

Article

Enabling Environments? Examining Social Co-Benefits of Ecosystem-Based Adaptation to Climate Change in Sri Lanka

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Abstract: Climate change vulnerability and social marginalisation are often interrelated in and through environments. Variations in climate change adaptation practice and research account for such social-ecological relations to varying degrees. Advocates of ecosystem-based approaches to climate change adaptation (EbA) claim that it delivers social co-benefits to marginalised groups, although scant empirical evidence supports such claims. I investigate these claims in two EbA interventions in Sri Lanka, interpreting social benefits through an empowerment lens. I use qualitative methods such as focus groups and narrative interviews to study the conduct and context of the interventions. In both cases, marginalised people's own empowered adaptive strategies reflect how power relations and vulnerabilities relate to dynamic ecologies. The findings show that EbA enabled social benefits for marginalised groups, especially through support to common-pool resource management institutions and the gendered practices of home gardens. Such conduct was embedded within, but mostly peripheral to, broader and deeper contestations of power. Nevertheless, projects acted as platforms for renegotiating these power relations, including through acts of resistance. The results call for greater recognition of the ways that marginalised groups relate to ecology within empowered adaptive strategies, whilst also highlighting the need to recognise the diverse interests and power relations that cut across the conduct and contexts of these nominally ecosystem-based interventions.

Keywords: power; ecosystem-based adaptation; nature-based solutions; sustainability transformations; social-ecological systems; co-benefits

1. Introduction

In a warming world with high inequality, integrated solutions that can move beyond the siloes of social or environmental sustainability are needed [1,2]. There has been a tendency, even in research, to assume that green is both good and fair [3,4]. Consequently, so-called nature-based solutions have become a prominent approach for delivering 'win-wins' in the form of socially just and environmentally sustainable outcomes [5,6]. The apparent potential to deliver social and environmental co-benefits—leading to a range of sustainable development goals, while avoiding the pitfalls of alternative approaches—partly explains why policy-makers, programmers and researchers alike are interested in these approaches [7,8].

Nature-based approaches, cited as 'the forgotten solution' [9], are central to efforts to mitigate and adapt to climate change. Based on an enhanced awareness of the potential of ecosystems to mediate many climate change impacts, ecosystem-based adaptation (EbA) has become a prominent part of an overarching response. Similar to nature-based solutions, EbA may also deliver a range of co-benefits, such as protection of biodiversity and positive impacts on economic and social factors.

By definition, EbA includes the 'sustainable management, conservation and restoration of ecosystems, as part of an overall adaptation strategy that takes into account the multiple social,

economic and cultural co-benefits for local communities' [10]. EbA is even proclaimed to provide social benefits, such as gender equality, social inclusion and cohesion, and empowerment, for marginalised groups [11,12]; that is, advocates explicitly claim it offers a pro-poor disposition. EbA may be especially suitable for addressing the vulnerability of marginalised populations because of the relative dependence of these groups on adjacent ecologies [11,13]. Indeed, a meta-analysis of countries' nationally determined contributions to the United Nations Framework Convention on Climate Change shows that ecosystem-based approaches are particularly important in the adaptation plans of low- or lower-middle-income nations [14].

Notably, EbA may allow for an implementation approach that is more inclusive than many technological or infrastructural alternatives because of certain affordances or preconditions. For instance EbA actions may be adaptable to specific conditions and livelihoods, allow more general participation, or accommodate local priorities and knowledge [13]. Given these apparent affordances, the extent to which EbA may contribute to more transformational change to address the vulnerabilities of marginalised peoples and explicitly consider issues of equity is nevertheless questioned [15].

In a recent review, Woroniecki et al., [16] found that whilst such preconditions may increase the opportunities for social co-benefits through the implementation of EbA, EbA scholarship does not adequately account for the process of the adaptation intervention itself. This lack of insight hinders an understanding of how social change outcomes emerge from particular types of interventions. Also, this scholarship does not take into account marginalised people's own interests and adaptive strategies, nor does it consider relations of power that cut across the conduct and context of such adaptation actions [16]. In fact, the framing of such an 'ecosystem-based' approach may even preclude greater attention to social aspects of such approaches.

In this article I focus on the interplay between the conduct of EbA and the social-ecological context in which it is embedded. Drawing on the conceptual gaps identified above, I investigate if and how these interventions provide social benefits for marginalised groups. I make use of empirical research at two sites in Sri Lanka where EbA has been implemented to address climate impacts. My normative contribution is to be constructively critical. I use an empowerment lens to interrogate why such claims are being made, and ultimately, I use this understanding to suggest ways to increase their potential to contribute to progressive social change.

Through my research, I seek answers to the following questions: Can EbA actions contribute to social benefits for marginalised groups and thus reduce their vulnerabilities? If so, how?

I arrive at answers by addressing several sub-questions:

1. How are climate change vulnerabilities of specific groups of marginalised people shaped by power relations and dynamic ecologies?
2. How are marginalised people's own adaptive strategies linked to how climate impacts are resolved in and through dynamic ecologies?
3. How do EbA interventions recognise and articulate with these strategies and relations, and thus enable or constrain the empowered adaptive strategies of marginalised people?
4. How do EbA practitioners and researchers frame the process of EbA and thus enable or constrain the potential for such social benefits?

The analysis is relevant for EbA scholars and professionals working on ecosystem-based approaches who are interested in how such approaches might facilitate transformations towards sustainability and justice, such as integrated approaches to fulfilling multiple sustainable development goals. More broadly, I aim to contribute to emerging power-sensitive scholarship on social-ecological systems, including in the context of responses to global environmental change (e.g., [2,17]).

To address these questions, I structure the article as follows. First, I describe key variables in the study and how they are addressed in the analytical framework. A brief case study description follows. Then I describe the data collection and analysis methodologies. The results section addresses each

of the research questions in turn. In the discussion section, I discuss my findings in relation to the existing research and suggest implications for EbA research and practice.

2. Theoretical Framework

To analyse the potential for EbA to yield social co-benefits for marginalised groups, I interpret such benefits using an empowerment lens. This lens explicitly unites empowerment with processes of marginalisation and the constitution of vulnerability, both in the conduct of EbA interventions and the context in which they intervene. Here empowerment is defined as the process by which people who have been denied the ability to make strategic choices acquire such an ability, after Kabeer [18].

