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Research Paper

Integrated landscape initiatives for agriculture, livelihoods and ecosystem conservation: An assessment of experiences from South and Southeast Asia

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HIGHLIGHTS

- Strengthening institutional and stakeholder capacity is key to ILI success.
- Early stakeholder involvement drove higher outcomes across initiatives.
- Stakeholders are often absent in planning phases of ILI development.
- Implementation costs, power dynamics and long timescales are greatest challenges.

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ABSTRACT

Integrated landscape approaches offer a means of integrating policy and practice to ensure equitable and sustainable use of land while strengthening measures to improve environmental conservation, production, and well-being outcomes. While traditionally practiced and increasingly adopted in many parts of Asia, there is no systematic assessment to date of the characteristics, outcomes, and limitations of integrated landscape initiatives (ILIs) in the region. We provide a review of 166 ILIs in South and Southeast Asia to complement previous assessments in Africa, Latin America and the Caribbean. We surveyed ILIs from 16 countries to characterize initiative contexts, motivations and objectives, stakeholders and participants, investments and outcomes, and major successes and shortcomings. Results demonstrated that ILIs are used to address multiple challenges across the region. Ecosystem conservation is the strongest driver behind ILI development and design, however, initiatives invested heavily across four identified domains: agriculture, conservation, livelihoods, and institutional coordination and planning. Investment in capacity building activities to improve agricultural practices, natural resource management and community participation, was strong. We found clear divisions in how stakeholders participate in ILIs: donors are more than twice as likely to design rather than implement ILIs, while other groups, such as women's associations, were frequently limited to implementation. Engagement of the private sector is comparatively low. Other challenges identified include concerns about the long-term sustainability of ILIs, lack of government and financial support, and agendas sidelined by powerful stakeholders. While integrated approaches are necessary to address landscape multifunctionality, many initiatives struggled to transition from planning to implementation.

1. Introduction

The nexus between agricultural production, environmental conservation and livelihood improvement continues to gain attention from the research, development and conservation communities, with increasing interest from the private sector (Andonova, 2010; MacDonald, 2010). Global dialogue on the post-millennium Sus-

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tainable Development Goals (SDGs) highlights a growing need for systems-based approaches that enhance synergies and reconcile trade-offs between multiple objectives. In this context, integrated landscape management has emerged as one of the more promising approaches to identify, negotiate and manage landscapes in a multi-stakeholder context, as it provides a framework to systematically address and negotiate conflicts between resource use and conservation, while considering multiple objectives, including social and environmental ones (Sayer et al., 2013).

Practiced and studied under many names, integrated landscape management encompasses a wide range of terms (Scherr, Shames, & Friedman, 2013) including "ecoagriculture" (Scherr, Buck, Willemen, & Milder, 2014), "satoyama" (Beílair et al., 2010), "biocultural landscapes" (Hong, 2014) and "multifunctional landscapes" (O'Farrell & Anderson, 2010). While landscape-scale initiatives may be focused on a singular goal around a defined boundary—be it social, ecological or political—integrated landscape initiatives (ILIs) are characterized by their intention to achieve multiple functional goals through collective action and integrated governance.

Integrated landscape approaches have a long history of use in many parts of Asia. They are often based on long histories of human interaction with the environment and are the foundation of societal arrangements and even psychologies (Talhelm et al., 2014). Possibly amongst the most well-known integrated landscape systems are the diverse forms of rice terracing, agroforestry and irrigation systems: the Ifugao rice terraces of the Philippines (Nozawa, Malingan, Plantilla, & Ong, 2008), the Hani rice terraces of Yunnan province in China (Jiao et al., 2011) and the *simpukng* forest gardens of the Dayak in Indonesia (Mulyoutami, Rismawan, & Joshi, 2009). Each of these represent systems that apply a mixture of private and communal governance to manage agricultural ecosystems for both natural resource conservation and livelihood benefits. For example, Bali's "subak" or water temple system supports shared water management in rice terrace landscapes. Each "subak" convenes farmers who share a common water supply, and collaborate to manage irrigation, water distribution, timing and location of crop establishment, regulations on permitted pest control interventions, as well as responsibilities regarding cultural activities (Kim & Hong, 2009).

Other commonly found forms of integrated landscape management in South and Southeast Asia include community-based natural resource management (CBNRM) initiatives, which emerged as early as the 1970s in the region (Menon et al., 2007). These initiatives frequently draw upon historical societal norms among communities dependent on natural systems for their livelihoods and cultural practices. Examples include community forestry or joint forest management (Bhattacharya, Pradhan, & Yadav, 2010; Milne & Mahanty, 2015), coastal management and community-based fisheries through customary law (Aswani et al., 2012; Cinner & Aswani, 2007), integrated watershed management (Wani, Chander, & Sahrawat, 2014), and community protected areas such as India's sacred groves (Bhagwat & Rutte, 2006).

Transboundary initiatives that serve to facilitate dialogue and action around biodiversity conservation are also common in the region, particularly in and around global biodiversity hotspots (Mittermeier, Turner, Larsen, Brooks, & Gascon, 2011). Many of these initiatives focus on the conservation of endemic species whose habitats overlap with land and natural resources valued for economic development. Other regionally important transboundary initiatives are linked to major watersheds such as the Mekong and the Ganges-Brahmaputra-Meghna river basins. These initiatives are examples of engaging with the private sector (e.g. the structure and function of the Mekong Basin Commission) to ease tensions between hydropower development, livelihood improvement, and biodiversity conservation objectives, while reducing resource degradation and vulnerability to climate change (Rasul, 2014; Sneddon & Fox, 2007).

The high rate of conversion pressure on standing tropical forests for cash crops, has led to many initiatives to mitigate deforestation and its impacts, particularly in the Malay Archipelago. Several of these initiatives are backed by climate mitigation mechanisms such as REDD+ which integrate sustainable forest management with carbon sequestration credits and biodiversity conservation objectives (Mertz et al., 2015). Concerns related to adaptation, have elevated the emphasis on livelihood and ecosystem dimensions in climate change interventions (IPCC, 2014), and have provided incentives for more integrated approaches that mainstream climate change adaptation with social protection and disaster risk reduction (Birkmann & von Teichman, 2010).

Mangrove and coastal wetland systems in South and Southeast Asia are also under conversion pressure from agriculture, urbanization and most importantly, aquaculture (Richards & Friess, 2016); these areas also suffer biodiversity degradation from unsustainable fishing practices. Recent global agreements on balancing conservation efforts with socioeconomic benefits (Edgar et al., 2014) have given rise to mangrove restoration, estuarine protection and marine protected areas (MPAs), particularly in the Coral Triangle countries of Indonesia, Malaysia and the Philippines. While most studies on integrated landscape management focus on purely terrestrial landscapes, the extensive coastline of South and Southeast Asia has resulted in many initiatives that straddle both terrestrial and aquatic systems.

