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Imaginaries of Development Corridors: Delivering the Sustainable Development Goals through development corridors in East Africa

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Abstract

This research provides critical analysis of development corridors as a mechanism for delivering on the Sustainable Development Goals (SDGs). Using Q-Methodology, we identify three qualitatively distinct imaginaries of development corridors that exist among development actors, across five development corridors in East Africa. These imaginaries articulate shared understandings of the ways in which corridors are likely to support, or limit, achievement of the SDGs by 2030. Contributing to sparse literatures on SDG interdependencies and trade-offs, they also construct explanatory logics around the ways in which SDGs goals and targets interact within corridors. Our analysis suggests that SDG goals and targets are mostly synergistic in corridor landscapes, creating conditions that aid the achievement of each other. However, we also (1) identify specific clusters of goals and targets that are considered to be directly mutually reinforcing and which, strengthened in parallel, could upscale development within corridors and; (2) identify ways in which, following current corridor trajectories, progress towards some SDGs is likely to directly threaten progress towards other goals and targets. Particularly, the analysis identifies biodiversity conservation (SDG14/SDG15), sustainability (SDG11, SDG12, SDG13) and secure and equal access to land (SDG2.3) to be potential trade-offs to other development gains in current corridor trajectories and suggests corridors are not on track to achieve the Agenda 2030 pledge to 'leave no one behind'. Our analysis of SDG interactions in corridors signals priority areas for investment, policy reorientation and strengthened safeguards, to maximise positive SDG interactions and minimise negative ones across multiple interacting policy domains. The research emphasises the need for more integrated corridor governance if the SDGs are to be achieved efficiently, and as a whole, and we suggest ways to enhance policy coherence in corridors, across often siloed sectors.

Keywords: Development corridors; Sustainable Development Goals (SDGs); SDG synergies and trade-offs; policy coherence/integrated development planning; Tanzania; Kenya

1. Introduction

1.1 Development corridors in sub-Saharan Africa

Development corridors represent an important development paradigm in many areas of the world, including in sub-Saharan Africa (SSA): Over 30 'corridors', at various stages of planning and development are in progress in SSA (Enns, 2018; Laurance et al., 2015) and corridors are often positioned as flagship initiatives in national development polices (Schindler and Kanai, 2019).

Development corridors are a generally ill-defined and disputed concept and the material practice of corridors, and the nature of corridor investments, varies significantly. In this paper we define development corridors as programmatic frameworks for spatially targeted investment, aimed at organising defined territories to foster human development via economic growth, often across

multiple economic sectors. Corridors are generally mobilised around objectives of developing a backbone of hard infrastructure (e.g. transport, distribution, water, energy, communication), alongside broader interventions designed to foster an enabling environment for private enterprise, within a determined geographic area (e.g. through the creation of special economic zones, investments in production areas and value chains and other soft infrastructure and enabling policies).

Development corridors attract a lot of development finance from national and international sources. Infrastructure-led spatial planning development strategies have been advanced by global and regional initiatives, from institutions such as the World Economic Forum, the Asian Development Bank, the African Union, the African Development Bank and the G20 (Schindler and Kanai, 2019). Large developing nations seeking to expand their sphere of influence and access to emerging markets are very influential in corridor development: Most notably China, through various regional development strategies such as 'One belt, one road', has become one of Africa's major investors, partially funding many of Africa's development corridors (Gu et al., 2019). National governments are directing their limited public sector resources towards developing corridors, aiming to attract foreign direct investment, overseas development assistance and private sector investment. At the same time, development corridors have become focal points for overseas development assistance (Enns, 2018).

Countries have also signed up to the Sustainable Development Goals (SDGs); a United Nations (UN) led development framework that, although non-legally binding, national leaders committed to deliver within their own national contexts by 2030. The SDGs are mobilised around 17 development goals, 169 targets and a commitment to equitable development, captured in the pledge to 'leave no one behind' (United Nations, 2015). It is generally assumed that development corridors will contribute to the achievement of the SDGs. Indeed, the potential for resources needed to achieve Agenda 2030 to be unlocked through development corridors has been recognised at national and international levels, including through the Belt and Road Forum in Beijing in 2019 (Gu et al., 2019). Given the extensive financial and political resources being diverted to corridor implementation, it is essential that this is realised. Recent research, however, has highlighted that development corridors can have enormous social and environmental consequences, produce a range of large-scale social, political, economic and environmental trade-offs, generate very uneven impacts and exclude vulnerable populations (Chome, 2020; Enns, 2019; Hughes, 2019; Lawer, 2019; Lesutis, 2019a, 2019b).