Power refers to the capacity to influence the general course of events, including the behaviour of others [19]. It is a complex and ambiguous notion that is notably contested in the social sciences [20]. Power as capacity—also referred to as agency—is asymmetrically structured across societies [21]. This structuring arises from the dual function of power as an enabling and a constraining social force [22]. Actions can both intentionally and unwittingly constrain the behaviours of others [21]. Power is a function of relationships, which may be direct (affecting the conduct between two individuals or groups) or diffuse (expressed in contextual social relations such as norms and institutions) [23]. The interactions between power relationships across conduct and context are part of what make power dynamic and constantly liable to contestation and renegotiation [24].

Power has an imaginative (mental, symbolic) form that is institutional and discursive. It is largely intangible, but nevertheless, it plays a critical role in both enabling and constraining the agencies of different people. This form of power also affects people's perceptions of their own agency, including their capacity to challenge asymmetric distribution of capacities and renegotiate power relationships, such as gender relations [18,19]. A key aspect of discursive power is recognition of the interests of particular groups within a community and by others such as businesses and the state actors [25]. Such power is furthermore represented by who has access to resources, and who is represented in decision making [6,26]. Marginalisation here simply refers to the process by which particular groups become disenfranchised through deliberate or unintentional denial of their distributive, representative and recognitional agency. This process occurs respectively through a lack of resources that other groups enjoy, a lack of representation within important decision-making bodies, and a lack of recognition of the needs and interests of particular groups.

To alter such power relationships, Kabeer's [18] theory of empowerment focuses on enabling function of resources. The findings show how these resources may include ecological resources. However, Kabeer shows that such resources may also be non-biophysical and even symbolic. In fact, existing research shows that the resources and benefits provided by ecosystems are just one of many components required for social development [3,12]. A wide range of tangible and intangible resources may be required for people to successfully enact agency in order to achieve adaptive strategies [27]. For empowerment to emerge, a renegotiation of relationships must occur, whereby the asymmetric distribution of agency is shifted in favour of marginalised groups [18,28].

Power relations may also be expressed in biophysical form, including in the changing conditions of landscapes or dynamic ecologies [29]. Instances of power enacted by some individuals may over time constrain the abilities of other groups to relate to landscapes in certain ways. Thus, we may view landscapes as complex interactions between ecologies and different people, expressing historical and contemporary relations of power [30]. In this way, environments may represent both enabling and constraining power on specific groups or individuals [31,32].

Climate change affects the context in which people operate (such as in changing capacities to achieve aspirations), in addition to more directly influencing their conduct (such as in the case of a dramatic event) [33]. Anthropocentric climate change itself represents, *inter alia*, power relations [34]. The increased agency of some individuals enabled by fossil fuel use and land-use change constrains the capacities of others to meet needs and aspirations [19]. Such diffuse contextual power relations are also expressed in vulnerabilities of different groups, defined as the particular climate-impact exposures,

sensitivities, and adaptive capacities for people in a given place and time [35]. More directly, the power of some individuals constrains the adaptive capacity of others [36]. Power likewise conditions the differential impacts of people's adaptive responses to climate change impacts [37]. Empowerment can be represented in the changing vulnerabilities and adaptive capacities of different groups [38,39].

The dynamic interactions between the four variables of power, marginalisation, ecology and vulnerability are conceptualised in Figure 1.

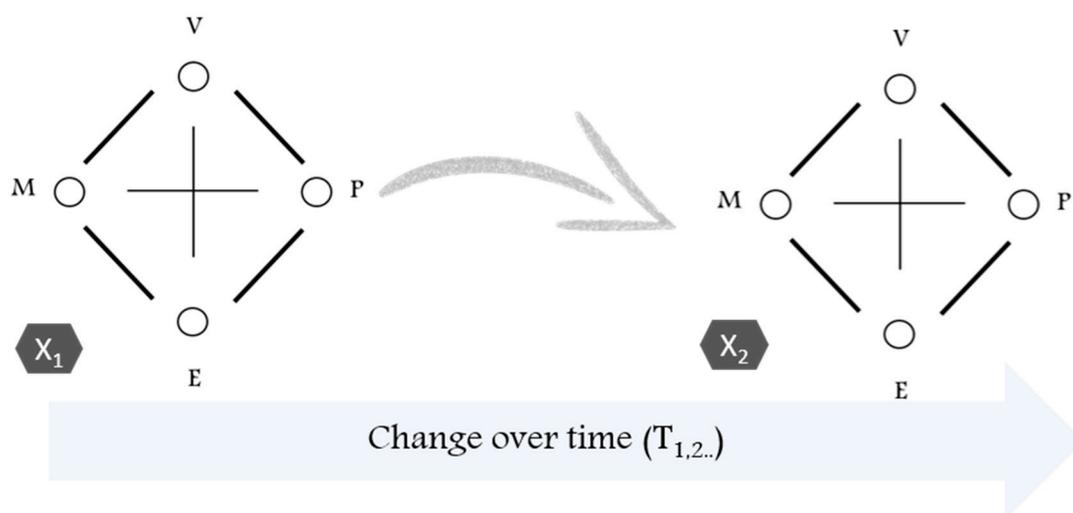


Figure 1. Conceptualisation of the interactions between the principle analytical variables of the study of contexts (X) into which Ecosystem-based Adaptation actions intervene with potential for pro-poor social benefits; vulnerability (V), power (P), marginalisation (M) and ecology (E). The relations between these elements are dynamic and drive change over time ($T_{1,2..}$).

The potential of climate change impacts, both directly and in terms of people's adaptive responses, to effect social change is thus interwoven with power relations. Adaptation action can comprise autonomous actions and strategies of individuals and groups as well as imposed actions, such as interventions by governments, universities, or development agencies. Both must be carefully unpacked through analysing how such actions represent the interaction between conduct and context [40,41]. Conduct refers to the action itself; whilst context refers to the totality of in-situ relations in which an EbA action intervenes. In the present study I analyse the ways that the conduct of an EbA intervention both shapes and is shaped by contextual power relations, including through the relevant pro-poor preconditions of knowledge sharing, recognition of local priorities and participation. Therefore, as Figure 2 shows, they are posited to express power relations across the conduct and context of EbA in a manner that allows these interventions to be interrogated for their social benefits potential.