Despite the strong tradition of social organization around production landscapes in South and Southeast Asia, there has been little formal effort to synthesize this approach, its impacts or its ability to reconcile the often divergent approaches of achieving agricultural productivity, biological conservation, and livelihood improvement. The purpose of this study is to complement previously conducted studies in Africa and Latin America and the Caribbean (Estrada-Carmona, Hart, DeClerck, Harvey, & Milder, 2014; Hart et al., 2015; Milder, Hart, Dobie, Minai, & Zaleski, 2014)—which jointly fill this knowledge gap—by providing a systematic characterization of 166 integrated landscape approaches in South and Southeast Asia. This review documents the location and context, motivations and drivers, participants and actors, investments and outcomes, and the most and least successful aspects of integrated landscape approaches in the defined subregions. Our results provide characteristics and recommendations that help improve the ability of integrated landscape initiatives to achieve their objectives.

In this study, we repeated methods previously used for the assessments of integrated landscape initiatives in Africa (Milder et al., 2014) and Latin America and Caribbean (Estrada-Carmona et al., 2014) as part of a global review of ILIs undertaken by the Landscapes for People, Food and Nature Initiative (http://peoplefoodandnature.org/). In order to remain consistent and to permit comparisons across regions, we used the same definition of integrated landscape initiatives (ILIs) that define ILIs as "a project, program, platform, initiative, or set of activities that: (1) explicitly seeks to improve food production, biodiversity or ecosystem conservation, and rural livelihoods; (2) works at a landscape scale and includes deliberate planning, policy, management, or support activities at this scale; (3) involves inter-sectoral coordination or alignment of activities, policies, or investments at the level of ministries, local government entities, farmer and community organizations, NGOs, donors, and/or the private sector; and (4) are highly participatory, supporting adaptive, collaborative management within a social learning framework" (Milder et al., 2014). This definition is specific enough to facilitate analysis, yet broad enough to encompass the diversity of forms that initiatives may take.

From a more technical perspective, the landscapes that these initiatives work in range in size from 10 s to 1000s of square kilometers. No single element is used to define their boundaries. Rather they are based on a combination of biophysical and socio-cultural features, mixed with jurisdictional designation. These boundaries are frequently delineated so that the target region is large enough to contain biophysical, economic, sociocultural and political heterogeneity but small enough to be socially coherent (Minang et al., 2015); or at least perceived by local populations to be so (Torquebiau, 2015). The interactions between multiple scales and actors within a landscape are what make these boundaries appropriate and functional for planning and management purposes.

The seven principal questions that this assessment of ILIs in South and Southeast Asia sought to answer, include: (1) where and in what contexts are initiatives taking place; (2) what are the motivations behind these initiatives; (3) who are the stakeholders designing and implementing these initiatives; (4) what kind of investments are included in initiatives; (5) what outcomes are being reported; (6) what were the most and least successful aspects of each initiative; and (7) which aspects of ILI design, structure and stakeholder participation most strongly predict levels and types of reported outcomes?

2. Methods

2.1. Contacted initiatives

We initially identified ILIs through keyword internet searches in multiple languages, online project and grant databases, and websites of conservation and rural development organizations operating in Asia, filtering through the ILI definition criteria stated above. Additional initiatives were identified through correspondence with experts and staff from organizations working on landscapes issues in the region, as well as a widespread call inviting practitioners to identify ILIs. Finally, we used a snowball methodology, asking ILI respondents to identify additional initiatives they were familiar with in the region. This effort revealed a higher concentration of ILIs with active participation of civil society and donor and government organizations located in South and Southeast Asia. Based on this observation, we focused our review on these two subregions which we grouped as follows: (1) South Asia and the Himalayas, including Tibet, and (2) Southeast Asia and the Greater Mekong, including Southwest China. These two subregions include major watersheds, food-producing areas, and regions of globally-important biodiversity, making them appropriate foci for identifying and analyzing initiatives that seek to integrate agriculture and/or aquaculture, livelihood and conservation goals. Despite the distinct political environment of China, we retained ILIs identified in Tibet, Yunnan and Guangxi provinces due to their prominence as biodiversity hotspots (Mittermeier et al., 2011) and their transboundary linkages to other countries as part of the Greater Mekong and Himalayan regions. In total, we identified 649 candidate ILIs that met the four stated criteria in Bangladesh, Bhutan, Cambodia, China (Southwest China and Tibet only), Laos, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, the Philippines, Sri Lanka, Thailand and Vietnam.

2.2. The survey

Each candidate ILI was invited to complete a survey that addressed our principal research questions. The survey was sent to identified ILI practitioners or leaders who were expected to be deeply familiar with the initiative, its objectives, and components. Those who did not consider themselves sufficiently versed in initiative details were encouraged to share the request with a more suitable respondent.

The survey was made available through the online survey tool Survey Monkey (see Supplementary Materials for a copy of the survey). We also made available PDF and Microsoft Word versions of the survey, as 34% of the respondents preferred to complete the survey offline. Most candidates responded in English, but the survey was also made available in Bahasa Indonesia and Simplified Chinese. To encourage participation, we offered direct support in Bahasa Indonesia, Bahasa Malaysia, Chinese (Mandarin and Cantonese), Hindi and Vietnamese.

The survey consisted of a combination of closed, multiple choice and open-ended questions that reflect the research questions posed above: (1) location and context; (2) motivations; (3) stakeholder participation; (4) investments and outcomes; (5) most and least successful aspects. The structure of the questions facilitated their organization around four key domains: agriculture, conservation, livelihoods, and institutional planning and coordination. A critical component of the survey entailed capturing investments and outcomes in each of these four domains.

We made slight adjustments to the survey developed for the previously mentioned studies of ILIs in Africa and Latin America and the Caribbean (Milder et al., 2014; Estrada-Carmona et al., 2014), in order to better fit the regional context and ensure accurate interpretation by respondents, but refrained from making any changes that would compromise the ability to perform future comparative intercontinental analysis. Edits primarily allowed for a greater inclusion of aquaculture and coastal ecosystems which formed a notable percentage of ILIs identified in the region, as well as changes to crop species examples given in the questions to assist respondents with more locally-identifiable cases.

The survey had a response rate of 35% (227 out of 649). These responses were screened for their completeness and re-evaluated to ensure that each ILI still met the definition and inclusion criteria. The final analysis consisted of a screened dataset of 166 initiatives distributed across 16 countries. The 61 initiatives that were not included were rejected due to incomplete responses, unreliable or inconsistent information, insufficient scale or scope of intervention, or failure to cover all four key domains listed above.