1.2 Development trade-offs and synergies and a lack of integrated planning in corridors

The SDG agenda explicitly recognises that the SDGs are interconnected and can produce a range of positive and negative interactions, wherein progress towards one goal or target may support or constrain progress towards others (United Nations, 2015). For example, using coal to further energy access targets under Goal 7 could accelerate climate change and ocean acidification, counteracting progress to Goals 13 and 14 (Nilsson et al., 2016). Thus, for the SDGs to deliver on their potential, they require an integrated approach, where development trade-offs and synergies are identified, balanced and prioritised in their implementation (Fuso Nerini et al., 2018; International Council for Science, 2016; Miola et al., 2019; Nilsson et al., 2016).

Achieving such integration is not straightforward. The conceptual underpinning of SDG interactions is in its infancy (Fuso Nerini et al., 2018; Nilsson et al., 2016) and understanding of how to overcome the governance challenges and transformations required to implement such integrated policy making at national levels, goes largely unaddressed within the SDG framework. The SDGs are a framework for countries to determine their own contextually appropriate national and regional implementation strategies; a process called SDG 'domestication'. Domestication efforts, however, are often fragmented and have tended to concentrate on vertical integration – mainstreaming the SDGs into

sectors from national to local levels – rather than on building horizontal linkages between sectors and departments (Curran et al., 2018). Under such systems, multiple public bodies – which typically operate in silos with distinct budgets, communication channels and monitoring systems and face a range of other barriers to cooperation (Newell et al., 2019) – have responsibility for SDG policy formulation and implementation. This limits opportunities to jointly design and implement coherent action through high-level strategic planning or to identify and balance trade-offs and synergies across development action.

Development planning is also fragmented at corridor levels. Although a development corridor may be conceived of as a single initiative, in practice, they are mobilised through a series of quite independent public and private investments, programmes, projects and institutions which cut across the institutional mandates of different government departments, seek numerous public and private benefits and interact and develop incrementally within a corridor landscape. Literatures on national policy integration highlight the implications of such fragmented responsibility between sectoral agencies, such as the risk that weaker ministries – which invariably include environment ministries – are less able to negotiate terms (e.g. Averchenkova et al., 2019; Newell et al., 2019).

African governments sometimes create a single national point of coordination for corridor development and operations (see Table 1). However, they too are limited in their capacity to balance the environmental, social and economic dimensions of the SDGs within corridor landscapes for some key reasons. Firstly, countries rarely adopt a high-level strategic policy or framework to guide the development of corridors; or give corridor coordinating bodies the political power to enforce a corridor strategy (Gannon, 2021, in press). Secondly, corridor agencies often lack clear mandates or incentives to consider their contribution to the SDGs in their work. Thus, where development corridor policies and plans do exist, attention given to the SDGs is mixed and they often focus on individual components of corridors, meaning the interactions and cumulative and synergistic impacts across a corridor are not considered (ibid.). Thirdly, corridor institutions don't necessarily have the tools and capacity to think systematically about the many SDG interactions and trade-offs that may exist over time and space (c.f. Nilsson et al., 2016). Finally, Strategic Environmental Assessment (SEA), which is another potential space in which interactions across different policies, projects and sectors might be evaluated pre-emptively to guide decision making (Hegazy, 2015), is also not reliably being applied in corridors (Olago et al., 2019).

The absence of a policy or institution with a clear high-level mandate to lead and coordinate policy implementation, can additionally limit opportunities for the public sector to signal direction to other stakeholders, such as the private sector and investment community (Averchenkova et al., 2019). This is especially salient in corridors, where delivery hinges on international investment and private sector finance (Schindler and Kanai, 2019) and thus where multiple national and international, public and private actors vie for influence and co-produce corridors.

