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Links between Climate Change Mitigation, Adaptation and Development in Land Policy and Ecosystem Restoration Projects: Lessons from South Africa

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Abstract: Links between climate change adaptation, mitigation and development co-benefits in land policy and ecosystem restoration projects are hampered by limited understanding of how multi-faceted policy, institutions and projects interact. This paper explores perceptions of co-benefits produced by two community-level projects that pursue ecosystem restoration in South Africa. It develops a new analytical framework to assess the enabling and constraining factors in delivering triple wins for adaptation, mitigation and development. The aim is to investigate the potential for integrating community perspectives into policy and project development and implementation. Data collected through mixed-methods (policy analysis, semi-structured interviews, participatory site visits and focus groups) are analysed using thematic analysis. We find that while the projects investigated have potential to deliver triple wins, siloed approaches presently hinder effective implementation. In particular, project focus on job creation hampers the achievement of longer-term mitigation and adaptation benefits. Operational flexibility, long-term goals, multi-sectoral cooperation and enabling frameworks are imperative to the achievement of triple wins. Findings provide valuable lessons that can be applied across sub-Saharan Africa towards achieving triple wins in climate and development policy and practice, especially those developed with job creation and ecological restoration aims.

Keywords: climate compatible development; sustainable land management; project monitoring and evaluation

1. Introduction

Mitigation of and adaptation to anthropogenic climate change ultimately share the same objective, namely to moderate its undesirable impacts. The two approaches, however, are fundamentally dissimilar, differing from each other, *inter alia*, with respect to the typical spatial and temporal scales on which they are considered. Both mitigation and adaptation interventions are usually undertaken at the regional or local levels. Yet, while the benefits of mitigation are global, those of adaptation are relatively localized and private [1]. Furthermore, whereas mitigation is a long-term effort requiring long-term commitment, adaptation is often a short-term coping strategy [2]. Owing to such major differences, the types of policies and sectors involved in the implementation of mitigation and adaptation strategies inevitably vary. Füssel and Klein ([3], p. 304) note that mitigation and adaptation policies are ‘formulated largely independent of each other’, while Swart and Raes [4] argue that in most economic

sectors concrete options for win–win outcomes that both reduce emissions and vulnerability to climate change remain limited.

It is worthwhile noting at this point, however, that important exceptions have been highlighted in the literature, particularly in the land and water management, as well as in the urban planning sectors. For instance, urban green spaces help to improve the physical and mental well-being of residents, while delivering at the same time adaptation benefits (e.g., cooling and storm-water drainage) and mitigation benefits through, for example, the shading of buildings [5]. Reforestation and agroforestry schemes can help, for instance, to sequester carbon, prevent flooding, enhance biodiversity, rehabilitate degraded lands, provide a local energy supply for the rural poor and improve land use and watershed management [6]. In the water sector, hydropower facilities can reduce fossil fuel use and improve energy security [7]. Obviously, while exploiting the possible synergies mentioned above could offer opportunities for multiple benefits, there can also be trade-offs. Adaptation projects at the local level may in some cases increase energy use and associated greenhouse gas emissions, while hydropower developments could have consequences for flows of water and sediment deposition further downstream [4].

Notwithstanding trade-offs, there has been an increasing recognition among decision-makers and governance scholars of the important role mitigation and adaptation can play in managing future climate change. At the same time, there has also been a growing realisation among involved stakeholders of the threat climate change poses to development, and the consequent need to mainstream climate change into nations' overall development trajectories [8]. Several countries have already taken steps to integrate or reconcile mitigation, adaptation and development in order to leverage the associated benefits, which include reduced poverty, increased employment opportunities, improvements in health, energy and food security, as well as climate benefits [9]. However, these countries—especially in the developing world—have also critically recognised that development gains of the past decades are far from secure and stable, as they have been made in climate-sensitive sectors [10].

As a result of such shifts in policy thinking, there has been growing interest since the mid-2000s in identifying integrated climate change planning approaches that seek to achieve synergies for mitigation, adaptation and development [11,12]. Opportunities to harness these benefits together are referred to as “triple wins” [13], although investigations aimed at aligning climate change and development trajectories in policy and practice have produced a range of terminologies with varied spatial and conceptual emphases on each dimension. “Low carbon development”, “climate resilient development”, “co-benefits” and “climate compatible development” are all examples of operational concepts currently in use in the literature which underpin achievement of triple wins [12]. A subset of studies on triple wins has assessed the aforementioned dimensions through policy analyses across the Southern African Development Community, where high climatic uncertainty limits accuracy in projecting future socio-economic development trajectories [7,14], and confirms the region as a location where further investigation is required. Focusing on the project level, Stringer et al. [8] indicate that triple wins in southern Africa can be achieved only through a systematic change across all governance levels, enabling a shift in the overall development landscape. More broadly, Tanner et al. [15] observe that institutional failings are a major constraint to delivering triple wins, due to the pressures from multiple actors towards fostering short-term improvements, rather than longer-term triple win outcomes.

Suckall et al. [13] stress the importance of implementing local climate policy interventions and community-based management to avoid adverse adaptation effects that might threaten achievement of mitigation and development goals across temporal and spatial scales. Dyer et al. [16] observe that adequate participatory practices and community engagement, combined with establishment of successful multi-stakeholder partnerships, are key factors for project and policy objectives to be met. However, the capacity to set adequate objectives that address mitigation, adaptation and development is hampered by the difficulty in engaging locally to tailor actions that can address community-specific needs [17]. Focus on mitigation, adaptation and development dimensions varies across stakeholder

groups at multiple levels, and there is a need to better understand how best to assess and integrate local-level perspectives into climate and development policy and practice.

To address this gap, this paper proposes a new comprehensive framework to investigate local perceptions of adaptation, mitigation and development co-benefits produced by two community-level projects that pursue ecological restoration in South Africa. This allowed investigation of the following two research questions:

1. What are the policy drivers of projects that support delivery of triple wins (Section 3.1), and what are the reported project achievements and challenges? (Section 3.2);
2. What are the mitigation, adaptation and development co-benefits produced across the case studies at community-level, and how well do these map onto the challenges perceived by people? (Section 3.3).

Data was collected through mixed-methods, including policy analysis, semi-structured interviews, participatory site visits and focus group discussions, and analysed using thematic analysis.