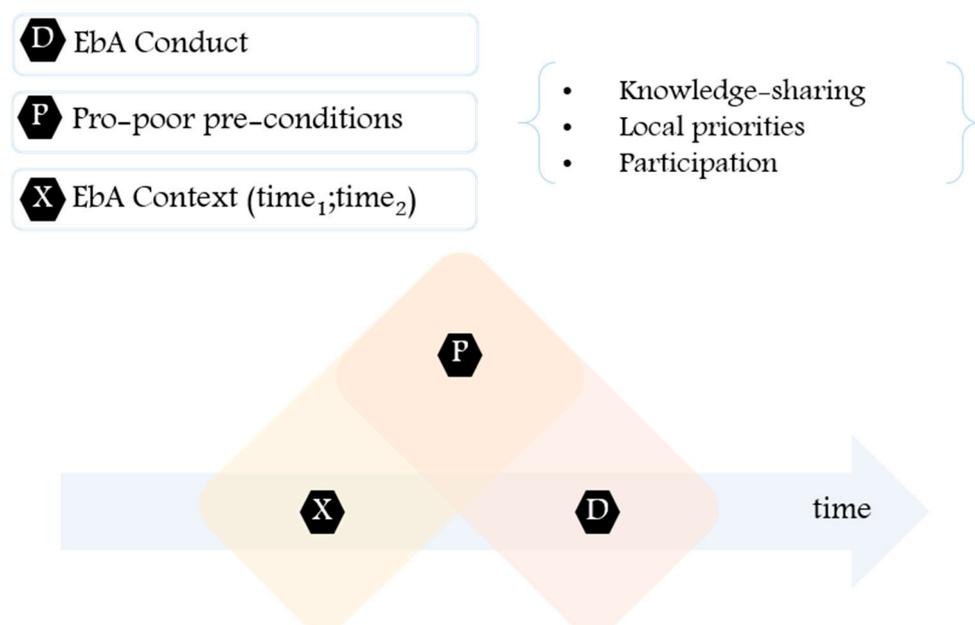


Figure 2. The social-ecological process of EbA intervention, taking into account the interactions that evolve over time between context (X) and conduct (D). Interactions between context and conduct occur through, inter-alia, pro-poor ‘preconditions’ (P).

3. Materials and Methods

In this section, I first describe the process of selecting appropriate EbA interventions for study. I then describe the chosen interventions in depth and provide a brief description of the methods used for data collection and analysis.

3.1. Site Selection

As part of identifying the effects of EbA projects on the most vulnerable groups, I identified EbA-type projects in the most vulnerable districts of Sri Lanka from policy documents. Following visits to the sites of several potential projects, I selected two projects for in-depth study, details of which are shown in Table 1. I chose these projects because each includes explicit claims to deliver social change and target the needs and priorities of marginalised and vulnerable groups. The sites represent diverse contexts and climate-change impacts.

3.2. Case Studies

Government and nonstate actor-driven social and collaborative nature-resource management programmes and projects have a long history in Sri Lanka, as elsewhere [42,43]. The projects that are the focus of this study can thus be understood as part of a pattern of Sri Lankan community-based natural resource management [43,44] and more specifically as adaptation projects that represent the invocation of global environmental discourses into specific locations [45]. Each place is also integrated into modern commercialised rural economies, which have undergone significant changes following the liberalization of the economy and resultant rationalization of landscapes since the 1970s [46]. At the time of data collection both sites were affected by a serious drought.

3.2.1. Soil Erosion Control, Serupitiya Village, Nuwara Eliya, Upland Zone

This project was led by the United Nations Development Programme (UNDP) and Sri Lankan academics alongside a local non-governmental organisation. The intervention was intended to address soil erosion and landslides associated with increasingly intense rainfall due to climate change. The project implemented contour hedgerows, tree planting and improvement of home gardens. These EbA measures were implemented in Serupitiya, Nuwara Eliya district, a municipality that has the highest landslide risk in the country.

3.2.2. Elangawa Ecological Water Tank Restoration, Galgamuwa Village, Kurunegala District, Dry Zone Sri Lanka

The project was led by UNDP and was aimed at restoring traditional forms of watershed management called ‘Elangawa’ cascades, which consist of a number of old ‘tanks’ or ‘*wewa*’. These ancient systems of water management were built according to ecological characteristics of the landscape and managed as commons resources [47]. The cascades are located in areas of Sri Lanka isolated from large-scale modern irrigation infrastructures. The ecological rehabilitation of such Elangawa occurred in Kurunegala district. The rural populations in this district are largely dependent on rain-fed agriculture, such as paddy cultivation, and *Chena* (slash and burn agriculture) in the catchment area of the Elangawa.

Table 1. Project specifications for the two EbA case studies selected for investigation.

Case Study	Galgamuwa	Serupitiya
Project title	United Nations Development Programme Climate Change Adaptation project	Global Environment Facility United Nations Development Programme Soil Erosion Project Serupitiya
Institutional setting	UN Agency partnered with municipal and National Government	UN Agency partnered with National Government and University
Scale of EbA activities	Intercommunity (catchment-scale), intracommunity, and household-scale interventions	Household and intracommunity scale interventions
Agro-ecological system	Dry zone agriculture (rain-fed); paddy farming in the Elangawa system, Chena cultivation in the catchment area, Home Gardens in the villages	Highland agriculture (rain-fed); paddy farming in the valley bottom, Chena cultivation and home gardens in the villages on steep slopes. Adjacent forests as part of Victoria Reservoir protected area
Climate impacts	Droughts and floods, water insecurity, agricultural uncertainty, exacerbated health effects of pollution, mobility	Soil erosion, landslides (caused by more intense rainfall events), water insecurity
EbA activities	Watershed (Elangawa) conservation, restoration of catchment areas, organic agriculture in home gardens, participatory planning	Contour hedge-rows, tree planting, support to home gardens, livestock (dairy) component negotiated by the community, participatory land management
Pro-poor preconditions	Participatory mechanisms, knowledge-sharing, incorporation of people’s interests; stated desire to contribute social benefits for marginalised groups	Participatory mechanisms, knowledge-sharing, incorporation of people’s interests; stated desire to contribute social benefits for marginalised groups
Marginalised groups targeted	Women, children, and poorer households within remote, rainfed-agricultural communities	Most face insecure land tenure and exploitative sharecropping arrangements. Women, children, and poorer or landless households within these remote, rainfed-agricultural communities are worst affected
Duration	2013–2017	2011–2014

3.3. Data Collection

I addressed the variables of interest in the analytical framework by using five types of qualitative techniques, given that ‘how and why’ questions lend themselves to in-depth enquiry of case studies (after de Haan and Zoomers, Bagchi et al., [48,49]). Five field assistants with a relevant educational background assisted with data collection by translating in situ and transcribing interviews into English. Respondents for focus groups and key stakeholder interviews were recruited through snowball sampling techniques, whilst those for narrative interviews were gathered using more systematic sampling techniques (every fourth household in Galgamuwa). The team was careful to ensure equal

representation in terms of gender and members of a diversity of livelihoods, age 18 and older. The data were gathered between January and June 2017.