1.3 Imagining the SDGs in development corridors in Kenya and Tanzania

Within fragmented SDG and corridor policy landscapes, monitoring and evaluation (M&E) of the development outcomes of corridors, especially in relation to the SDGs, is also limited. Corridor authorities' internal M&E functions may have unclear lines of reporting and are often not publicly available. And, while there are ongoing initiatives aiming to harness the potential of big data (Data4SDGs, 2020; IEAG, 2014), data gaps are a widely reported challenge to assessing the performance of corridors and the SDGs (e.g. Republic of Kenya, 2020). In some instances, access to data is further limited by political and legal sensitivities surrounding corridor implementation. For example, in East Africa, open access to data on corridors has been hindered as protests and legal

action – based around claims of land grabs, environmental impacts and lack of appropriate consultation and environmental assessment processes – have emerged around implementation of development corridor projects (KTN News Kenya, 2018). As a result, what development corridors mean for sustainable development, and for who, is often unclear (Schindler and Kanai, 2019). More broadly, while it is clear that context conditions the nature of SDG interactions, there has been very limited academic analysis of how SDG interdependencies and trade-offs emerge and manifest, in theory, or in practice. Existing research is largely theoretical (Nilsson et al., 2016), focused on individual goals (Fuso Nerini et al., 2018; Singh et al., 2018) or published in grey literature (International Council for Science, 2016; Miola et al., 2019).

This study responds to these gaps by exploring stakeholder perceptions of the way in which development corridors in East Africa are likely to support delivery of the SDGs and of the way in which SDG interactions and trade-offs manifest within corridors. It does this using Q-Methodology (Watts and Stenner, 2012), wherein development corridor actors (e.g. policy makers and technical and implementing officers), involved in designing and delivering development in five major corridors in East Africa, are asked to construct a representation of their perspective on which development objectives are most likely to be achieved through corridors, by the year 2030. This is achieved via a statement-sorting exercise based on key SDG goals and targets associated with corridors, with factor analytic techniques used to identify shared perspectives among respondents.

The conceptual basis for the shared perspectives identified through the Q-Methodology factors is drawn from literatures from the field of science and technology studies on imaginaries. Our use of imaginaries follows Jasanoff and Kim (2009), who understand imaginaries as an inherently future-oriented and socially-held and produced concept. However, in applying the imaginaries concept to our Q-Methodology factors, we follow the broader definition of imaginaries mobilised in Jasanoff's (2015) later work, which recognises that an imaginary can be held by *any* collective group. We also move beyond Jasanoff and Kim's (2009) exclusive focus on *desirable* futures within imaginaries, which ignores *undesirable* futures and the opportunity that their articulation may offer to motivate social change (c.f. Milkoreit, 2017). Thus, instead of focusing on desirable or undesirable futures, through our Q-Methodology factors we produce representations of socially-constituted *envisaged* futures, the desirability of which can then be considered and debated.

In doing this we achieve three main objectives. Firstly, we articulate shared understandings of development trajectories in corridors and of the types of development that are likely to be mobilised through corridors. In this way, the research builds on the tradition of using Q-Methodology to identify and compare shared understandings of phenomena within a given population (Coogan and Herrington, 2011).

Secondly, Stephenson, (1936) emphasises that the key difference between Q-Methodology and by variable, or by item, methods of data collection lies in the holistic nature of the Q-Methodological process: The factors constructed in Q-Methodology cannot be reduced to their component parts but rather are interpreted on the basis of the ways in which different themes and ideas (statements) are configured and connected by participants. The Q-Methodology analysis is therefore responsive to the integrated and interdependent vision of the SDGs, providing a tool to explore the way in which stakeholders perceive SDGs to be interacting and interconnecting in development corridors; generating a mechanism to advance our understanding of SDG trade-offs and synergistic relationships within a given context, as called for by Nilsson et al. (2016).

Thirdly, explicitly envisioning possible and likely futures offers potential to meaningfully guide decision-making and to direct and motivate transformational social change (Milkoreit, 2017). Indeed, earlier scenario-based and deliberative envisioning tools have been shown to have the potential to

reduce impact associated with infrastructure development (e.g. Gregory et al., 2012). Grand development plans in SSA often progress slowly and the corridors in this study are at different, but early, stages of development. Thus, the SDG trade-offs and synergies, and areas of uneven SDG progress, that are articulated through the study factors can support reflexive decision-making, reorientation and the identification of priority areas for policy intervention.