2.3. Data analysis

We compiled survey responses from the two subregions into a single dataset to inform analysis within and between South Asia and Southeast Asia. For simplification, the two subregions are hereafter referred to as SA (South Asia) and SEA (Southeast Asia). The SA dataset included any ILIs present in Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka and any Himalayan regional initiatives (including Tibet). The SEA dataset included ILIs in the Indo-Malay Peninsula, the Philippines and the Greater Mekong (including Guangxi and Yunnan provinces in southwestern China).

We treated close-ended questions as ordinal or categorical variables depending on the question to facilitate statistical analyses. For example, respondents indicating the motivations for their ILIs as ‘very important’, ‘moderately important’, or ‘not important’ were ordered on a scale of 1–3. We also used a set of indices developed for the other assessments to quantify the proportion of investments and outcomes across four key domains of integrated landscape management previously mentioned: agriculture, conservation, livelihoods, and institutional planning and coordination. The investment index was calculated as the ratio of reported investments in each domain to the total possible number selected of predefined investments listed in the questionnaire. The ratio was normalized for each domain on a 25-point scale and summed to derive an overall investment index whose score could range between 0 and 100. The outcome index was calculated in the

Table 1
Summary data of surveyed integrated landscape initiatives (ILIs; n = 166) subdivided by landscapes in the South Asia (SA), and the Southeast Asia (SEA) regions, as well as combined.

Variable	SA	SEA	Combined
Survey responses (#)	97	69	166
Countries (#)	9	7	16
Initiatives initiated before 2000 (%)	6	23	13
Oldest initiative	1990	1985	1985
ILIs continued from previous projects (%)	44	43	44
ILIs evolved into permanent efforts (%)	15	7	12
ILIs with >5 years operation (%)	49	57	52
Mean motivations/objectives (#)	6.4	7.7	6.9
Mean stakeholders groups involved (#)	11.4	10.8	11.1
Mean sectors involved (#)	3.4	3.6	3.5
ILIs investing in all four domains (%)	79	78	79
ILIs investing in capacity building (%)	80	78	79
ILIs investing in capacity building across all four domains (%)	51	52	51

same way. The aim of these indices was to understand the relative diversity of investments and outcomes, and the degree to which activities within ILIs were integrated across domains. An important caveat of these indices is that they may not reflect all possible investments and outcomes in a landscape, nor are they indicators of the magnitude of the investment or outcome. They are useful however for understanding the relative prioritization and breadth of coverage across the four domains and of the intersectionality of the initiatives.

We analyzed both the raw data and derived indices to assess investments and outcomes and their association with other variables such as stakeholder participation, ILI duration and motivations. We used statistical tests such as *t*-tests, chi-square tests, analysis of variance (ANOVA), Pearson's product-moment correlation analysis and Tukey-Kramer post hoc tests to understand relationships between different ILI attributes, including the relationship between investments and outcomes across the four key domains. Open-ended questions addressing the most and least successful elements of the initiatives were analyzed qualitatively through keywords. Recurring themes and illustrative statements from respondents are highlighted in the discussion section.

3. Results

3.1. ILIs locations and contexts

The final analysis consisted of a screened dataset of 166 initiatives distributed across 16 countries, with the greatest numbers of initiatives in India (19%), Vietnam (13%), the Philippines (12%), Indonesia (9%) and Nepal (7%) (Table 1; Fig. 1). Twelve ILIs were transboundary initiatives, mostly spanning large mountain ecosystems, forest ecosystems or watersheds. The survey revealed an increasing prevalence of ILIs in the two subregions since the 1990s (Fig. 2), with the trend in SEA starting relatively later than SA—peaking between 2000 and 2009. Only 5% of initiatives in SEA started in the 1990s compared to 18% in SA.

The majority of surveyed ILIs were linked to grants or projects lasting from one to five years; however, SA had more initiatives that exceeded 10 years. Forty percent of all ILIs were a continuation of previous projects, of which 16% evolved into permanent efforts and 34% continued at least 5 years beyond inception. Ninety percent of initiatives reported the use of adaptive management approaches. Similarly, 90% of initiatives included a monitoring and evaluation component, which was supported by baseline assessments in 87% of all ILIs.

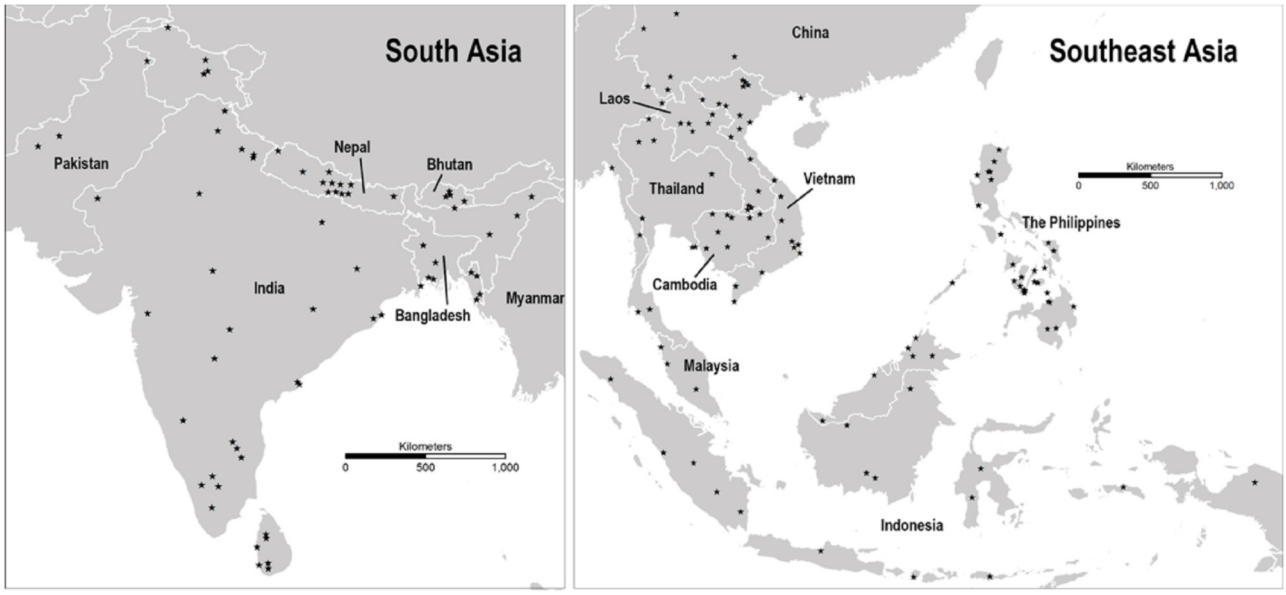

Fig. 1. Location of 166 integrated landscape initiatives in South and Southeast Asia.