While there is potential for the delivery of triple wins, data show that siloed approaches hinder effective implementation. By discussing key opportunities and challenges in the integration of community perspectives into policy and project development and implementation through case studies from South Africa, these findings provide valuable lessons that can be applied across sub-Saharan Africa and the developing world more widely in order to facilitate the achievement of triple wins for adaptation, mitigation and development. A further contribution of this paper is the development of a novel analytical framework that can be applied as a useful tool for empirical project analyses.

2. Materials and Methods

2.1. Study Country and Case Study Selection

Across Africa, South Africa boasts the most advanced research on climate science [18] and presents a model that all African nations can learn from. Since the country ratified the United Nations Framework Convention on Climate Change (UNFCCC) in 1997, and following the 2001 results of its Initial National Communication to the UNFCCC, the country developed a strong adaptation and mitigation action agenda. The objectives of this agenda have been increasingly coupled with development goals, with a focus on fostering economic growth by raising employment. Under the 1997 Expanded Public Works Programmes (EPWP) and the 2012 EPWP Ministerial Determination, a range of labour intensive ecological restoration activities have been promoted through various “Working for” programmes—i.e., Working for Water, Land, Ecosystems, and Woodlands. These target multiple aspects of mitigation (e.g., sequestering carbon through thicket vegetation planting), adaptation (e.g., building gabions and storm water channels) and development (e.g., education and creating jobs) (Section 3.1).

In 2004, the Working for Water programme initiated the Subtropical Thicket Restoration Programme (STRP), with the ambition to set up a scientific platform to catalyse restoration investments in the Eastern Cape across one million ha of degraded subtropical thicket, mainly by planting Spekboom (*Portulacaria afra*) [19]. The EPWP was broadened by the 2009 National Development Plan—Vision 2030, with a focus on employment and mitigation through carbon market engagement.

Two case study projects that pursue ecological restoration in South Africa were selected (Figure 1) to investigate how these policy drivers can support project delivery of triple wins, assess local environmental and development priorities, and evaluate community-level perspectives. Selection criteria included the following: (i) case studies pursue mitigation, adaptation and development, (ii) they share similar socio-economic and environmental background features, (iii) project conceptualisation and implementation are driven by the policy drivers identified above, (iv) carbon market opportunities are explored by the projects, (v) community-level activities include thicket restoration through Spekboom planting, (vi) observable activities at the community-level have been implemented for at

least three years (allowing for initial project impacts to be assessed) (While this last criterion allows comparability across cases, it must be noted that Living Lands has been operational for ten years, while J4C for 3 years. Despite the limitations in comparing achievements between projects of different duration—with J4C still being in an early stage of its learn-by-doing curve—this comparison provides useful insights in the assessment of implementation opportunities and challenges.).



Figure 1. Ecological restoration case study projects, South Africa. Source: adapted from [20].

2.1.1. Case Study 1: Living Lands

Living Lands is an NGO that since 2008 has been operating in the Baviaanskloof Hartland, an area of approximately 50,000 ha. The area is part of the Baviaanskloof Mega-Reserve in the Eastern Cape, and comprises a cluster of state-owned protected lands within a network of private and communal land. Most of the 1000 people who live in the Hartland belong to the coloured community and work on the farms owned by white landowners. Major economic activities include farming of goats, sheep, and to a minor extent cattle and ostriches, alongside production of vegetable seeds. Overgrazing is recognised to be the main driver of degradation of the thicket vegetation that characterises the area, resulting in increasing levels of soil erosion, reduced water retention and creation of gullies [21]. These threats are exacerbated by the changing climate and high rainfall unpredictability, with extended droughts that can last several years. Annual precipitation averages 250 mm, but can range between <50 mm and >400 mm [22]. Since 2008, Living Lands has implemented a range of projects in the Hartland with the aim of promoting a social learning process towards a “living landscape” [23]. This has been pursued through various restoration, catchment management, awareness raising and community building activities, which include thicket restoration through Spekboom planting (Section 3.2).

2.1.2. Case Study 2: Jobs 4 Carbon (J4C)

The J4C project, initiated in 2014 and managed by the Wildlife and Environment Society of South Africa (WESSA), is located within the Gouritz Cluster Biosphere Reserve (GCBR) in Vanwyksdorp, Western Cape. The initial J4C project (2014–2016) was managed by WESSA, the second phase (2017–2018) by the GCBR. Uniquely, three biodiversity hotspots (Fynbos, Succulent Karoo and Maputoland–Tongoland–Albany) converge in this area. With a population of approximately 800 people, Vanwyksdorp is a marginalised and vulnerable area characterised by high levels of unemployment, poverty and ecological degradation. Overgrazing under historical land use has

caused soil degradation, exacerbated by climate change and high annual rainfall variability, ranging between 125 and 400 mm [24]. Economic activities focus on livestock farming, irrigated agriculture and some tourism. J4C aspires to restore degraded thicket through Spekboom planting aimed at creating employment and developing alternative income streams from the carbon market (Section 3.2).

2.2. Methods

Table 1 summarises the multi-level, mixed-methods approaches used to address the research questions, including details on sample size across stakeholder groups.

Table 1. Mixed-method research approaches across case studies and sample size.

Method	Stakeholder Type	Sample Size (Total N): Case Study 1 Living Lands	Sample Size (Total N): Case Study 2 J4C	Total
Semi-structured interviews (community-level)	Land owners	4 (4)	4 (7)	8
	Field workers	8 (9)	15 (24)	23
Semi-structured interviews (experts)	Project developers	6	3	9
Semi-structured interviews (experts)	Policy makers and academia	7	5	12
Participatory site visits	Mixed	3	4	7
Focus groups	Mixed	2	2	4
TOTAL				63

Fieldwork across study sites took place between February and April 2017. Participants' consent to participate in the research was obtained prior to each interview (ethical approval reference: AREA 16-108, University of Leeds, Leeds, UK). Initial stakeholder identification through literature review and introductory conversations with project developers allowed purposive sample identification and selection, as well as design of interview questions targeting each sample group [25]. To address research question 1, stakeholder roles and perceptions of triple wins, achievements and challenges were assessed through semi-structured interviews with project developers ($n = 9$), and regional- to district-level policy makers and academics ($n = 12$) identified through snowball sampling [25] [Supplementary Material 1]. Questions considered: the organisation's background data; socio-economic and geographical features of study sites; stakeholders' roles; project drivers, objectives, achievements and challenges targeting mitigation, adaptation and development; community engagement; monitoring and evaluation; and policy implications. Using documents purposefully retrieved from online archives and government departments, complemented with data gathered in the semi-structured interviews, a list of relevant national to sectoral policies concerned with climate change and development nationally was compiled, including details on their aims, objectives and activities (Table 3, Section 3.1).