We focus our analysis on Kenya and Tanzania; countries where development corridors have taken a central role in national development plans. Respondents are comprised of actors involved in the design and delivery of five corridors, which are at different stages of implementation and have different focal development objectives, but which are all identified as key, or flagship, projects for enabling national socio-economic transformation within the latest national five-year plans (Government of Kenya, 2018; Republic of Tanzania, 2016). In Kenya, we sampled respondents from the Lamu Port South Sudan Ethiopia Transport (LAPSSET) Corridor and the Northern Corridor. In Tanzania, we sampled respondents from the Southern Agricultural Growth Corridor of Tanzania (SAGCOT), the Mtwara Development Corridor and the Central Corridor. Key characteristics of these corridors are summarised in Table 1, with a more detailed summary offered in Supplementary Information (SI).

Table 1: Corridors included within the study sample

Corridor	Corridor agency	Summary and status
Lamu Port South Sudan Ethiopia Transport Corridor (LAPSSET)	LAPSSET Corridor Development Authority	LAPSSET aims to foster transport linkages and promote regional socio-economic development in northern parts of Kenya. It aims to connect a new port at the coastal town of Lamu with Ethiopia and South Sudan. New highways, airports, oil pipelines, railway networks, resort cities, a new dam and a series of development zones are also envisaged in the corridor. Some elements, such as the first three berths at Lamu port, are in progress.
Northern Corridor	Northern Corridor Transit and Transport Coordination Authority (NCTTCA)	The envisioned corridor extends from the Port of Mombasa, across southern Kenya to Uganda, South Sudan, Rwanda, Burundi and Democratic Republic of Congo through planned road and high-speed standard gauge railway (SGR) networks. Oil pipelines, and processing improvements such 'One Stop Border Points' are also planned, with other initiatives such as Konzo Techno City, intended to be developed in the vicinity. Some aspects of the initiative, such as the first and second phases of the SGR project, are complete.
Mtwara Development Corridor	No designated corridor body	The envisioned corridor aims to connect the Port of Mtwara in Tanzania with southern Tanzania, northern Mozambique, eastern Malawi and eastern Zambia through road, rail and waterway access. A port expansion project, new roads, and new power and mining operations are among the other components envisaged. Currently some sections of road and 'Unity Bridge' are complete.
Southern Agricultural Growth Corridor (SAGCOT)	SAGCOT Centre Limited	SAGCOT pursues a cluster approach that aims to integrate value chains and nucleus farms in supportive eco-systems and along a backbone of rail, road and power infrastructure. Rehabilitation of the Tazara railway which links Lusaka in Zambia to Tanzania's capital Dar es salaam also overlaps the SAGCOT territory. Six clusters have been designated. Ihemi Cluster is the first to be established, with Mbarali Cluster more recently initiated.
Central Corridor	Central Corridor Transit Transport Facilitation Agency	The envisioned corridor aims to connect the port of Dar es Salaam in Tanzania with Rwanda, Uganda, Burundi and Democratic Republic of Congo through new and upgraded port, rail, road and water way infrastructure, alongside border posts and supporting services facilities. Rehabilitation of the current meter gauge railway is underway and the government is soliciting financing for a standard gauge railway.

2. Material and methods.

2.1 Assessing delivery of the SDGs within development corridors through Q-Methodology

In Q-Methodology, respondents sort a set of 'Q-statements', pre-defined by the researcher, onto a fixed and approximately-normally distributed grid, according to what they deem to be meaningful or significant, in response to a question, or sorting instruction, provided by the researcher. The resulting 'Q-sorts' are then compared in terms of the entire configuration of responses produced by participants, in a by-person factor analysis, which identifies patterns of association between the sorts and generates a small number of factors that are used to help interpret shared meanings within the data (Stephenson, 1965; Watts and Stenner, 2012; Webler et al., 2009, 2007).

The Q-statements employed within this study reflect SDG goals and targets associated with development corridors in East Africa and respondents were asked to identify which development

objectives they believed corridors are most – and least – likely to support the achievement of, by 2030. This medium-term timeframe was selected to align with the Agenda 2030 horizon and allowed respondents to draw on their existing experiences and knowledge of development activity within corridors, to represent their expectations and understandings of feasible development futures.