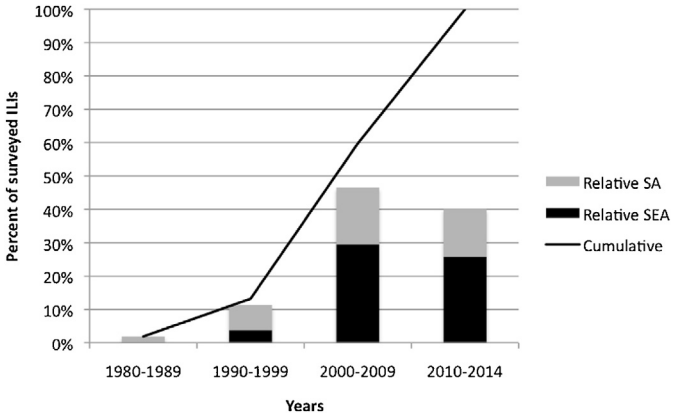

Fig. 2. Percent relative and cumulative frequency of surveyed ILIs across South and Southeast Asia with valid start date (n = 163) based on the decade in which they began.

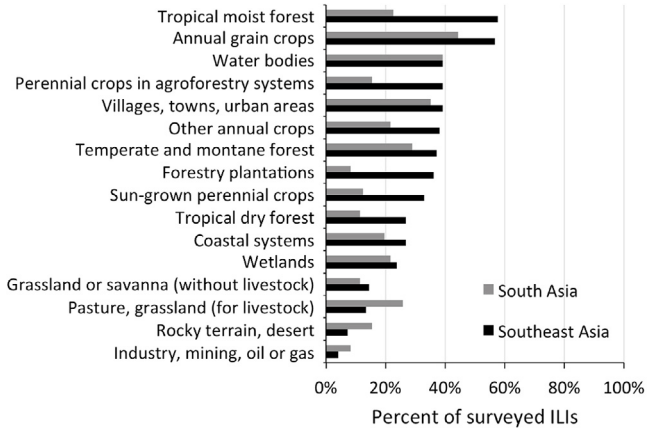

Fig. 3. The percentage of integrated landscape initiatives (ILI's; n = 166) that include the listed major land uses. ILI's can include more than one dominant land use.

All ILIs were reported to take place in mosaic landscapes with multiple land uses, but there were some differences in land-use composition between the two subregions (see Fig. 3). Each landscape had a mean of five major land uses (SE = 0.2) that each occupied at least 5% of the landscape and 4.5 minor land uses (SE = 0.2) that each covered less than 5% of the landscape. Forestry plantations were significantly more frequent as a major land use in SEA than SA ($\chi^2(1) = 12.27$, $p < 0.001$). Likewise, tropical moist forests and perennial agroforestry systems were twice as frequently a major land use in SEA than in SA ($\chi^2(1) = 1.33$, $p = 0.01$; $\chi^2(1) = 5.37$, $p < 0.05$ respectively). SA landscapes, on the other hand, reported pasture or grassland for livestock as a major land use more than twice as often as SEA ($\chi^2(1) = 12.31$, $p < 0.001$). Annual grain crops were the most frequent major land use in SA (44%).

3.2. Motivation

Respondents were asked to identify ILI motivations from a list of 15 choices such as 'enhance food security', 'conserve biodiversity' and 'reduce conflict between resource users'. The survey also provided space to indicate the most important motivations for their initiatives. Respondents identified a mean of seven very important objectives (SE = 0.3) and five moderately important objectives (SE = 0.2) per initiative. Stopping or reversing natural resource degradation, conserving biodiversity and enhancing sustainable land management were each considered as very important motivations by more than 70% of ILIs in both subregions (Fig. 4). Seventeen

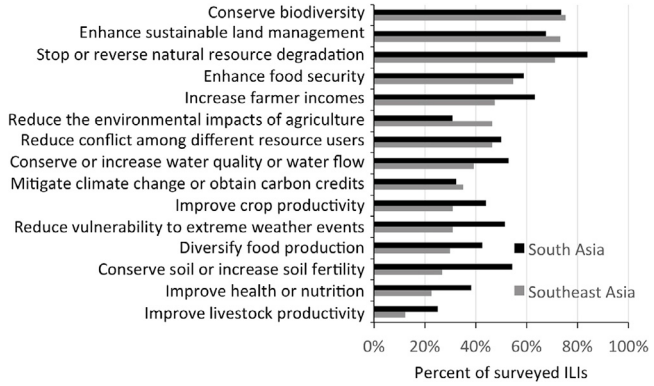

Fig. 4. Identified motivations for the creation of the surveyed integrated landscape initiatives (ILI's; n = 166), as reported by initiative leaders or participants. Values indicate the percentage of integrated landscape initiatives that identified each given motivation as "very important". Results are shown for the South Asia, and Southeast Asian regions separately.

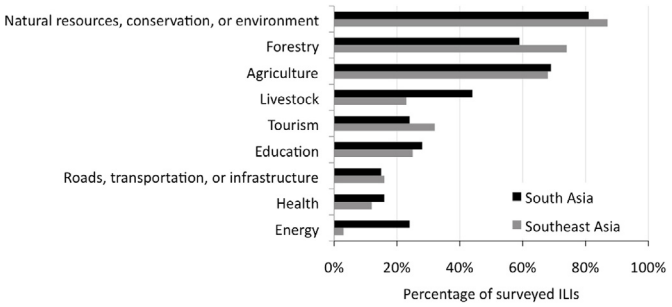

Fig. 5. Percentage of integrated landscape initiatives (ILI's; n = 166) in which each of nine different sectors was involved.

percent of ILIs, particularly in Bangladesh and the Mekong countries, cited climate change adaptation, mitigation and disaster risk reduction as a primary motivation.

Ninety-six percent of respondents reported their primary motivations in a separate open-ended question in addition to selecting from the predefined list. Conservation and sustainable natural resource use were the most frequently mentioned motivations (71%), but most ILIs listed several primary motivations that were stated to be intrinsically linked. These motivations were often an integration of conservation, natural resource management, livelihood advancement, and food security, with some element of institutional coordination. In some cases, the ILI was motivated by a community's desire to improve management capacity, or defend their community's resources or way of life. One respondent from SEA stated: *"We are motivated by the need to legitimize the non-state administered sustainable management of our ethnic lands and to guard against land grabbing and imposed development aggressions including dams, roads, rubber plantations and rare earth mining ventures. We want to protect our endangered species, abused people and indigenous knowledge"*.

3.3. Participating stakeholder groups and sectors

An average of 3.6 sectors (SE = 0.1) were involved in each initiative. Two percent of ILIs engaged in nine sectors. The three most commonly involved sectors were 'natural resources and environment' (80% of ILIs across both subregions), 'forestry', and 'agriculture' (see Fig. 5). One of the least commonly involved sectors was 'energy', although its presence in SA (24%) was much greater than in SEA (3%).