At both sites the field assistants and I were initially presented to communities through key stakeholders such as project staff and community liaisons. Aware that such contact could bias the responses both in terms of whom we talked to and how community members perceived us, we also took initiative to meet people more informally. In some cases, the research team split into groups, and the field assistants asked questions according to the interview guide we had developed, practiced, and reflected on together.

Using participatory activities, I built an initial understanding of community relationships and climate change impacts, as well as an understanding of the character of the EbA project. I was present in some project workshops and during my stay in each site I observed interactions between different actors (government officials, key individuals, marginalised groups). I complemented that with in-depth semi-structured narrative interviews with a representative diversity of community members, and finally interviews with relevant local key informants. In three in-country feedback workshops I discussed interim findings with relevant experts, including with country-level staff of UNDP, the principal operating partner of both projects. In so doing, I followed the reflexive livelihoods methodology from Prowse [50]. Table 2 shows how these methods were employed in succession in order to address the research questions.

3.4. Data Analysis

Table 2 shows the methods used in the study and how they were analysed for specific components of the analytical framework. Interview and focus group transcripts were coded deductively according to this framework, using both word processor and handwritten codes to elicit emerging themes. The deductive codes were overall a good fit for the data, although new inductive codes were introduced through the process (such as 'resistance') to ensure that the framework did not overly constrain analysis of emerging themes. I then triangulated initial findings with narrative and key stakeholder interviews and confirmed emerging themes through feedback workshops.

Table 2. Contribution of various methods to the different components of analysis. Verification was enabled through an iterative process (After Prowse, 2010).

Research Question	Components of Analysis/ Deductive Codes	Participatory Methods/Focus Groups	Community-Level Narrative and Key-Stakeholder Interviews	Secondary Data/Key Stakeholder Interviews at the National-Level	Feedback Workshops
Questions 1 & 2 Context and Agency	<ul style="list-style-type: none"> • Vulnerability (risk exposure) • Marginalisation • Power relations • Ecological relations and dynamics • Instances of agency and empowerment 	<ul style="list-style-type: none"> • Understand vulnerability context, history, community profile, livelihoods and relevance of ecosystem services, institutions • How people have been involved in different types of actions, including autonomous responses to climate change 	<ul style="list-style-type: none"> • Gain deeper understanding of livelihood-ecosystems-climate links, role of relevant institutions • How people experience risk and change, the work (livelihoods) they do, and how they work together • How environmental conditions and relevant institutions have changed 	<ul style="list-style-type: none"> • Understand institutions, adaptation strategies, power-relations, discourses and policies at national level 	<ul style="list-style-type: none"> • Presentation and discussion of interim findings
Questions 3 & 4 Conduct and Framing	<ul style="list-style-type: none"> • Formal modes of conduct, pro-poor preconditions (knowledge-sharing, participatory processes, recognition of local priorities) • Informal engagements (resistance; negotiation; claims for recognition and authority) • Framing and recognition of actor's diverse interests, priorities, and strategies 				

4. Results

In this section I show how power relations are interrelated with dynamic ecologies across both the conduct and context of the EbA interventions. In Section 4.1, I focus on the context of EbA interventions and how people's agency—and thus empowerment—helps to understand how vulnerability is reconstituted across social and ecological relations. In Section 4.2 I focus on the conduct of the EbA interventions. At the end of the section, Box 1 illustrates how context and conduct of the EbA actions focused on Home Gardens interact at both sites to produce specific opportunities for social benefits.

4.1. Context

I examine here how power relationships are interrelated with dynamic ecologies at the two study sites. These are supported by illustrative quotes in Table S1. The central findings from Questions 1 and 2 were as follows.

Ecological relationships are part of marginalised peoples' vulnerabilities to climate change at the two study sites. Each of the sites is an isolated, marginalised farming community, largely dependent on rain-fed agriculture. Consequently, people at these sites are vulnerable to an array of climate-related risks, especially water insecurity, that are mediated by the ecological characteristics of the landscapes. For instance, in Galgamuwa, a dry-zone area vulnerable to climate-related droughts and floods, vulnerability is exacerbated through the reinforcing feedback loops of commercialised agricultural development. Changing agro-ecologies result in a gradual shift away from the multifunctional qualities of each landscape that provide for a wide variety of livelihoods and basic needs, towards landscapes that provide fewer benefits for fewer individuals and greater incidence of harms and insecurities for a greater proportion of the population. This situation in turn contributes to a greater dependence on cash and to more out-migration to seek employment to meet individuals' needs. In Serupitiya, a rise in pest problems following gazettement of forested hillslopes increases people's livelihood insecurity (Table S1, Quote G). Human-animal conflict is exacerbated by forest degradation in Galgamuwa, threatening livelihood security and mobility, especially during climate-related droughts (Quote D). Through their contribution to existing ecological trends, climate change impacts may reinforce such trajectories, in turn increasing marginalisation (Quote Sb).

Power shapes and is shaped by these dynamic relationships. The Elangawa system itself is a prominent example. In ancient times, Elangawa formed the basis of highly successful hydrologically based empires, the leaders of which gained legitimacy for their rule through water security provided to their paddy-cultivating subjects [51,52]. '*Rajakariya*'—or 'service to the king'—was a key form of Elangawa maintenance, administered by a local *Velvidane* or water manager [47,51,53].

Ecologies, like that represented in Elangawa, are shaped by power relations operating at different scales and timespans. At the political-economic level, colonialism and its legacies have led to a deterioration of common-pool resource management institutions, including for Elangawa maintenance and watershed protection [54]; see also Quote B. The deterioration has been reinforced by changes to village economies, agricultural practices, and land-tenure institutions facilitated by government policies, such as incentives for high-input commercialised paddy production [46,47,53,55,56].

