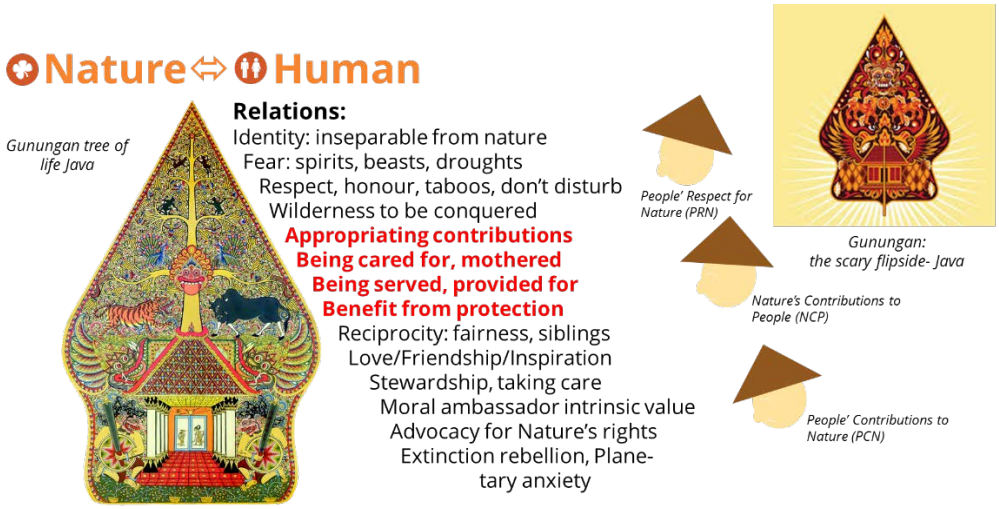

Figure 38.4 Tentative listing of the multiple ways in which Nature ⇔ Human relationships can be perceived and described, with the ES and NCP framing targeting an intermediate group of terms

As indicated in Figure 38.4 the Indonesian wayang tradition conveys visually in its 'gunungan' background to all stories that there is a strong unity between a tree of life, spirits, key animals of the wild and domesticated part of nature and the place where people live. The flipside, occasionally shown for dramatic effect shows fire and fierce spirits threatening this house. As such it illustrates a wide range of 'relational values' between people and nature. Throughout human history perspectives on spirits, deities or a single Almighty or personified Nature have been described in metaphors of words that also describe Human-Human relations in terms of family (ancestors, (grand)parents, siblings, offspring; partners, in-laws), neighbours, friends or adversaries, business partners and competitors, armed attackers and defenders, educators or servants. A subset of these relations can be interpreted as 'instrumental', directly supporting human goals and objectives – but even those imply that there will have to be a two-way (rather than unidirectional) relationship to maintain or support what is relevant to people, because it cannot be taken for granted and is, as part of the same spaceship Earth, under threat.

Taking this idea a step further (Figure 38.5) we may relate the 'instrumental values' as 'nature-based solutions' to the set of 17 Sustainable Development Goals (SDGs). With public funding, both within and between countries and including public-private partnerships increasingly tied to SDG achievement, it may be more effective to communicate 'nature-based solutions' to recognized human needs, than to introduce a novel (and probably not comprehensive) terminology as the NCP list tried to do.

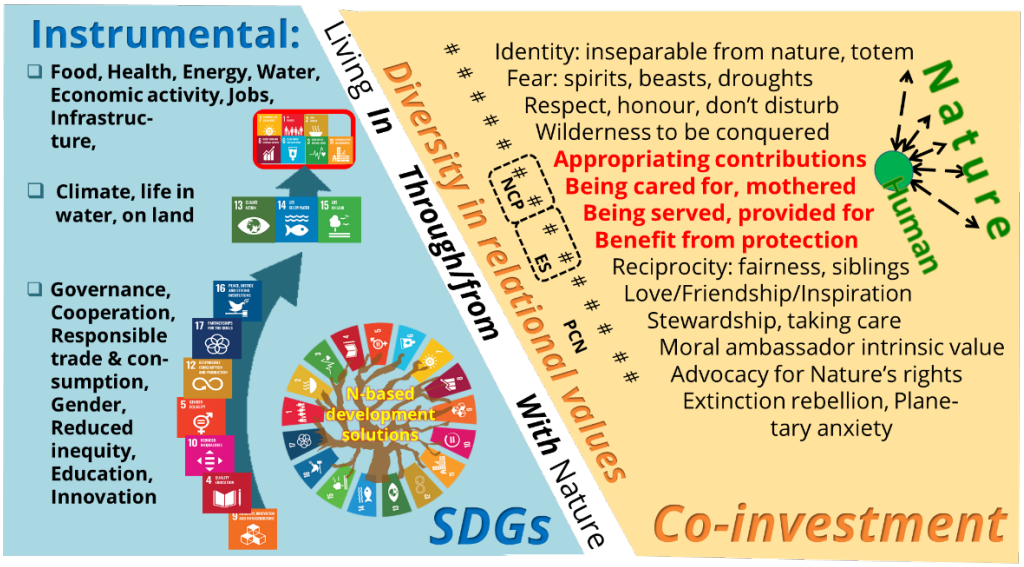

Figure 38.5 Proposed reframing of 'relational' and 'instrumental' values, where the latter are linked to SDGs (and its agreed monitoring standards) and there is substantial interpretive flexibility in the 'relational' descriptors used among and between any specified group of stakeholders

In this perspective our coinvestment terminology may obtain further meaning – as it can refer to the diversity in ways 'relational values' are perceived, communicated and part of individual, group-based, national or international decision making, without inferring a single (e.g. the buyer/seller terminology of markets, the mother-child relationship of NCP's or servants) paradigm. In as much as the issues covered in Sustainable Development Goals matter to all countries that signed up to this agenda 2015-2030, nature-based solutions are worthy of coinvestment. The specific way depends on local context and the way it is called on legal and cultural context. We need to focus on the 'territory' where all this plays out in reality, rather than on the 'map' of how it is represented.

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