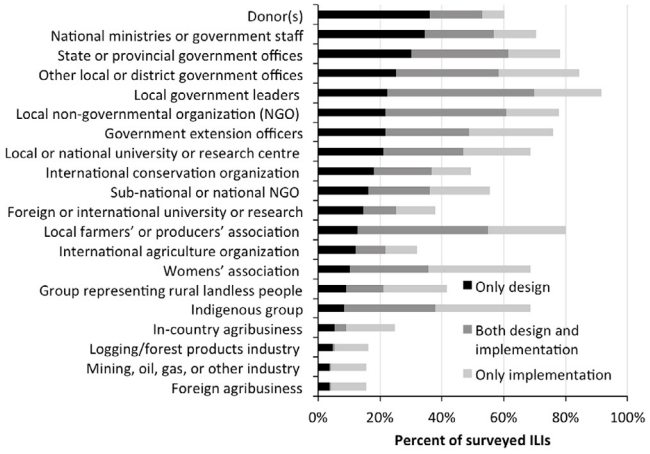

Fig. 6. Percentage of integrated landscape initiatives (ILI's; n = 166) in which the indicated stakeholder groups were involved either only in the design, only in the implementation or in both design and implementation.

In terms of stakeholder participation, respondents reported an average of 11.1 different stakeholder groups (SE = 0.3), out of 20 pre-defined options in the survey. Respondents were requested to indicate which stage of ILI activities they had actively participated in: design, implementation or both. Local government leaders (such as village leaders, mayors and chiefs) were the most commonly represented stakeholder group in both subregions (92%). Government stakeholders at the local, state and national levels were involved in over 70% of ILIs in both subregions. The involvement of NGOs and of local farmer associations was equally high, but slightly stronger in SA (SA 88%, SEA 70%; and SA 85%, SEA 76% respectively).

SA initiatives reported a higher involvement of rural landless people (51%, compared to 35% in SEA). However, the participation of rural landless people in these cases was often limited to the implementation of ILI activities (58% took part in design compared to 85% in implementation). This relationship was similarly reflected in the participation of women's associations and indigenous groups (Fig. 6). Participation in implementing activities by women's associations in SEA was almost twice as frequent as their involvement in design (36% took part in design compared to 58% in implementation). This distinction becomes even greater if we limit our analysis to women's associations involved in only one stage, i.e. only design or only implementation (Fig. 6), in which case, women's associations participated three times more frequently in implementation (33%) than design (10%) in both subregions.

By contrast, donors were more than twice as involved in designing ILIs in both subregions (53%) as they were in implementation (24%). Again, if we limit our analysis to donors participating in only design or only implementation, we find them to be five times more frequently involved in design (36%) than implementation (7%). Overall, private sector stakeholders were the least represented, taking part in less than 20% of surveyed initiatives in both subregions (16% for natural resource extractive industries such as logging, mining, oil and gas). In-country agribusiness stakeholders participated more frequently in SEA (29%) than in SA (19%).

A moderate but significant and positive correlation was found between the number of stakeholder groups involved and the number of sectors involved ($r = 0.35$, $p < 0.001$). In particular, initiatives with a higher participation of private sector or international stakeholders reported a significantly higher number of participating stakeholder groups overall (*t*-test, $p < 0.001$ and $p < 0.001$ respectively).

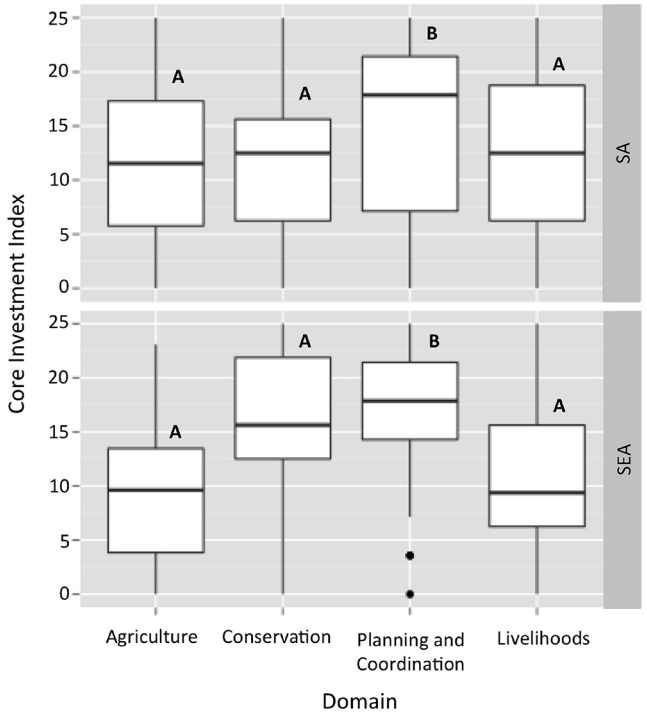

Fig. 7. Median core investment index plus or minus one quartile, by domain of investment. Different letters above each data series denote statistically significant differences among domains investments ($p < 0.05$) based on Tukey's HSD test.

3.4. ILI investments

Investments were reported in all four key domains: agriculture, conservation, livelihoods and institutional planning and coordination. Initiatives reported separately the investments and activities made directly by the initiative itself (core investments), and the investments and activities carried out by other organizations or groups in the landscape (associated investments). The level of investment was characterized by the investment index described in the methodology. Seventy-nine percent of all initiatives reported at least one core investment in each of the four key domains. Initiatives reported more than twice as many core investments as associated investments (mean core investment index = 51.8, SE = 2.0; mean associated investment index = 21.4, SE = 1.7; paired *t*-test, $p < 0.001$). When comparing investments across the four domains, the investment index for institutional planning and coordination was significantly higher than the other three domains. The agriculture and livelihood domains had the lowest index scores (ANOVA, $F = 22.49$, $p < 0.001$, Tukey's post hoc test; Fig. 7).

Investments in capacity building were reported by almost 80% of ILIs. SA initiatives reported a significantly higher number of investments in agriculture than SEA initiatives (*t*-test, $p = 0.006$), while SEA initiatives reported a significantly higher number of investments related to conservation than SA (*t*-test, $p = 0.007$). Investments in agriculture were significantly greater in landscapes where respondents reported dominant land uses related to agriculture (*t*-test, $p = 0.002$). However, investments in conservation were not significantly greater in landscapes where respondents reported dominant land uses related to forest cover.

3.5. ILI outcomes

Sixty-two percent of initiatives reported at least one core outcome in each of the four domains. Similar to the investment pattern, the outcome index for the institutional planning and coordination

domain was significantly higher than any other domain and the outcome index for livelihoods was the lowest (ANOVA, F3 = 2.6184, $p < 0.001$; Fig. 9). The mean core outcome index (4.5, SE = 2.0) was significantly higher than the mean associated outcome index (6.0, SE = 0.9, paired *t*-test, $p < 0.001$).