At the community scale, power is expressed in the enactment of agricultural practices, such as hybrid-maize cultivation in catchment areas previously protected for watershed functioning. These practices rely in part on unequal groundwater access through agro-well development, as well as the availability of credit facilities and the need for cash to serve debts. This contributes to the self-reinforcing adaptive trajectory [46]. Power is also expressed in the corrupt practices of Tank maintenance contracts [54]. In Serupitiya, ecology changes through land degradation due to marginalised people's responses to highly asymmetrical power relations, expressed in unfavourable share-cropping agreements and insecure land tenure on hillslopes.

At the household scale, power is expressed in gendered agricultural practices and especially in the prioritization of the male-dominated cash crop cultivation of paddy and hybrid maize at the expense

of female-dominated home garden cultivation (see Box 1). At the individual scale, power expresses itself in people's changing ecological values, including reduced interest in alternative livelihoods such as animal husbandry, as well as a reduced awareness of the ecological functioning of the Elangawa system. The tanks become reduced in people's imaginations to hard infrastructure designed to provide water for commercial paddy harvests twice a year, making the case for ecological restoration much harder (Quote A).

The degradation of landscapes, and the resulting differentially-experienced vulnerabilities, can drive further marginalization. For example, a water crisis like that experienced during the 2017 drought means that only priority activities receive water, and risk-spreading mechanisms do not accommodate marginalised livelihoods (see Box 1). Otherwise, water insecurity disproportionately affects those without wells, a piped water supply, or cash for bottled water. Marginalised peoples, such as women, children, and impoverished community members, have disproportionate dependence on common-property resources/landscape conditions (such as soil, water, and forest cover quality, quantity, and reliability). Powerful actors attempt to encroach upon land and resources, dispossess communities of valuable ecosystems and deprive them of access. These actions may not be intentional or designed to cause such effects. In Serupitiya, the gazettement of forested hillslopes to protect the nearby Victoria hydropower reservoir deprives marginalised people of key adaptive strategies during times of hardship, such as sand mining, gravel extraction, and hunting (Quote G).

Such ecologies form the focus of many of such groups' (empowered) adaptive strategies. Findings from both sites show how marginalised people's agency is integral to specific achievements around securing ecosystem functioning as an adaptive response to climate change impacts (Quote T).

Ecological relations are a tangible component of people's daily lives that helps make them capable (that in turn they are capable of modifying). Such action is limited according to particular contextual power relations, such as the constraining power of tenure rights and share-cropping agreements.

In the face of such power, ecological relations can represent catalysts for marginalised people's agency in the face of change. Such action is illustrated by the example of home gardens (Box 1). At both sites, women are able to effect change in their home gardens more than larger-scale catchment ecosystems, and they can leverage these changes as part of empowering adaptive strategies (Box 1). In these contextual constraints on individual agency, collective power is especially important for marginalised groups. People at either site engage in collective action to manage common-pool resources, labour-sharing, risk-spreading and to honour sacred practices (Quotes H, E, G and F). They are involved in campaigns of resistance, as well as campaigns to get state actors to recognise their diverse (adaptive) needs and aspirations. People come together to increase their collective agency through common-property management and institutions (Quote B). The maintenance and renewal of such institutions is an important empowered adaptive strategy in which people play an active role in maintaining enabling environments. Encroachments of powerful actors that threaten to block marginalised people from accessing ecological resources has faced resistance. For instance, people in Serupitiya led a coordinated and successful campaign against the attempted dispossession of forest resources (recognised for their water security and bio-remediation benefits).

In synthesis, at each site climate change impacts resolve through the ecological relationships people are embedded within. Marginalised groups in particular are increasingly vulnerable to water insecurity because of the degradation of landscapes. These resolutions effect social change, such as increased marginalisation, because of the historical and contemporary power relations embedded in such ecologies. The findings show how different groups are actively involved in reshaping ecologies according to their own empowered adaptive strategies. Consequently, the fulfilment of empowerment as a social benefit of EbA is crucial in order to avoid further marginalisation and increased vulnerability to climate change.

4.2. Conduct

The conduct of the EbA actions was embedded within this relational context, making the EbA actions platforms for renegotiation of such relations. This has implications for social benefits. For instance, in Serupitiya EbA provided opportunities for social benefits through home gardens and dairy production (an addition to the project negotiated by community-members). These were actions that aligned with marginalised people's own adaptive strategies. The EbA projects—and the social benefits that occurred through them—represented expressions of power and transient opportunities for change. These are inseparable from wider struggles over what the ecological dimensions of communities and landscapes represent to different actors as part of their own agencies and aspirations. In the studied cases, power relations critical to shaping the vulnerability of particular people were not addressed through formal participation mechanisms or knowledge exchange opportunities.

Conduct of such EbA actions is embedded within but peripheral to broader power structures, such as tenure, economic or gender-based marginalisation (Quote M). The empowerment expressed in these cases is shaped by land-tenure dynamics that neither people nor the EbA projects have much control over. Likewise, the extent to which surplus production from home gardens can be converted into economic empowerment depends on a wide range of entitlements that condition access for different people (Box 1). Project actors themselves may contribute to such dynamics, for example, by overriding marginalised peoples' risk priorities (Quotes M, R, and U). Based on the findings, both projects have succeeded in involving the community in adapting their environment to a changing climate, but neither has fully managed to create the added benefits of participation to achieve empowerment at a deeper and broader level.

The projects themselves represented power relations in different ways, including formal mechanisms for participation and informal mechanisms such as negotiation and resistance (Quote P). Projects became sites for renegotiating and disrupting the power relations that shape marginalised peoples' vulnerabilities. Here marginalised people's agency was expressed in the project itself, countering more top-down frames of EbA overly focused on ecologies. In the two cases in which social benefits occurred, outcomes were dependent on attention to formal participatory processes as well as more informal means of renegotiating project aims. (Quote N).

An important finding was that empowerment can emerge, not only from taking part in, but by actively resisting and organising against projects. And resistance has consequences, both for participation in project activities and more broadly because the resistance itself becomes a stepping stone for people to achieve societal goals, such as recognition by state actors. For instance, in the Elangawa restoration project, people organised collectively to resist specific parts of the project plan. In so doing, they confirmed their relative power at the district government level. They also pushed for new additions to the project, such as a road across the top of the reservoir levy. Participatory conduct does not always work in the favour of EbA. As an example, when a well-connected community of commercialised paddy farmers resisted ecological rehabilitation of their tank system, it showed how the varied interests of the actors become expressed within processes of participation (Quotes K and O).