The next step involved addressing research question 2 through the use of community-level semi-structured interviews ($n = 31$), participatory site visits ($n = 7$) and focus groups ($n = 4$). Gender-balanced samples comprised owners of farmland and workers. This enabled us to equally value different gender-specific viewpoints and priorities [26]. Participants were selected who have been actively engaged with the projects since their early stage of implementation. A grounded theory style approach was employed, where sampling continued until theoretical saturation was reached [27]. Questions targeting land owners [Supplementary Material 2] and workers [Supplementary Material 3] further investigated key themes, with a focus on their perceived current and future benefits derived from the projects and the level of community engagement. Interview notes were compared and analysed through the writing of analytical notes to identify emerging issues for further discussions. Data and initial findings were cross-checked through four focus groups comprising 3 to 10 purposively sampled participants, including mixed stakeholder types. Collective discussions enabled a deeper understanding to be gained of the issues covered in individual interviews. Seven participatory site visits (3 with Living Lands, 4 with J4C) with mixed stakeholders validated and triangulated the data generated through the other methods.

Interview notes were subjected to qualitative thematic analysis undertaken by the lead researcher [28]. Key steps involved: (i) scrutinising interview notes after the end of the fieldwork to familiarise one's self with the data, (ii) noting patterns and making a list of salient features, (iii) grouping patterns into key themes (iv) further examining the data to ensure that the themes identified were valid, non-redundant, and that there was sufficient data to fill them, (v) refining the named themes.

The steps above allowed elaboration of a novel analytical framework to assess the benefit dimensions of the case studies. This framework targets a gap in the literature with respect to better assessing and integrating local-level perceptions of co-benefits in climate and development policy and practice. Table 2 outlines the definitions of each benefit type and the indicators used to assess them across dimensions.

Table 2. Framework for analysis of adaptation, mitigation and development benefits of case studies: definitions and indicators.

<p>Adaptation: Adjustment made to cope with climate impacts, which moderates harm or exploits beneficial opportunities (adapted from Noble et al. [29])</p> <hr/> <p style="text-align: center;">Indicators:</p> <p style="text-align: center;">STRUCTURAL</p> <ul style="list-style-type: none"> • Built environment & ecosystem-based: ponding, natural barriers, soil & water conservation <p style="text-align: center;">SOCIAL</p> <ul style="list-style-type: none"> • Educational: awareness raising, knowledge-sharing and learning platforms • Informational: community-based adaptation plans and participatory scenario development • Behavioural: changing cropping & livestock practices and livelihood diversification; reliance on social networks. <p style="text-align: right;">(Source: adapted from Noble et al. [29])</p> <hr/>
<p>Mitigation: Intervention that reduces greenhouse gases emissions and increases their uptakes by the Earth system (adapted from Denton et al. [30])</p> <hr/> <p style="text-align: center;">Indicators:</p> <ul style="list-style-type: none"> • Trees planted, soil restored and carbon sequestration <p style="text-align: right;">(Source: adapted from Powell [31])</p> <hr/>
<p>Development: Intervention that enhances short and long-term capabilities, assets and activities required for a means of living, towards the achievement of the Sustainable Development Goals (adapted from Chambers and Conway [32] and Suckall et al. [13])</p> <hr/> <p style="text-align: center;">Indicators:</p> <p style="text-align: center;">HUMAN</p> <ul style="list-style-type: none"> • Skills, knowledge, training <ul style="list-style-type: none"> • Labour power • Livelihood diversification <ul style="list-style-type: none"> • Health <p style="text-align: center;">SOCIAL</p> <ul style="list-style-type: none"> • Networks, connectedness, membership, relationships of trust <ul style="list-style-type: none"> • Information exchange, empowerment, ownership <p style="text-align: center;">NATURAL</p> <ul style="list-style-type: none"> • Access to land, water, wildlife, flora, forest <ul style="list-style-type: none"> • Soil organic carbon <p style="text-align: center;">PHYSICAL</p> <ul style="list-style-type: none"> • Infrastructure and production equipment <p style="text-align: center;">FINANCIAL</p> <ul style="list-style-type: none"> • Savings, access to regular income and credit, insurance <p style="text-align: right;">(Source: adapted from Carney [33])</p> <hr/>

Individual phrases from the interview notes from all stakeholder types were input into Microsoft Word 2013, categorised into their appropriate themes and pasted into the analysis framework matrix (data deposited in Research Data Leeds Repository, doi: <https://doi.org/10.5518/347/>). Expert perspectives were combined with the literature review in order to assess the reported project achievements and challenges (Section 3.2). Community-level interview notes were used to assess

the local perceptions of project benefits and challenges. Each phrase in the analysis matrix from all stakeholder types was assigned an ID based on the type of (co-)benefit to which it relates.

Figure 2 summarises the integration between mixed-methods approaches used to assess case studies and policy, their linkages to the analysis framework and the study outputs.