3.6. Relationships among ILI characteristics

Overall, initiatives with higher investments also reported higher outcomes. Total investment index scores were positively and significantly correlated with total outcome index scores ($r = 0.56$, $p < 0.001$). Both the total number of core investments and the total number of core outcomes were significantly and positively correlated with the total number of participating stakeholder groups ($r = 0.42$, $p < 0.001$; $r = 0.27$, $p < 0.001$ respectively), suggesting that a larger number of participating stakeholder groups resulted in more ILI objectives being set and met. Correspondingly, the total number of motivations reported by ILIs was positively correlated with core investments and core outcomes ($r = 0.32$, $p < 0.001$; $r = 0.38$, $p < 0.001$ respectively).

As previously mentioned, the majority of ILIs invested in capacity building. High investment in capacity building within all four domains was positively correlated with total outcome index scores ($r = 0.35$, $p < 0.001$). Years of operation was also positively and significantly correlated with total outcome scores ($r = 0.47$, $p < 0.001$), implying longer timescales allow for a higher achievement of outcomes. This correlation was less significant in the agricultural domain ($r = 0.28$, $p < 0.001$).

Previously, we highlighted not only participation levels but how different stakeholder groups participated in ILIs. The participation of groups representing the rural landless, women's associations, indigenous groups and local farmer associations were all positively correlated with high outcome index scores ($\chi^2(1) = 11.82$, $p < 0\ 0.001$; $\chi^2(1) = 8.45$, $p < 0.01$; $\chi^2(1) = 6.62$, $p = 0.01$; $\chi^2(1) = 6.01$, $p = 0.05$ respectively). This relationship increased in significance when these groups participated in the design of ILIs, particularly for women's associations and local farmer associations ($\chi 2(1) = 11.21$, $p < 0.001$; $\chi 2(1) = 9.82$, $p < 0.01$ respectively). The association between higher outcome index scores and the participation of donors in implementation stage is highly significant ($\chi^2(1) = 90.6$, $p < 0.001$).

3.7. Most and least successful aspects

Overall, 84% of respondents provided answers on the most successful aspects of their ILIs. Twelve percent of these reported successes related to agriculture, such as improving agricultural production systems through capacity building, crop diversification and the use of more environmentally friendly practices. Fifty-one percent reported successes related to conservation and natural resource management. Often, these successes were combined with livelihood benefits and strengthened institutional capacity, such as reduced overfishing due to livelihood diversification; training communities in ecotourism; and securing land tenure and empowering communities to manage their forests sustainably. Twenty-seven percent reported their most successful aspect as increased coordination and collaboration between stakeholders towards more participatory resource management.

Sixty-seven percent of respondents identified a least successful aspect, most of which reported difficulty in ensuring the sustainability of infrastructure and institutions in the long run. Eleven percent attributed this to a lack of stable or adequate financial resources. Many also highlighted the difficulty of engaging all relevant stakeholders (especially government actors) in their initiatives. There were consistent reports of lack of coordination, barriers in moving from a sectoral or 'project' approach to a more integrated one, and generating interest from private sector stakeholders such as agribusiness and extractive industries. For instance, respondents noted: *"Timescales were too long and benefits too small to generate stakeholder interest and participation"* and "*it was difficult to include institutional stakeholders not directly related to environment and natural resource management, such as mining, energy and infrastructure"*.

Complex and entrenched power dynamics were also identified as a barrier to true multi-stakeholder landscape management: *"The attempt to implement adaptive collaborative management of the landscape was co-opted by the acceptance and pushing of government programs (when in fact the original idea was to respond to local people's wishes and interests)"*.

4. Discussion

This study provides the first broad assessment of the extent, characteristics, and outcomes of integrated landscape management in South Asia and Southeast Asia. In comparison to the previously conducted reviews of Africa (Milder et al., 2014), and Latin America and the Caribbean (Estrada-Carmona et al., 2014), the Asian review surveyed ILIs in fewer countries (16 in Asia compared to 35 in Africa and 21 in Latin America and the Caribbean), but documented more initiatives (166 in Asia compared to 87 and 104 respectively).

Several limitations of the study should be noted before discussing the findings. This study should not be seen as a comprehensive review of all ILIs in the two subregions, but rather a snapshot of ILIs responding to both local demands and global contexts. A high dependence on web-based and partner networks to identify ILIs could have biased our final sample towards initiatives with online documentation and support from international institutions, thereby failing to fully capture grassroots-led ILIs. However, correspondence with both smaller in-country NGOs and international organizations made it clear that working at a landscape scale and across sectors usually requires resources, leverage and staff capacity beyond those of local grassroots organizations, creating a natural tendency towards collaboration with, if not initiation by, stakeholders with an online presence.

Second, given the linguistic diversity of the two subregions, language barriers posed some hurdle to identifying ILIs, but not to the extent expected. The majority of ILI representatives were able to respond in English (even preferred doing so), but where respondents needed clarification or assistance, our data collection team was able to provide guidance in Bahasa Indonesia, Bahasa Malaysia, Chinese (Mandarin and Cantonese), Hindi and Vietnamese.

Finally, as all data are based on self-reporting, responses may be limited to or biased by information or perspectives held by respondents. We attempted to mitigate this factor by encouraging respondents to complete the survey with help from colleagues, which was facilitated by providing an offline version of the survey.

4.1. Motivations, investments and sustainability

The findings suggest that integrated landscape management approaches in South and Southeast Asia are widespread but often struggle to continue beyond their initial funding cycles and establish institutions that support long-term engagement. Most initiatives surveyed were under 10 years old and in a phase where outcomes were not yet evident. Longevity is important—we found a strong correlation between older ILIs and a greater number of outcomes reported. However, many ILIs voiced sustainability as a key concern, largely attributed to financial challenges and difficulties in working with multiple stakeholder groups. Fragmented and overlapping governance systems frequently made the integration of different land uses and sectors even more difficult (Mertz et al., 2015). While there is a growing interest in integrated approaches

and adaptive management, funding and governance mechanisms tend to be inflexible and of much shorter duration. Achieving long-term impacts at the landscape scale requires institutional arrangements that are able to link or bridge individual projects.

Despite these challenges, respondents reported significantly more outcomes related to improved institutional planning and coordination among stakeholders than any other domain. Many ILIs invested heavily in capacity building activities to improve stakeholder ability to manage their landscape, or diversify livelihoods to reduce pressure on natural resources. This finding suggests that stakeholder groups see value in building capacity and institutions within the landscape, which is well-founded: ILIs with greater investments in capacity building had a significantly higher number of outcomes.