2.2 A Q-Set based on SDG goals and targets

The set of Q-statements (the 'Q-set') was sampled through structured and interpretative approaches. To ensure participants were prompted to engage with the breadth of SDGs, the statements were designed to ensure that core development objectives of each SDG – as well as broader Agenda 2030 commitments around equitable development – were captured within at least one of the Q-statements. However, key strategic corridor policy documents, such as the SAGCOT Investment Greenprint (Shames et al., 2013), were also examined to tailor the Q-set to reflect the relative emphases afforded to SDG objectives associated with corridors at policy levels. SDGs were occasionally explicitly referred to within these policy documents. But in most instances coding was an interpretative process, as we compared the development objectives linked to corridors in policy documents with the full list of SDG goals, targets and indicators (see UN General Assembly, 2019), to identify areas of overlap. We sought to reflect the overall character of development ambitions attached to corridors in the final Q-set (c.f. Gannon and Hulme, 2018). The number of statements within the Q-set was limited to 30, to ensure participants could sort the statements within a reasonable timeframe. The final Q-set is listed in full in Table 2 below, with the primary SDGs that informed the construction of each statement also identified.

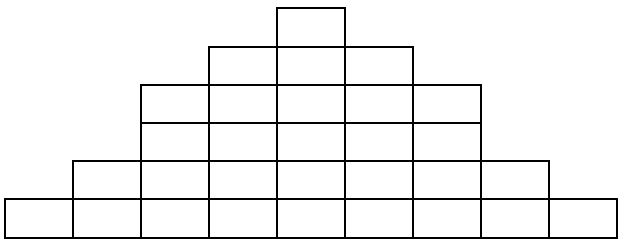
Using statements reflecting development goals represents a departure from what has largely become a Q-Methodology convention – to employ statements which, often described as 'opinion statements', are explicitly self-referential in their nature. Yet, theoretically any collection of items can be used in a Q-Methodology study, as long as participants are understood to project their own feelings and experiences through the Q-Methodology sorting process (Stephenson, 1982; Watts and Stenner, 2012). Developing a Q-set based on SDGs also allowed us to avoid employing the explicitly 'provocative' statements, that are typical of Q-sets (Watts and Stenner, 2012). As a result, we were able to access a wider range of stakeholders, for whom the exercise could have otherwise appeared confronting, or even alienating, given the politically sensitive nature of the development environments in which they are operating.

2.3 Conducting the Q-sorts

Q-Methodology employs small numbers of theoretically sampled participants, selected to represent the breadth of opinion in a population, rather than the distribution of beliefs and the method works best when participants have 'well developed' perspectives on the research subject (Brown, 1980). Our 35 participants each had significant experience of designing and implementing development action through corridors, from different sectors and at different scales. They included respondents from national and regional corridor management institutions, as well as key national implementing ministries, departments and agencies. The respondents also included representatives from community groups, NGOs and international finance institutions. Participant demographics are summarised in SI.

The sorting exercise was conducted through face-to-face interviews. Respondents were asked to sort the Q-statements onto a grid with a 9-point distribution (Figure 1). Interviews were conducted alongside the statement sorting exercise, in which participants were asked to 'think out loud', to outline the assumptions underpinning their placement of the statements within the grid and the way in which the statements related to one another.

Figure 1: The Q-Sort Matrix



The Q-sorts of all participants were analysed in a by-person factor analysis using purpose-built Q-software, PQMethod. Centroid factor analysis was used to extract factors based on similarly organised sorts and varimax rotation was employed to produce the most orthogonal (uncorrelated) factors possible. Factor loadings produced following rotation measure a participant's affinity to a factor. Those participants with statistically significant factor loadings ($p < .01$ level) were used in the construction of 'factor estimates', wherein the weighted average of their sorts was used to construct ideal-typical sorts for each factor (Watts and Stenner, 2012). Triangulated and enriched by the qualitative data, these estimated arrays were then used to construct narrative interpretations of the factors. Crib sheets, presented in SI, were also used in this process. Key interactions between SDG goals and targets interpreted through the factor viewpoints were then mapped using the SDG interactions framework developed by Nilsson et al. (2016).