The creation of enabling environments was not enough to fulfil social benefits outcomes, particularly the empowerment of marginalised groups such as women and people without access to many of the resources necessary for adaptation. In fact, the projects were framed around ecological relationships (Quotes R and U). This appeared to make practitioners less capable of recognizing the social dimensions critical to achieving such outcomes (Quote Y). The focus on horticultural home gardens in Serupitiya in a context in which dependence on cultivating steep-slopes was shaped by lack of livelihood alternatives and unjust tenure arrangements exemplified this. Although ecology plays a key role in contexts that mediate the impacts of climate change at both sites, the ecological dimension was foregrounded to the extent that the important social dimensions that would be critical to achieving empowerment were not adequately recognised. Since ecology was framed as something separate to be managed according to technical principles by outsiders, rather than as embedded within

people's everyday lives and adaptive strategies, the extent to which ecological factors could form part of empowered adaptive strategies was constrained.

I found examples of project actors implying that ecological context was more important than conduct. The justification was that even if the most vulnerable people are not included through these mechanisms, EbA may nonetheless provide an enabling environment, founded upon marginalised people's disproportionate dependence on ecologies. At both sites ecological context was often prioritised by EbA actors above social-ecological context (Quotes N, P, X, and Y).

Whilst EbA practitioners deliberately chose vulnerable groups including women-headed households and individuals affected by kidney disease as project beneficiaries, project actors stated that the most vulnerable people do not make use of opportunities for participation. In the eyes of the practitioners, the logic is that in the conduct of EbA, more can be achieved by people who already have high agency, and the outcomes of such effective processes can be experienced through the creation of enabling environments that benefit even (or especially) the most vulnerable in these contexts.

Box 1. Illustrating the promise and pitfalls of EbA as an empowering adaptive strategy through attention to Home Gardens.

Both EbA projects specifically worked with home gardens (HGs) because of their relevance to a particularly marginalised group (women within rain-fed agricultural communities). HGs (also known as Kandyan gardens) are an ancient and widely distributed practice and land-use type in Sri Lanka, across both dryland and upland areas. They are social-ecological systems, and moreover, they are active responses to combined pressures, rather than static or passive dependences on natural ecosystems. They represent enactments of individual and collective agency; women (and some men) organize around particular livelihoods and ecologies through HGs which, in the language of EbA, represent discrete sets of provisioning and regulating ecosystem services confined to a particular land-ownership unit (although also playing an emergent role for the Elangawa catchment characteristics). The management of an HG can be conducted by a small group of people or even by individual women.

HGs become especially important to household livelihood security during times of drought, although the gardens themselves face challenges under such conditions [44]. Their potential as an adaptive strategy is based on their ecological functioning as *relatively* resilient forest allegories. Especially critical in relation to paddy or *chena* cultivation, soil moisture and organic matter are restored, micro-climates are more favourable, and there may be synergistic relationships between species [44]. In non-drought times, HGs also play an important role for the household since they are often cultivated with organic techniques, making them an important source of nutritious, pesticide-free food for the family. This is important to people's risk priorities given the high prevalence of kidney disease in these rural communities.

The differential preference for certain livelihoods at the expense of others is expressed in the marginalisation of HGs as a form of adaptation strategy and means of gender-based economic empowerment. In Galgamuwa the home garden committee was instructed by the more influential water management committee to cut back on water use, production, and support to home-gardeners based on the apparent need to conserve water (nominally as a drought-coping mechanism). Such incidents show how HGs are an adaptive response to climate change set amongst broader power relations: "Home gardens are not valued. Their multi-functionality and delivery of regulating services are unrecognised. This is connected with that they are women's domain. Women are in control of the smallest income-generating activity." (Key-stakeholder interview). Such power relations also extend to the conduct of EbA: "UNDP's support to home gardens has received criticism in the past. People have questioned why do they need to be funded? Why do they need to be elevated?" (Key-stakeholder interview). The relevance of HGs to climate change as well as empowerment, indeed their recognition as an empowered adaptation strategy, should be understood in the context of their marginalisation as a gendered practice within rural communities. They exist within broader ecological contexts shaped by unequal power relations, especially the self-reinforcing development trajectory of commercial paddy and maize production, well-digging, and catchment degradation as adaptive responses to climate change impacts and political-economic drivers.

The HG dimensions of the projects further clarified their potential as a vehicle for empowerment. However, it was clear that these benefits were not straightforwardly delivered. Residents of Serupitiya also faced huge barriers to market access of surplus production in their remote location. The project in Serupitiya showed the importance of HGs as an empowerment mechanism. The following quote shows how the financial gains made through HGs play a role in renegotiating relationships in the household and enabling women to have greater control over household decision making. In Serupitiya it was represented in support to women's home gardening societies:

Box 1. Home Gardens (continued).

Society Member: 'Women are a key part of the household. However, unlike men woman have problems with earning money. Now most of the women in this [home gardening] society are earning money and have deposited their money in their own bank accounts. To create a force from women's side, mainly we started this [home gardening society]. We are getting loans from the organization and doing Chena cultivation and home gardening. Then we pay back the loan. The most important thing is the home gardening. We spend this money for our children's education and for buying things for our homes.'

In both Galgamuwa and Serupitiya, financial gains were founded on the direct relationship between women's practices of home gardening and the potential of surplus production from HGs to be sold. Such a vehicle for empowerment depends upon many types of unequally distributed entitlements through which aspirations are achieved. At a planning level as well as within the village, such adaptive strategies and their potential for empowerment partly rest on the extent to which such strategies are recognised by other actors as being embedded within such unequal power relations. This clarifies the need to understand the particular power relations (entitlements) that condition who can access the benefits of particular livelihood strategies and how empowerment may take place through such strategies, making sole focus on the ecological dimensions of HGs a misrepresentation of their embeddedness in power relations.

The EbA actions took advantage of the aforementioned pro-poor preconditions and created participatory means of conduct (Quotes I and J). However, when power relations were not made explicit as part of the conduct of the projects, space was left for dominant interests to predominate the forms for participation (Quotes M, K and Y).

4.3. Synthesis: From Conduct to Context

In this study I explored how conduct and context interrelate at the study sites, providing a useful depth of field through which to analyse the potential for social benefits and the power relations embedded within EbA interventions. The major findings are shown in Table 3, which presents a synthesis of the findings as a whole, enabling the research question to be appraised in light of the data.