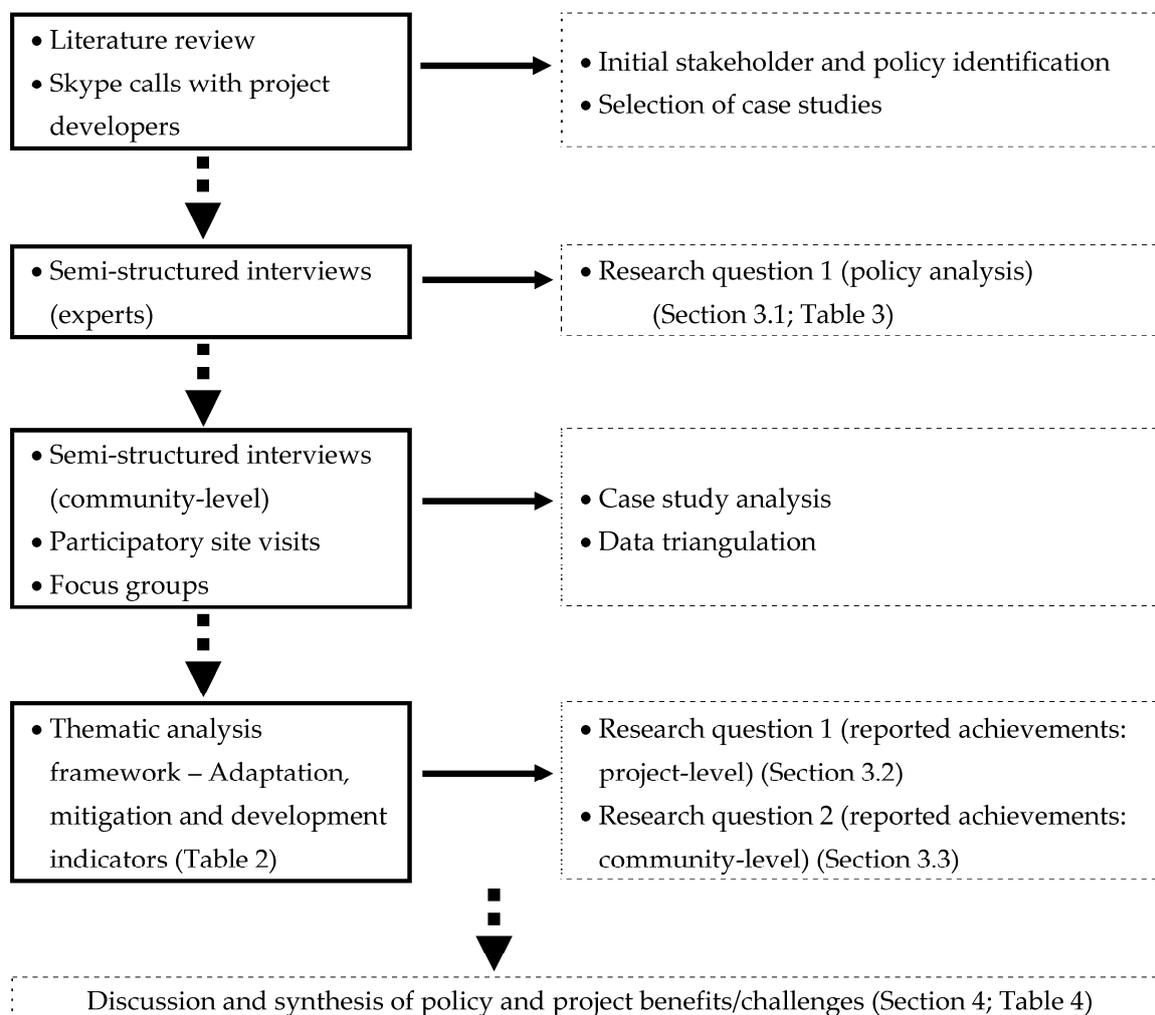


Figure 2. Linkages between mixed-methods, analysis framework and research outputs.

3. Results

Grounded in the analytical framework's structure detailed in Table 2, this section reports on the policy drivers of projects that support delivery of triple wins (3.1), summarises the reported achievements and operational challenges of case study projects (3.2), and outlines the perceived benefits and challenges of case study projects across development, adaptation and mitigation as viewed across different stakeholder groups (3.3).

3.1. Policy Drivers of Projects That Support Triple Wins

The wording "triple wins" was not found in any policy document analysed. However, interviews with the Department of Environmental Affairs reveal that triple win dimensions are targeted by various policies and programmes, in which thicket restoration is promoted for the following reasons: "we have water problems, we need to restore land, there is a carbon market, and there are opportunities to create jobs and fight global warming" [interview #22, policy maker]. Table 3 summarises the key policies and programmes identified.

Table 3. South Africa’s policies and frameworks addressing triple wins in ecological restoration.

Policy/Programme	Objectives Addressing Adaptation, Mitigation and Development
Expanded Public Works Programmes (EPWP): Basic Conditions of Employment Act (1997); and Ministerial Determination (2012)	Programmes aimed at improving public natural assets through labour-intensive activities: Working for Ecosystems: reverse environmental degradation through ecological restoration; enhance carbon sequestration, water regulation and purification; reducing natural disasters by improving landscape/catchment stability and resilience. Working for Water: foster labour-intensive community development for environmental conservation. Create an enabling environment for skills training and health improvement. Working for Land: restore degraded ecosystems to their original state so to maintain or support their natural species. Address land degradation caused by overgrazing, soil erosion and unsustainable farming.
Subtropical Thicket Restoration Programme (STRP), 2007–2016	Demonstrate feasibility of restoring thicket at a farm scale to provide biodiversity gains and carbon sequestration on a landscape scale through labour-intense activities.
National Development Plan—Vision 2030 (2009)	Protect and enhance environmental assets and natural resources as a basis for economic growth and development. Increase employment to pursue economic growth. Reduce GHG emissions and entrench an economy-wide carbon price. Broaden the EPWP to cover two million fulltime jobs by 2020.
National Framework for Sustainable Development (2008); National Strategy for Sustainable Development and Action Plan (2011–2014)	Foster ecological sustainability through transition towards a resource-efficient, low-carbon, pro-employment growth path. Stabilise GHG concentrations and adapt to climate change impacts. Foster a green economy.

Development through job creation is seen as the main driver of policy action, with ecological restoration as a tool to achieve this: “The EPWP sets ambitious employment goals . . . but how do you employ all these people? Through environmental restoration” [interview #23, policy maker]. Given the limited STRP and EPWP budgets, mitigation opportunities through carbon sequestration were pursued as a way to financially sustain future restoration activities.

The case study projects came into existence driven by the policy programmes outlined in Table 3. Both Living Lands and J4C’s objectives were conceptualised to meet policy demand and access funding from the National Department of Environmental Affairs and other funders, e.g., the European Union in the case of J4C. Between 2006 and 2016 the STRP funded the PRESENCE Learning Network and village—a platform that generates and shares knowledge to mainstream restoration of ‘living landscapes’. In 2007, this resulted in the creation of Living Lands as an NGO: “Living Lands was born out of the process to sequester carbon and do thicket restoration funded by EPWP, STRP and East Cape Parks . . . we acted as knowledge facilitator between these agencies—who did the planting—and the farmers” [interview #17, project developer]. For J4C, the project idea came from discussions with government officials about their restoration work: “We’ve packaged the concept of planting Spekboom to create jobs, setting up agreements with landowners, and doing carbon mapping to assess the potential to access the carbon market” [interview #31, project developer].