In terms of motivation, conservation and the sustainable use of natural resources were the strongest motivators for ILI design and implementation. There are clear incentives for conservation stakeholders to move beyond protected area approaches to work at larger spatial scales and engage with communities and stakeholders that interact with and affect wildlife and environmental conservation (Kumaraswamy & Kunte 2013; Lele, Wilshusen, Brockington, Seidler, & Bawa, 2010). By comparison, agricultural development was a weaker motivator for ILIs, but still featured amongst the top three sectors involved and invested in. This was particularly the case in South Asia where agriculture is a dominant land use feature (Figs. 4 and 5). Strengthening livelihoods was also cited as an important motivator. Twenty percent of respondents reported their ability to integrate livelihoods with conservation activities as a success. ILIs recognized that successful conservation outcomes are dependent on livelihood benefits, which act as a means of securing stakeholder interest in ILIs. However, investments in livelihood activities still lagged behind other domains, confirming critiques that international conservation organizations might prioritize the welfare of endangered wildlife over the welfare of human lives in these same environments (Redford, Levy, Sanderson, & de Sherbinin, 2008; Sanderson & Redford, 2003, 2004).

The weakest investments were in the energy and health sectors. The involvement of the energy sector was much higher in South Asia than Southeast Asia, mostly in transboundary initiatives in the Himalayan region or water catchment areas. Many of these ILIs were those interested in using alternative energy sources to reduce deforestation, subsequent soil erosion, and carbon emissions associated with the use of fuelwood by upland communities. With equally important watersheds and extensive hydropower development in the Mekong region, it is unclear as to why there were fewer ILIs that collaborated with the energy sector in SEA. After energy, the health sector was the least involved, and subsequently ILIs demonstrated low investment in human health and nutrition. This finding suggests that development interventions to improve health and nutrition, while of growing interest to the international development community (FAO, 2015), either do not resonate with ILI stakeholders or are not yet coupled with landscape initiatives. This may be an opportunity for further research in the growing literature on the role of nutrition in landscape multifunctionality (DeClerck, Fanzo, Palm, & Remans, 2014; Powell et al., 2014; Remans et al., 2011; Tilman and Clark, 2015).

4.2. Role of institutional development and multi-stakeholder processes

The complex reality of diverse actors and institutions operating at multiple scales with different motivations is an ongoing challenge of interdisciplinary approaches (Faysse, 2006; Shahbaz, Ali, & Suleri, 2011). While the surveyed ILIs reported a high degree of engagement with local actors, the involvement of grassroots organizations and stakeholders such as women, indigenous peoples and the rural landless, were concentrated in the implementation stage. Inversely, donors were primarily involved in the design stage. While not atypical, this bifurcation of roles may represent a missed opportunity, as grassroots stakeholders are closely connected to the landscape, deeply impacted by its management, and possess the knowledge to identify critical gaps that inhibit change. Adaptive co-management allows for better regulation, access and use of key common resources, as local actors are able to enforce regulations using local institutions, customary laws and accepted practices (Plummer et al., 2012; Plummer, Armitage, & de Loë, 2013). This is supported by our analysis that shows a strong association between a higher total outcome index and participation of these stakeholder groups.

This same result begs the question as to whether ILIs are driven by the international conservation and development agenda, rather than specific needs of the communities inhabiting these landscapes. Identifying top-down (donor-driven) versus bottom up (community-driven) motivations is difficult, if not impossible. What the study results do suggest is that gender empowerment, equality and the representation of different voices help ensure community aspirations and needs are met and can lead to more successful outcomes. However, a lack of participation does not necessarily indicate a lack of invitation. Existing power dynamics and inequities based on stakeholder capacities and access to resources can result in unequal participation, both in terms of physical presence and shaping dialogue (Reed, 2008; Reed et al., 2009). As one respondent from SEA put: "*[Participation] was inadvertently more attractive to those who were financially well-off and better organized. Because of its expense—in both time and opportunity costs for meetings—the poorer stakeholders were less able to spend their limited resources to learning activities*". This observation however, does not explain the differences amongst stakeholders in ILI design versus implementation, which also correlated with total outcome index scores. Those differences might reflect a more traditional top-down approach to rural development, rather than approaches that are inclusive of multiple knowledge systems and value the opinions of those who actively live in the landscape and use its resources. The absence of minority groups in the planning phases of ILIs demonstrate a need to reconsider current operational approaches to landscape management, and identify new ways to include these voices at the design stage. The relatively low reporting of women's empowerment and traditional knowledge as outcomes by ILIs (Fig. 8), suggests the need for a deeper understanding of community dynamics, particularly along gender, caste and class lines, as well as greater resourcing of skilled facilitators (Edmunds & Wollenberg, 2001; Reed, 2008). The very significant association between donor involvement in the implementation stage of ILIs and a higher total outcome index, suggests that those more involved in the landscape are able to make better decisions about where to invest financial resources. These donors might have a more realistic understanding of the time scales and investments required to coordinate multiple stakeholder groups and achieve multiple objectives. They might also be less likely to pre-specify objectives that are not in the interest of local stakeholders and enable conditions more conducive to adaptive management (Larson & Ribot, 2004).

The low participation of private sector actors and extractive industries in ILIs may also affect the efficacy of newly created institutions, and explains why ILIs struggle to stay on track to achieve long-term outcomes. Private sector actors influence investments, market dynamics, and are increasingly involved in decisions that affect social, political and environmental welfare (Biersteker & Hall, 2002). In India for example, private companies in the hydropower sector are powerful stakeholders with political ties and vested interests that may not always align with conservation efforts and local livelihood goals. Without the active inclusion of such stake-