3. Results

Statistical criteria signalled the presence of three factors within the data set, that accounted for 43% of the study variance. This result compares well with the variance explained by other Q-studies and with the general rule that solutions explaining 35-40% or more of the study variance can be considered sound (Watts and Stenner, 2012). 22 of the 35 participants loaded positively onto only one of the three factors at the 99% confidence level. Four Q-sorts were confounded, meaning that they loaded significantly onto more than one factor and nine Q-sorts did not load significantly onto any of the factors. Annex 2 in SI identifies participant factor loadings and the the participants whose Q-Sorts were used to generate the factor estimates. Z-scores (normalised item scores which facilitate cross-factor comparison) for each of the items in the Q study were then rank ordered to convert these scores into the same form as that in which the data were originally collected; in terms of a complete pattern of statements (see Table 2).

Table 2: The factor arrays. Factor Q-sort values for each statement and each factor

Q-Statements and the SDG Goals and Targets that each statement is most closely based on	SDG	Factor array values		
		1	2	3
1. Reduce inequality	10	-1	-2	-3
2. Support employment and decent and safe jobs	8	1	-1	0
3. Support safe migration and mobility of people	10.7	1	-3	2
4. Support entrepreneurship and encourage growth of small enterprises including through access to inputs, affordable credit and technology	2.3 8.3	1	3	1
5. Encourage development assistance and mobilise domestic and foreign direct investment to support national development where the need is greatest	10.b	2	0	3
6. Build sustainable and resilient infrastructure, including rural and transborder infrastructure	9.1	3	0	4
7. Increase access to affordable, reliable and sustainable energy	7.1	-1	-2	2
8. Support the development, transfer and dissemination of environmentally sound technologies for national development	17.7 9.4	-1	1	0
9. Support peaceful and inclusive societies	16	0	-2	-1
10. Encourage effective partnerships that mobilize and share knowledge and resources to achieve national development objectives	17.7	0	2	1
11. Support sustainable management and sustainable use of natural resources	14 15	0	2	1
12. Reduce hunger and improve food security and nutrition	2.1	2	1	-2
13. Support the empowerment of women and girls	5	-2	-1	-1
14. Build effective, accountable and transparent institutions	16.6	-3	-3	-2
15. Support inclusive and sustainable economic growth	8.1	2	1	0
16. Support positive linkages between urban and rural areas by strengthening national and regional development planning	11.a	1	1	2
17. Improve access to safe drinking water and sanitation	6	-2	-4	0
18. Strengthen resilience to climate-related hazards and natural disasters	13.1	-2	1	-2
19. Integrate climate change mitigation and adaptation into development planning	13.2	-1	0	0
20. Increase national exports and enable trade	17.11	4	2	2
21. Support healthy lives and increase access to health-care services	3	-1	0	0
22. Support sustainable food production and resilient agricultural practices	2.4	0	2	-2
23. Increase agricultural productivity and incomes of small-scale food producers	2.3	2	3	-1
24. Reduce extreme poverty	1.1	0	-1	-4
25. Integrate small enterprises into value chains and markets	9.3	1	4	-1
26. Reduce the degradation of terrestrial and marine ecosystems and reduce the loss of biodiversity and extinction of species	14 15	-4	0	-1
27. Support education, increase skills and promote lifelong learning opportunities	4	-2	-2	1
28. Support secure and equal access to land and other natural resources	2.3	-3	-1	-3
29. Support higher levels of economic productivity through diversification, technological upgrading, innovation and value addition	8.2	0	0	1
30. Increase access to safe and sustainable transport systems	11.2	3	-1	3

A narrative interpretation of each factor is now offered. As is convention in Q-Methodology, each factor is named, to provide it with an "identity" (Watts & Stenner, 2012: 160). Participant reference numbers, listed in SI, are included within the text (e.g. K07 refers to participant 7, from Kenya). To trace the abductive reasoning through which the factor interpretations were constructed, relevant Q-statements and their respective grid rankings are cited in square brackets within the text. E.g. in the interpretation of Factor 1, "[26:-4]" indicates statement 26 being ranked at -4.

3.1 Factor 1 – Corridors can mobilise development through infrastructure and trade, but they are not developing sustainably

Nine participants are significantly associated with this factor. These actors are associated with a range of corridors: Four are most involved with Kenya's Northern Corridor, two with the LAPSSET Corridor, three with the SAGCOT Corridor and one with the Central Corridor.