3.2. Reported Project and Policy-Level Achievements and Challenges across Adaptation, Mitigation and Development

This section outlines the projects’ achievements and challenges across dimensions reported through the expert interviews and literature review.

3.2.1. Adaptation

Structural landscape adaptation has been pursued by Living Lands through multiple projects targeting restoration and catchment management. These resulted in the restoration of four alluvial fans, various gullies and one wetland [23]. Social adaptation was prioritised, e.g., through the development of a participatory landscape plan on integrated catchment rehabilitation: “We are improving water replenishment” [interview #19, project developer], and the support provided to Eastern Cape Parks to contract a biodiversity stewardship agreement over 45,000 ha in the Baviaans. Through contractual agreements with five land owners, since 2014, J4C has set aside 1220 ha of habitats to be used for conservation. As of 2017, J4C developed a preliminary management plan used to facilitate the establishment of a nature reserve in the project area, under a stewardship agreement with Cape Nature.

3.2.2. Mitigation

A wealth of knowledge on carbon sequestration potential in the project area has been generated by Living Lands through PRESENCE—e.g., by MSc-level research [22]. However, adaptation through catchment restoration and development are prioritised over mitigation: “We are not sequestering much carbon . . . we retain water in a much shorter time and over a smaller surface . . . we are trading future benefits from carbon with more immediate benefits for water and local livelihoods” [interview #19, project developer].

Carbon market opportunities have been explored by J4C through a baseline carbon sampling carried out by the Rhodes Restoration Group. After performing a fine scale mapping of planting habitats in 2014, planting sites were selected based on where (i) the spekboom veld occurs in the project domain, (ii) varying levels of degradation occur, and (iii) areas with the highest carbon sequestration potential were identified. The planting methods, grounded in government protocols, were refined through ecologists’ expert advice. The planting was carried out by workers directly employed by J4C, which gave the flexibility to postpone the planting dates when the weather was not suitable, therefore maximising success rates. The reported mortality rate under J4C accounts for less than 20% [interview #30, project developer].

3.2.3. Development

Human

Human development impacts through labour enhancement were facilitated by Living Lands. Between 2008 and 2017 through the Gamtoos Irrigation Board (GIB)’s contracting system a total of 298 temporary workers—employed on short-term 21-day contracts—have been employed for 7932 working days [interview #26, project developer]. According to a policy implementer, the contracting system generates valuable development opportunities: “Employment is a good achievement, people gain transferable skills” [interview #21, policy implementer]. Since 2015 Living Lands has sought to diversify and employed 9 permanent restoration workers, with the aim to deliver more sustainable employment and improve restoration work by testing alternative techniques that are conducive to stronger natural development impacts [interview #19, project developer]. This marks an operational shift from “facilitator” to “implementer” of restoration. Through research supported by PRESENCE, knowledge on restoration and catchment management has been generated by 90 BSc and MSc students and 10 PhD researchers.

J4C employed 60 workers in 2014–2016 and 24 workers after 2016 to carry out Spekboom planting [15, interview #30, project developer]. When the workers are not planting, labour power is sustained by keeping them employed in other activities, such as harvesting and picking olives across J4C’s partnering farms. As noted in an interview with a scientist: “J4C’s priority was the success rate. Using their own workers instead of contractors allows them to plant better and during the appropriate time” [interview #50, scientist]. This was mirrored by another scientist, who stated that

“J4C operates at very small scale; it is very well implemented because there is a local champion behind it” [interview #20, scientist].

Through training delivered by both projects to the workers involved with restoration and Spekboom planting, skills and knowledge development impacts have been reported: “We’ve trained them on first aid, health and safety, how to run a bank account and manage personal finance, fire protection, snakes handling, erosion and rehabilitation” [interview #30, project developer].

Social

Since 2008 Living Lands has promoted social learning processes for restoration through a bottom-up “Theory U” type of approach, which aims to build trust and deliver change in co-production with the local community [23]. Focus on social development dimensions included the implementation of awareness raising and community building activities. A farmers’ conservancy was created to provide farmers with an alternative communication platform to discuss restoration priorities among land owners and implement actions. In 2015 Living Lands supported the creation of DEVCO, a development company managed by 4 farmers. DEVCO promotes transition from traditional livestock farming to less water-intensive practices such as growing lavender and rosemary for the production of essential oils.

Social development through trust and community building, information exchange and empowerment have also been reported by J4C: “We have dinners, presentations, talks . . . we connect and empower people” [interview #30, project developer]. Focus on social development through small-business generation was also reported by J4C. Since 2016, they have trained one land owner who is now participating in the development of a social enterprise that sells Spekboom cuttings.

Natural

On the one hand, rehabilitation through Spekboom planting has been pursued by Living Lands by facilitating the on-the-ground work of STRP implemented by the GIB. However, it played a minor role in achieving Living Lands’ mission to create a living landscape: “We were not advocating for Spekboom planting . . . We did the initial ground work and connected the GIB to the community. GIB funded PRESENCE and the funding came from thicket restoration” [interview #26, project developer]. The testing of alternative restoration techniques has not yet produced observable large-scale impacts.

On the other hand, within a three-year implementation period, J4C has rehabilitated areas of Spekboom and they expect to generate observable restoration benefits in the longer term [interview #30, project developer]. Figures on the amount of ha restored by each project are not indicated due to the variability of the planting and restoration methods used, which limits the meaningfulness and comparability of quantitative figures: “How many ha are planted is important but it’s not a good indication of how the area has been restored” [interview #21, policy implementer].

Physical

Through funding provided by Commonland in partnership with Grounded under a 20-year operational timeframe, an essential oil distillery was built by Living Lands to support the DEVCO farmers, with the aim to: “promote sheep and goat removal to stop degradation . . . generate alternative income through the essential oil distillery, and reduce irrigation needs” [interview #17, project developer]. No infrastructural impact was reported by J4C.

Financial

Increased access to regular income has been reported by Living Lands after the 9 permanent workers were hired: “We prefer to employ a few permanent workers as it provides much better longer-term upliftment . . . people want stability, we wish to avoid working with contractors” [interview #19, project developer]. Similar benefits were reported by J4C, which since 2014 employed a total of 24 workers on a regular basis.