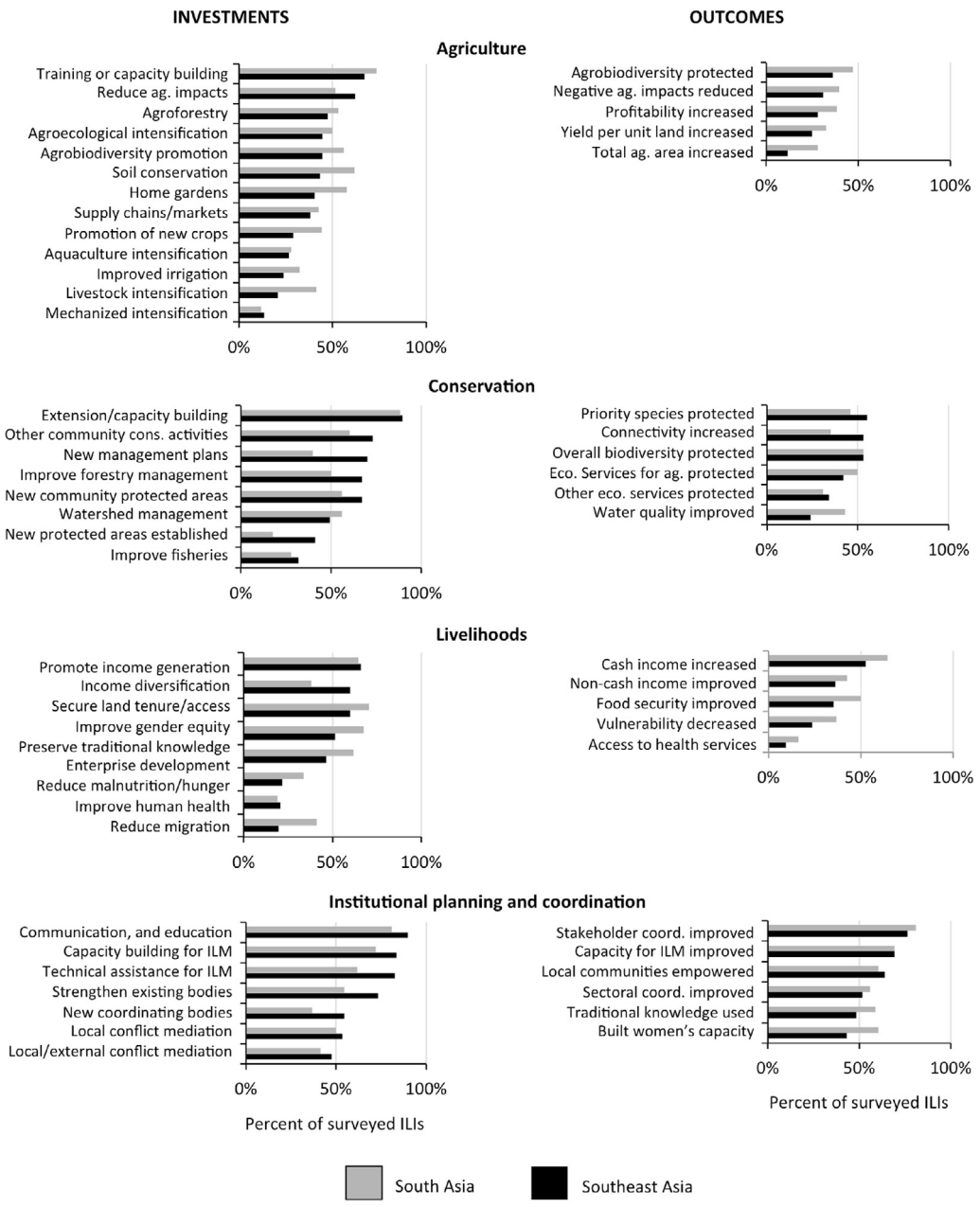

Fig. 8. Core investments and outcomes for four domains.

holders, any multi-stakeholder process is subject to being co-opted or superseded by those who influence key investment decisions (Erlewein, 2013). Discovering where the interests of ILIs and private sector actors intersect, both in terms of potential synergies and trade-offs, is an important step in defining and embedding private sector engagement in ILI interventions (Estrada-Carmona & DeClerck, 2012; Fremier et al., 2013).

5. Conclusions and future research directions

Overall, data from the survey provided a rich basis for an initial analysis of ILIs in South and Southeast Asia. The detailed responses to the open-ended questions suggest that there is room for a more nuanced qualitative study of a smaller sample of ILIs to better understand the contexts and realities of the subregions. Given that almost 90% of ILIs reported having baseline data, and monitoring and evaluation components, it may be possible to use such data to quantitatively analyze ILI investments and outcomes over time. Such research could yield key insights about the long-term value and cost-effectiveness of integrated landscape approaches.

Our findings in relation to stakeholder participation in ILIs suggest a need for the development of better frameworks to involve the participation of grassroots stakeholders and the private sector (particularly extractive industries), but also the need to investigate how to involve donors in more productive and efficient ways. The specific challenges that we find here are how to engage minority groups, including women, indigenous groups and the rural landless in landscape planning phases. The decentralized nature of many of these groups, and their limited access to financial and institutional resources, spurs their involvement in the later implementation stages of ILIs. The need to involve donors is quite the opposite, ILIs have to find a way to demonstrate to donors the realities on the ground, without compromising a certain level of independence when it comes to management. As for the private sector, interdis-

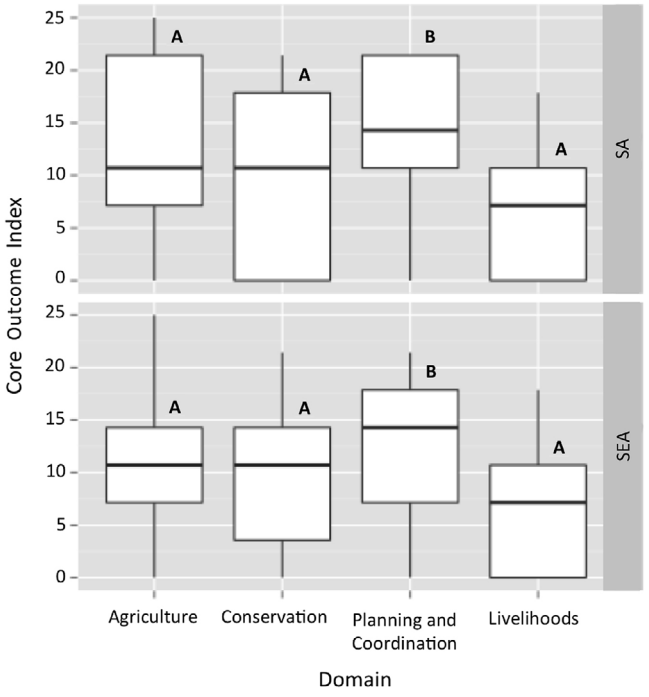

Fig. 9. Median core outcome index plus or minus one quartile, by domain of outcome. Different letters above each data series denote statistically significant differences among domains outcomes ($p < 0.05$) based on Tukey's HSD test.

ciplinary and inclusive approaches are not typical *modus operandi* for most industries (and possibly not of interest), necessitating specific efforts by ILI leadership to identify and engage private sector interests in ILI investments. All these elements emphasize the need for ILIs to have the capacity to play an important coordination role and provide agency to different stakeholder groups to find common ground for collaborative governance.

As the first broad empirical assessment of integrated landscape initiatives in South and Southeast Asia, this study provides initial lessons and a basis for further research on landscape management in the region and beyond. Our results reveal that strengthening institutional capacities and creating spaces that allow different stakeholders to participate on more equal footing are key factors towards achieving ILI objectives. Innovative strategies to engage private sector stakeholders in a meaningful way are also needed and could provide a means of supporting ILI investments when well aligned with stakeholder needs and objectives. Finally, supportive policies and sustainable financial mechanisms are necessary to accommodate the long-term scope of ILIs, as outcomes from many investments on integrated landscape management often take years, if not decades, to become visible.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.landurbplan.2017.03.010.

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