Table 3. Synthesis of the main findings.

Sub-Research Question	Can Ecosystem-based Adaptation Strategies Contribute to the Empowerment of the most Vulnerable Groups? If so, how?
1	<ul style="list-style-type: none"> Ecological relationships are a key part of marginalised peoples' vulnerabilities to climate change.
2	<ul style="list-style-type: none"> Power shapes and is shaped through these dynamic relationships. Such ecologies form the focus of many of such group's (empowered) adaptive strategies.
3	<ul style="list-style-type: none"> EbA provided opportunities for social benefits through home gardens and dairy production, actions that align with marginalised people's own adaptive strategies. Conduct of such EbA actions is embedded within but peripheral to broader power relations. Projects are nevertheless key sites for renegotiating and disrupting the power relations that shape marginalised people's vulnerability.
4	<ul style="list-style-type: none"> The creation of enabling environments is not enough to fulfil social benefits outcomes. Projects framed around ecological relationships appear to be less capable of recognizing the social dimensions that are critical to achieving such outcomes.

5. Discussion

In this section, I discuss the findings in relation to existing literature and suggest some implications for EbA practice as well as scholarship. I focus the discussion on four main contributions.

A principal confirmation from these findings is that EbA projects do present opportunities for empowerment, but it is not automatic. The potential for social benefits depends on recognition by the

researchers and practitioners of EbA of people's own adaptive strategies, on the social processes of the interventions themselves, as well as the broader power relations in which EbA is embedded. In the latter part of the discussion, I focus on the possibilities and constraints of such recognition and the role of transformational approaches to EbA.

5.1. Ecology Matters

Previously there has been a lack of crossover between scholarships on EbA and critical studies of adaptation [15,57]. By demonstrating the ontological continuity between ecology and power within the conduct of adaptation, the findings from this study contribute towards a more fruitful conversation between the two fields.

Across the study sites climate-change impacts resolve amidst broader co-evolving social-ecological relations that extend back for millennia. Climate change impacts are driving changes in social-ecological relations [44,45]. Climate change and local ecologies interrelate to shape vulnerabilities for marginalised groups. Such contexts place demands on both research and practice [58–62].

The relations embedded within EbA are expressions of biophysical as much as social power [58]. Such 'socio-natures' [63,64] represent evolving opportunities for renegotiating power relations [24,65]. The cases showed how these transient opportunities for change could not be separated from wider struggles over what the ecological dimensions of communities and landscapes represent to different actors [25,66]. Ecosystem-based adaptation policy, planning, and programming represents opportunities for renegotiation of power structures, confirming the propositions of Bisaro and Hinkel [58]. Contextualising these interventions means being cognisant of the historical and contemporary social-ecological relations in which EbA are embedded. As such, a 'grounding' of critical adaptation studies that account for how dynamic materialities, especially ecologies, recursively evolve with social relations appears to be warranted [67].

5.2. Empowerment Matters

I found that marginalised peoples' subjectively defined adaptation strategies (the aspirations people have to address their risk priorities) are strongly linked to how climate impacts resolve in and through dynamic ecologies. In Serupitiya the advantages of EbA concerned the ability of home gardens to be a catalyst for women's collective action, which relates to widening literature on civic ecology and practices of commoning [68,69]. An important finding was that empowerment can emerge, not only from taking part in, but by actively resisting and organising against projects. The importance of resistance as a necessary push-back mechanism against over-reaches of power is recognised in the power-sensitive scholarship on adaptation, but it has yet to be discussed in relation to EbA. It may be fruitfully incorporated into discussions around trade-offs of ecosystems services [70,71] and the role of knowledge exchange [72]. Recent research on the politics of adaptation by Eriksen et al. [24] and Nightingale [25] shows how people's actions may be just as much about gaining recognition from important actors (such as government officials) or demonstrating authority within common-property management institutions, as making direct changes to ecology.

From the vantage point of theories of empowerment, which recognise the importance of achievements [18], these findings show that in some cases ecological relations are a tangible component of people's daily lives that they can modify [64,73]. By using an empowerment lens, I show that the relationship between ecology and marginalised peoples can equally be expressed in terms of agency, rather than in terms of dependence, which precludes attention to people's own interests, priorities, and strategies. This finding is interesting in light of the study showing that ecosystem-based approaches are particularly prominent in the adaptation plans of low- or low-middle-income nations [14].

The limits of such agency are located within contextual power relations. For instance, property and ownership structures condition the extent to which a farmer can afford to set aside land for soil conservation measures, which in turn is dependent on land-tenure dynamics that people have

little control over. Likewise, the extent to which surplus production from home gardens can be converted into economic empowerment depends on a wide range of entitlements that condition access for different people [73]. The ways that contextual power relations limit the potential for agency of particular groups, including making changes to ecologies as part of broader adaptive strategies, is a finding supported by the critical adaptation literature [34,57,74].

5.3. Social Processes Matter

The cases confirm that EbA contributes to addressing the vulnerabilities of marginalised groups through empowering adaptive strategies, such as through support to home gardens and common-property management institutions. These cases show that the potential for EbA to leverage this position to facilitate empowerment of marginalised groups depends on careful attention to the conduct of EbA through participatory mechanisms, redistribution of expertise and mediation of the diverse subjectivities of various actors. Aside from such formal conduct, empowerment may also arise in the face of EbA actions through renegotiation of project aims, resistance to unwelcome demands, and movements to renewed recognition by state actors. The predominant character of EbA as an intervention places certain constraints on its empowerment potential. Such constraints may be expressed, for instance, in the inability of EbA project managers to recognise such issues.

EbA is a *social-ecological* process, even if it is not recognised as such by those who conduct it [75]. The ‘social benefits’ do not ‘trickle down’ deterministically from the technical administration of ecosystem services [76]. Whether these are state or NGO-driven interventions or more emergent, community-led processes, they are likely to explicitly represent or subtly manifest people’s struggles, rights claims, and resistance around particular ecological functions and dependencies.

To prevent injustices and leverage opportunities for the expression of such agencies, I recommend EbA researchers and practitioners look for ways to build awareness around issues of inclusion and understand where opportunities may lie for vulnerable groups to take greater roles in projects, strengthening their voices in decision-making processes and allowing local priorities and knowledge systems a fair place at the table. Provisions to enable people to build collective agency around the management of ecosystems—recognised as a valuable part of broader aspirations—require negotiation and collaboration that takes time to organize and needs to be protected from the constraints of broader political-economies.