3.2.4. Challenges

Starting with Living Lands, one challenge identified concerned limited access to the carbon market. Despite research having been implemented by the organisation to expand knowledge of carbon sequestration potential, carbon market opportunities have not explicitly been pursued due to high costs: “baseline studies on each plot planted were needed, but they were not done as too consuming in terms of money and time” [interview #26, project developer]. Accessing the carbon market is not considered by the project as a community’s priority: “In the Baviaans nobody is interested in the carbon credits” [interview #17, project developer].

A second challenge for Living Lands related to Spekboom planting under STRP’s protocols during the period when the organisation acted as “facilitator”. Planting sites were selected based on convenience and accessibility. Planting methods followed the STRP’s protocols, with inflexible dates decided on contract. The reported mortality rate accounts for over 50% and project interviewees observed that the STRP’s system is inefficient. While prioritising job creation, it misses opportunities to implement successful restoration: “They tried to apply the same plantation protocol across different areas with different vegetation, but we have learned that it doesn’t work . . . some spots were planted multiple times as all the plants died, but this accounted towards a larger total amount of ha planted and jobs created” [interview #26, project developer]. This was mirrored in interviews with policy implementers: “We replant up to 6 times in the same area” [interview #22, policy implementer]. In addition, scientists found that: “60% of the planting sites chosen by the implementers trained by us were in the wrong habitat . . . they worry about claiming how many jobs they have created, but they don’t assess their ecological and social impacts, there is no baseline and monitoring assessment” [interview #20, scientist]. However, the latter statements are in contrast with those from policy implementers, who state that despite not having a formal reporting system to monitor mortality rates and not carrying out formal analysis of their socio-economic impacts: “We check when we do the field visits” [interview #22, policy implementer].

Thirdly, limited operational flexibility imposed by funding agencies has been highlighted as a major challenge by Living Lands: “Proposals want us to do cheap rehabilitation, but we have a variety of ecological problems, and Spekboom is not enough to address them. The replanting of thicket needs to be combined with erosion control measurements to prevent erosion and the development of gullies” [interview #19, project developer]. Since 2016, flexibility in restoration approaches has been sustained by private sector funding. A field visit revealed that changing practices through higher operational freedom can better sustain delivery of multiple benefits: “We test new methods: co-planting, adding organic matter, breaking the soil crust, brushpacking, biodegradable silt traps . . . this will create Spekboom hotspots around which more plants will grow and retain water . . . it will build up the top soil, slow down water runoff, promote nutrient cycle, stabilise the environment” [participatory field visit #P1].

Moving on to J4C, the need for higher funding flexibility was also raised. The organisation stressed that the current funding system focuses on actions aimed at achieving long-term broad goals. However, this does not sufficiently support the short-term activities needed to achieve them: “We can’t build our activities only based on government funding. There is never enough allowable money for the type of activities that we need to do, such as engagement and carbon assessments” [focus group #56]. Enabling access to co-funding was identified as a priority in order to cover the spectrum of project costs and deliver wider mitigation benefits coupled with development: “You can’t translate the amount of money you have straight into jobs without having a wider buffer system” [focus group #56]. Improved multi-stakeholder cooperation was viewed as necessary to create institutional and legislative environments that are conducive to the achievement of broader co-benefits: “The challenge is to get a range of actors to deal with an issue . . . all the legislative requirements must work down quickly to find solutions, otherwise things don’t happen” [interview #31, project developer].

A second challenge stated by J4C related to the introduction of a carbon tax, combined with the project capacity to deliver wider conservation benefits. These were reported as major enabling success

factors: “Carbon will become attractive only if coupled with water, food, conservation, biodiversity . . . we are not pursuing certification as we are too small to face the costs . . . a carbon tax will hopefully be implemented in 2018 and it will create a market” [interview #31, project developer]. This has been stressed as a pressing issue also by policy makers, who noted that access to carbon income expected under the STRP has been constrained by the fall of the carbon market in the late 2000s: “In 2008 we had a crash in the market and the whole carbon thing collapsed. At this stage, carbon credits are not anymore an option” [interview #21, policy maker]. Similar views were shared by a scientist, who stated that instituting the South African Carbon Tax will be key in boosting the carbon market in order to foster higher mitigation and financial development benefits at the project level [focus group #55].

A final challenge noted by J4C was on the narrow reporting criteria—focused on finances—set by international funders. It was argued that these do not create incentives to implement projects from a triple win perspective: “While for us the exciting part would be to share narratives about our achievements, their [funders’] reporting has a rigid tabulated format: box thinking focused on finances but with no narrative on the socio-environmental impacts” [interview #30, project developer].

3.3. Perceived Community-Level Project Benefits and Challenges across Adaptation, Mitigation and Development

This section details the perceived benefits and challenges of projects at the community-level as assessed in interviews, focus groups and participatory site visits.

3.3.1. Adaptation

Spekboom planting and broader restoration activities of Living Lands are expected to deliver positive structural adaptation impacts on soil and water conservation: “With Living Lands we have been working on three restoration projects on hill slopes to reduce runoff and on the river flood plain to channel the water” [interview #12, land owner, male]. The new business opportunities introduced by DEVCO have acted as a driver of social adaptation, i.e., they have started diversifying their livelihoods by changing cropping and livestock practices: “We adapt to the lack of water by removing our livestock and switching our crops to lavender and rosemary for essential oil production, which consume a fraction of water than fodder” [interview #14, land owner, male].

Under J4C, no benefits focused on adaptation alone have been reported, but two land owners reported awareness of the potential to deliver triple wins: “It is the perfect marriage between restoring the little Karoo and fostering development. The Spekboom will make a natural wall that will stop and accumulate water, retain carbon in the soil, and it makes so much sense because the project fosters socio-economic development” [interview #53, land owner, male].

3.3.2. Mitigation

Mitigation through composting and carbon absorption derived by Spekboom planting has been reported as a secondary benefit by the majority of Living Lands’ workers: “Living Lands gives oxygen by planting Spekboom” [interview #4, worker, female]. Only one land owner stressed the carbon sequestration potential of Spekboom.

Under J4C, wider co-benefits were perceived between mitigation and natural development as a result of Spekboom planting: “Spekboom takes carbon dioxide out of the air and it brings oxygen back. It removes the pollution, which is absorbed into the plant” [interview #36, worker, male]. According to a land owner: “Spekboom drops its leaves, creates compost, gathers carbon and releases it into the top soil . . . It improves water retention in the soil and you will then have other plants growing around it” [interview #33, land owner, female].