Participants loading significantly onto Factor 1 frequently expressed frustration at the slow pace of infrastructure development in corridors and highlighted roadblocks to accelerating and achieving planned investments; such as insecure financing arrangements and legal disputes around land and due process in Environmental Impact Assessment (EIA). Nevertheless, Factor 1 is underpinned by an infrastructure-led vision of development, in which achievement of all other corridor development objectives depends on the realisation of rural and transborder infrastructure (6:+3) – particularly transport infrastructure (30:+3) – to link often landlocked sites of production with markets and mobilise exports and trade (20:+4).

Factor 1 emphasises economic opportunities within 'hinterland', regions of Kenya and Tanzania, that will 'become connected' through corridors. The ability to *"easily move people and goods"* (T26) (3:+1), will allow corridors to unlock access to new economic resources (especially agricultural and mineral resources), while also lowering the cost of trade. New corridor infrastructure are therefore 'enabling investments', that will spur further investment, "*whether local or foreign"* (T26), into the corridor by "*reducing the cost of doing business"* (T26). As T26 explained of planned Mtwara corridor investments: "*Expansion of the port in Mtwara… will cut down the logistic costs being incurred using the port of Dar Es Salaam. That will increase the business efficiency. And products which were not initially viable, will start being viable*" (T26).

With fewer barriers to investment and new links to productive regions, Factor 1 assumes "*the infrastructure will inspire other development aspects*". **"***With improved roads and railway, traders and agricultural traders will be able to take their products to the market*" (K07) and producers "*will be able now to access [new] inputs and other technologies*" (29:+1). "*New enterprises cropping up*" (K17) is an inevitable outcome of market forces (4:+1, 25:+1). Development corridors are therefore likely to support employment opportunities (2:+1), economic growth (15:+2) and agricultural productivity (23:+2).

Increased agricultural production will have direct impacts on food security (12:+2): "*Because with access to the market, we expect production also to go up and access to food and availability of food to increase*" (K17), and because "*income for the small-scale [producers and] traders is enhanced*" (K10). Since corridor infrastructure will also decrease the costs of investment for the public sector and other development actors, government and donor-led development programmes will also be able to reach new regions (5:+2).

Development corridors are about "*open[ing] up*" (T26, K02, K04, K05, K07, K17) access to underdeveloped regions and decentralising development, "*so that the national cake can trickle down*

to… rural areas which feel marginalised" (K10). Factor 1 is therefore more optimistic than the other factors that corridors may contribute to a reduction in extreme poverty (24:0), promote more inclusive societies (9:0) and reduce inequality (1:-1).

Opportunities to realise the economic and social spin-off benefits from corridors are, however, hindered by a lack of cross-sector and regionally-integrated planning that organises corridor landscapes to harness synergies across corridor activities (14:-3). This means that many of the ways in which corridor benefits manifest will be fortuitous, rather than arising from deliberate strategic planning. Participants, for example, perceived an absence of integrated strategies to support business development, meaning the growth of small enterprises within corridors "*won't be by design, because it's not government's clear strategy to do that*" (K02).

Factor 1 also understands current corridor development to be unsustainable, with insufficient progress towards green growth and resilience building integrated into corridor investments (28:-3, 18:-2, 19:-1, 8:-1, 11:0). Ecosystem and biodiversity loss are positioned as direct trade-offs to development gains through corridors (26:-4): "*I can only see the negative effects*", K02 explained.

For Factor 1, these trade-offs are a product of governance failures (14:-3). Participants suggested that the problem is not that sustainability and environmental protection policies don't exist, but rather primarily that they are not reliably implemented and enforced). "*I can't say there are no policies*" (K07). But "*Whether it's enforced is another question*" (K02). Implementation challenges around environmental assessment processes were particularly highlighted by participants.

In this context, some participants looked to international investors to support sustainability within corridors through their external investment criteria. "*All these international funders are forced by the international system to have some standards",* K02 explained, adding *"It's a bit harder with China as they operate a little outside the international community*".