5.4. Framing Matters

The findings suggest that in the studied cases, contextual power is not addressed through formal participation mechanisms. When contextual power relations are so left intact, there are associated outcomes for vulnerability of marginalised groups. Whilst equitable engagements are important constituents of justice in themselves [77], it appears as if the lack of attention to such contextual power relations is a constraint to translating participatory methods into pro-poor social benefits as they have been defined here.

I have demonstrated how the invocation of ‘ecosystem-based’ interventions framed purely in terms of their ecological dimensions has consequences for the agencies of marginalised people in the face of climate change. I argue that without recognition of the power relations and diverse interests that run through and around such interventions, not only will politics, rights claims, and struggles (i.e., conduct) that define people’s subjective social-ecological relations be marginalised, but broader power relations also fail to be addressed [78,79].

The findings support the importance of recognizing the social-ecological character of EbA, evading a distinction between what constitutes “ecological” or “social”, which appear to effect important blind spots in both practice and research on EbA. Indeed a plurality of scholarship examines the distinction between ecology and society, at least in terms of framing (e.g., [80,81]). This suggests that EbA practitioners contribute to ‘minding’ EbA strategies and processes, recognizing and actively working with the subjective dimensions of EbA (see Figure 3). EbA scholarship can contribute to

emerging power-sensitive sustainability science that recognises that silos of equity and environmental sustainability are inappropriate for dealing with the agency of marginalised groups amidst a changing climate [5,8]. Whilst the disciplinary background and experience of the EbA practitioners was not recorded in this case, the results would appear to warrant interdisciplinary attention to such matters.

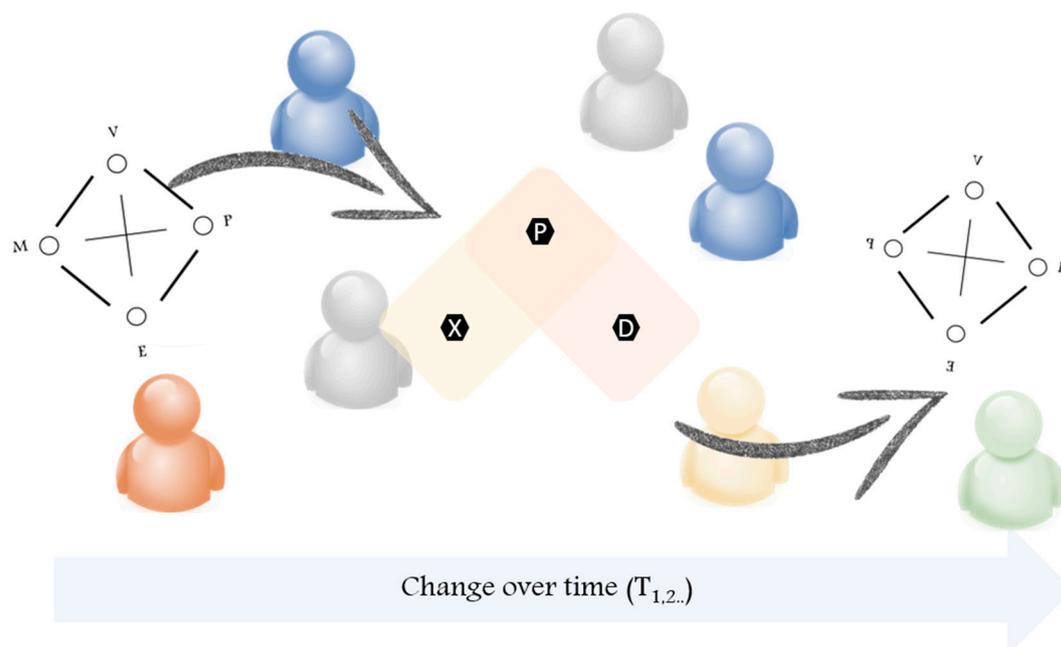


Figure 3. Minding the subjective dimensions of ecosystem-based adaptation, through paying attention to marginalised people’s strategies, the social processes of EbA intervention, and power relations that flow across EbA conduct and context.

5.5. Transforming Nature-based Solutions

EbA protagonists were apparently limited in being able to recognise the politics, resistance, and even diversity of dependencies that such actors need to account for within the conduct and contexts of EbA. In subtle ways, EbA may even reinforce power relations. Such findings add to growing arguments that peoples’ subjectively defined strategies and agency (i.e., empowerment) become part of sustainable adaptation action [82,83].

However, such agency is limited according to particular contextual power relations. EbA may be able to access leverage points for transformational change of power structures not available to marginalised people. EbA may be better positioned to confront broader scale power dynamics, such as land-tenure institutions, or increasing recognition of marginalised people’s strategies in government policy and climate- or non-climate-related programmes. The most transformational leverage points may be in understanding how power and ecology interrelate over time to drive particular adaptive trajectories at the expense of others [75,84].

6. Conclusions

This work contributes to sustainability science by unpacking the emerging framings of ‘nature-based solutions’ to societal challenges. Importantly, this means being open to plural understandings of how power works in specific contexts to condition vulnerabilities and opportunities for different groups of people. In addressing the social co-benefits of nature-based solutions, researchers and practitioners implicitly recognise that environmental sustainability and vulnerability to climate change are bound together. Such links form the sites of power struggles between actors with diverse interests who occupy different positions of power within society.

In the two instances of EbA studied here, enabling marginalised people to respond to climate change impacts through empowered adaptive strategies (i.e., social benefits) is not only possible but also crucial to address to avoid further marginalisation and increased vulnerability to climate change. Despite such potential, I have shown how EbA focused on the creation of ‘enabling environments’ will not be enough to fulfil such social-benefit outcomes. In the studied cases EbA practitioners had difficulties in recognizing power relations and social aspects. Moreover, the focus on ecology as something separate from society appeared to occlude such issues. I suggest greater attention to the power relations that are bound up in researching, designing, and implementing such solutions. EbA projects—in the form that they are currently framed—are likely to be marginal in people’s claims to rights and broader recognition. Being reflexive towards relations between power and ecology, and combining transformational adaptation with EbA could be useful steps forward.

Supplementary Materials: The following are available online at <http://www.mdpi.com/2071-1050/11/3/772/s1>, Table S1. Illustrative examples.

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