3.3.3. Development

Human

Positive perceptions about Living Lands were reported on the potential to deliver human development by improving skills and knowledge about restoration through training: “I have learnt about gullies, about working in the field and the need to stop erosion. Before I thought that erosion was normal. Training was very good, and I keep learning” [interview #7, worker, male]. The new skills gained were perceived to deliver the potential to enhance labour power as they could be applied to other jobs: “If they [project] leave tomorrow, I can apply my new skills to find another job, I can become an entrepreneur and deliver training on restoration” [interview #6, worker, male].

Similar human development benefits of building skills and labour enhancement were reported under J4C. According to a worker that used to work as labourer across farms: “J4C is a better job and gives more money . . . In the future I hope to become manager . . . If the project ends, I could find more work as now other farmers know me and would be willing to give me a chance” [interview #49, worker, female].

Social

Land owners reported that solid community networks and relationships of trust were built by Living Lands: “It’s about bringing people together . . . since 2014 we had a lot of communication activities and workshops. This is part of the success story of Living Lands” [interview #11, land owner, male].

Trust and community building were perceived as short-term impacts also under J4C: “Part of the success of J4C is that their manager is able to keep people together” [interview #33, land owner, female].

Natural

All Living Lands workers stressed the natural development impacts derived through the project’s activities: “Living Lands stops erosion, builds up soil and turns places green” [interview #3, worker, male]. A land owner appreciated that the holistic approach to restoration followed by Living Lands has the potential to deliver natural development which will result in triple wins benefits: “The goal of their Spekboom project is to get the canopy back, protect the soil and reduce its temperature, retain water, and retain carbon in the soil to build new soil . . . We must look at it holistically” [interview #12, land owner, male].

Under J4C, only a minority of workers reported similar natural impacts, while their observations were mostly focused on the labour enhancements. Co-benefits between natural development and social adaptation were noted by three land owners: “I don’t have the money to rehabilitate myself, so it’s a win-win . . . Spekboom works well, it will stop erosion and improve water retention” [interview #34, land owner, male].

Physical

The trust built by Living Lands resulted in increasing levels of perceived empowerment and ownership derived by the provision of physical development: i.e., the project constructed an essential oil distillery to be used by DEVCO’s farmers: “I wouldn’t have joined the essential oil production project if we did not have our own distillery. We retain ownership in the process . . . if it wasn’t for them, we wouldn’t have got where we are now, with Commonland [DEVCO’s shareholder] being interested in building opportunities here” [interview #9, land owner, male]. No physical development was reported under J4C.

Financial

Under both projects, no direct financial development benefits were reported. General hopes were expressed by permanent workers that the projects will continue to work with the community in the long term and sustain access to regular income: “I think that they will stay a long time and hope to work with them forever” [interview #2, worker, female].

3.3.4. Challenges

Starting with Living Lands, concerns were raised on its capacity to sustain long-term development impacts on labour power: “I’m not sure if I can grow as we are all just general workers . . . I think that Living Lands will stay only if they get more money” [interview #8, worker, male]. As mirrored by a DEVCO farmer, in order for sustainable employment to be delivered, long-term projects must be sustained. Another DEVCO farmer stressed that a shift from livestock-intensive farming towards alternative practices—i.e., essential oil production—is hampered by the reduced level of income generated shortly after the downsizing of livestock. This needs to be compensated in order to motivate a wider number of farmers to act in the future: “It is easy to say withdraw the animals and plant lavender. But there is a gap period where you need money to keep surviving until you start making profit. Restoration is directly against your pocket in the short term” [interview #14, land owner, male].

Moving on to J4C, concerns over the long-term sustainability of job creation and empowerment were also reported by two farmers: “Only if the project continues there will be no unemployment” [interview #34, land owner, male]. Another farmer stressed that funding unpredictability might hamper project delivery and reduce development benefits: “J4C generates a lot of labour . . . they downsized from 60 to 24 workers because they didn’t have funding. The ones that have been left out might suffer a negative impact” [interview #53, land owner, male].

The abovementioned issues raised by community members under both projects link to broader development priorities being reported. The creation of job opportunities has been flagged up as a way to get out of the vicious cycle of low economic development and poverty [interview #5, worker, male]. Finally, as regards the challenges posed by climate change and land degradation, involvement with both projects was perceived as offering the potential to adapt to and mitigate these changes.

4. Discussion

Since the late 1990s increasing policy efforts have been made by the South African government to address climate adaptation, mitigation and development. This research shows that objectives and actions targeting one or multiple dimensions have been mainstreamed in key policies and programmes, i.e., the EPWP and STRP, under which restoration of degraded subtropical thicket is pursued mainly through planting Spekboom. A major finding from policy analysis and expert interviews indicates that human development—focused on raising employment—is the main driver of these policies, while restoration—through labour-intensive thicket planting—is the tool to achieve job creation. The mitigation component was expected to be pursued as a way to financially sustain restoration activities through potential access to the carbon market. These drivers played a major role in the initiation of the two case study projects analysed in this paper, which have been conceptualised with a view to access government funding by pursuing shared goals. These linkages suggest that policy has the potential to drive projects that can foster triple wins. However, this study mirrors findings from Nunan [12] and Stringer et al. [8], indicating that the simultaneous achievement of three dimensions is hampered by varied—sometimes divergent—priorities pursued by multiple stakeholders across different scales.

A second major finding concerns the new analytical framework that this study proposed as a tool to assess the impacts of policy and practice across dimensions. The framework proved useful in comparing perceptions of multiple stakeholders on achievements and challenges linked to key socio-economic and environmental needs, identified at the community-level. Table 4 summarises the

types of project and policy benefits reported in the expert and community-levels interviews across Living Lands, J4C and EPWP/STRP.

Table 4. Type of project and policy benefits reported across stakeholder type in expert and community-levels interviews.

Benefit Reported	Living Lands		J4C		EPWP/STRP
	PD *	WK/LO	PD	WK/LO	PM
Development (D)					
Human	X	X	X	X	X
Social	X	X	X	X	X
Natural	X	X	X	X	X
Physical	X	X			
Financial	X		X		X
Adaptation (A)					
Structural	X				X
Social	X		X		
Mitigation (M)					
D-A co-benefits	X	X		X	
D-M co-benefits			X	X	
A-M co-benefits					
Triple wins		X	X	X	X

* PD: project developer; WK/LO: worker/land owner; PM: policy maker.

Interestingly, the framework shows a substantial match in reported and perceived benefits at the project and community levels. Projects were perceived to deliver a range of development, adaptation and mitigation impacts, with development being dominant, followed by adaptation in Living Lands and mitigation in J4C. In the case of Living Lands, Table 4 shows stronger reported and perceived benefits across development and adaptation. As stated by the project developer, Spekboom planting has been pursued as a way to sustain broader restoration activities towards the creation of “living landscapes”, instead of being a primary mitigation strategy. This suggests that discrepancies might occur between dimensions pursued by policy/funding and the ones achieved by projects on the ground. Living Lands’ operational focus has been reflected in the training delivered to the local community, which resulted in strong emphasis on development and adaptation impacts being reported in the interviews. In the case of J4C, focus was reported by the project developer on raising employment and mitigation. This has been reflected in the community’s perceptions, according to which, J4C’s main impacts are on job creation and mitigation. As far as both projects are concerned, the aforementioned match in reporting and perceptions shows that they have strong capacity to deliver on human and social development dimensions—i.e., through effectiveness of their activities on awareness raising, knowledge exchange, training and community building. More broadly, this highlights the variability of perceptions across stakeholders about benefits and co-benefits. Varied stakeholder types might have different levels of understanding of the linkages between dimensions leading towards triple wins. Enhancing knowledge and understanding of these links at all levels—i.e., farmer, practitioner, extensionist and policy maker—would favour the design and implementation of actions conducive to triple wins.

A third major finding is that even though short-term labour enhancements have been achieved by both projects, the capacity to co-deliver on longer term adaptation and mitigation will depend on the (i) future sustainability of the jobs being created, and (ii) flexibility of projects to adequately implement actions targeting the two latter dimensions. As stressed by land owners, scientists and project developers, policy funding is heavily focused on reporting short-term job creation achievements. Such an approach is not conducive to the wider implementation of effective adaptation and mitigation

actions. For example, STRP Spekboom planting protocols resulted in high amounts of short-term jobs being reported. However, the lack of operational flexibility afforded to the projects, and the pressure to achieve short-term restoration, have hampered projects' capacities to test alternative or more effective techniques that could be successfully upscaled in the long-term. As stressed by developers and land owners in both projects, successful restoration is expensive and time intensive. It requires flexible approaches which must be location-specific and led by a local champion in order to address local priorities. The narrow focus on the labour dimension of funding is reflected in the reporting system which heavily focuses on finances and number of jobs created. Stronger emphasis on reporting narratives about wider socio-economic and ecological achievements could drive the projects towards achieving triple wins. This could be sustained by making funding available to implement side activities other than job creation, particularly relating to sustaining dimensions on which the projects have strong achievements, such as awareness raising, knowledge generation, training and community building. Capitalising on these strengths would help overcome some key community-level constraints to adaptation in sub-Saharan Africa, which as identified by Shackleton et al. [34] include informational and knowledge limitations that might reflect in "cognitive" barriers to adaptation. This is mirrored by Living Lands, who noted that while "The biggest threat to degradation is people's perceptions", through the knowledge generated by the project "the community has realised that they have to change their traditional farming practices" [interview #17, project developer].

The fourth finding concerns the importance of putting in place the requisite enabling environments for all three dimensions. Even though job creation is paramount, a siloed approach won't deliver triple wins [1,2]. For example, in relation to mitigation, while expectations have been placed on the capacity of restoration to generate revenues through carbon credits, the fall of the carbon market has drastically reduced these hopes. Opportunities are limited by the lack of adequate legislative environments that could support the creation of a carbon market or facilitate entry into existing carbon market opportunities. The institution of a carbon tax has been reported as a key enabling factor. This would raise more concrete interest from projects and land owners to pursue this route.

Mirroring findings from Stringer et al. [6] and Dyer et al. [8], this research suggests that enabling environments can be put in place through enhanced communication and multi-stakeholder cooperation. As noted in an interview with a scientist, despite training being delivered to help policy implementers choose planting sites, planting was implemented in the wrong habitats. Bridging science and policy gaps would promote shared learning—e.g., on planting techniques and site selection—and improve local-level implementation. Improving cooperation across government and project stakeholders would help in setting shared achievable goals over multiple timeframes. This reinforces observations from Tanner et al. [7], who noted that institutional failings and pressures to achieve short-term improvements pose major constraints to delivering triple wins.

Critically, this study shows that enabling environments that can sustain wider and longer-term generation of co-benefits is also provided by the shift of projects' focus towards small-scale, business-driven approaches to restoration. Under DEVCO, Living Land's farmers shift their livelihood activities to new ones that can generate a short-term and tangible alternative income, which is perceived as a more attractive option than "hoping" for carbon credits to materialise in the future. The sense of ownership generated by delegating the control of new infrastructure built by the project (i.e., essential oil distillery) to the farmers under a 20-year operational timeframe enhances local buy-in and sets people's mind into long-term planning and thinking: "We committed to keep our livestock out of the land for 10 years to avoid overgrazing . . . With the essential oil production we won't need any more animals in the field" [interview #9, land owner, male].

5. Conclusions

This paper has explored achievements and challenges of delivering adaptation, mitigation and development co-benefits in two community-level projects pursuing ecosystem restoration in South

Africa. A novel analytical framework was employed to assess reported and perceived impacts across project, policy and community stakeholders.

This study found that while policy can foster triple win delivery at the project level, divergent stakeholders' priorities can hinder success on the ground. Even though project and community stakeholders acknowledged similar benefits on each dimension, the long-term viability of these benefits is hampered by short-term and inflexible approaches (e.g., prioritising unsustainable job creation).

Remedial action could focus on creating enabling environments conducive to the achievement of triple wins (e.g., the institution of a carbon tax to drive forward mitigation, adaptation and development). Such environments could be pursued by enhancing communication and multi-stakeholder cooperation, as well as moving towards small-scale, business-driven approaches.

Findings are applicable across sub-Saharan Africa and can provide important insights with respect to the simultaneous achievement of co-benefits in climate and development policy and practice. The analysis framework developed in this paper provides a useful tool to replicate the study across multiple socio-economic and environmental themes and geographical locations.

Supplementary Materials: The following are available online at www.mdpi.com/xxx/s1, Supplementary Material 1: List of interview questions: project developers, policy makers and academia, Supplementary Material 2: List of interview questions: land owners, Supplementary Material 3: List of interview questions: field workers.

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