3.2 Factor 2 – Development corridors provide a space to coordinate investments and activities to overcome multiple barriers in business environments, upscale agricultural productivity and commercialise smallholder agriculture

Four participants are significantly associated with this factor. Three of these are primarily engaged with SAGCOT corridor. However, one participant has a strategic role in the coordination of Kenya's Northern Corridor, suggesting Factor 2 does not capture a uniquely SAGCOT-focused vision of corridors.

Factor 2 characterises a vision of development corridors often associated with the idea of 'agricultural growth corridors' (c.f. CGIAR, 2016). Corridors are a tool to coordinate investments and activities to create broad enabling conditions that unlock agricultural potential and commercialise smallholder agriculture in underdeveloped regions (23:+3, 25:+4; 20:+2).

Mobilising agricultural investment requires a backbone of infrastructure, such as "*opening up rural areas with roads and bridges*" (T23) to make timely movement of goods possible, reduce transport costs and support access to markets. Thus, as in Factor 1, current gaps in corridor infrastructure (6:0, 30:-1, 7:-2, 17:-4) threaten realisation of broader corridor development objectives.

For Factor 2, however, corridors require – and can enable – a move beyond infrastructure, to development of a broader supportive ecosystem of enabling conditions to overcome a range of entangled challenges to agricultural development. "*To address some of the issues fully, I think it is a*

cocktail of things" (K08). This is achieved by "*concentrating resources and effort in a specific area*" (T32), to nurture new economies of scale, make viable new public and private agricultural investments, harness synergies and produce a "*multiplier effect*" (T24). Corridors can therefore support value chain development (25:+4) and access to inputs, credit and technology (4:+3), as corridors encourage the development of new businesses supplying inputs and machinery, new crop storage and processing facilities, and new extension and financial services.

For Factor 2, corridors offer some space to enhance, coordinate and link investments and to develop partnerships and more cooperative forms of development planning (10:+2, 16:+1, 5:0), since a corridor is defined as much by the new opportunities it creates for "*knowledge sharing*" (K08) and interaction between stakeholders, as it is by physical infrastructure. The role of both SAGCOT Centre and the Northern Corridor Transit and Transport Coordination Authority, in mobilising partners, brokering strategic partnerships, and building new connections through corridor infrastructure and forums, were particularly emphasised by participants. However, informants suggested that, through concentrated activity and facilitating new forms of interaction, corridors "*break silos and [create] dialogue*" (T23) more generally.

These new forms of interactions also support learning, including through "*farmer demonstration"* (T24). This means that, as well as increasing *access* to new technologies, corridors can also support *uptake* of more technologies, including those that support resilience (8:+1, 22:+2, 18:+1). New forms of accountability and scrutiny can also emerge from interactions within corridors. "*By encouraging information sharing and partnership, you are not inward-looking but accountable to a [shared] vision and other stakeholders*", T28 explained. Similarly, Factor 2 envisages corridors supporting stakeholders to "*convene*" (T23), to "*make noise*" (T24) for change in policy and regulatory environments, to address a range of sustainability and market barriers, and other *"[shared] challenges, like weak tenure rights or environmental refugees"* (T32): Although progress on these issues has been variable to date (e.g. 11:+2, 22:+2, 19:0; 26:0, 28:-1, 3:-3).

Factor 2 emphasises the potential benefits of corridors for small-scale agricultural populations, given their predominance in corridor regions. "*Communities in the country, [are] mainly agricultural… by extending the corridor to agricultural areas, this is what benefits*" K08 explained. And "*as agricultural productivity increases, it will increase incomes*" (T32) (23:+3), as well as help reduce hunger (12:+1) and access to other services (21:0).

Yet, Factor 2 also emphasises that corridor development strategies focus on mobilising the private sector, for which inclusion and sustainability will always require a business case. Meanwhile smallholders don't participate in value chains on equal terms and will not benefit equally; with the poorest and most vulnerable communities facing additional barriers to accessing opportunities in corridors (1:-2, 24:-1, 15:+1). Access to finance – in part due to "*no title deeds and livestock not [being] accepted as collateral"* (T32) (28: -1) – was highlighted as an especially notable challenge for small-scale farmers accessing new agricultural resources available in corridors.

New vulnerabilities created through market-led agricultural development strategies in corridors are also emphasised by Factor 2. These include risks arising from outgrower and nucleus farm models (advanced particularly through SAGCOT), increased dependency on cash crops, and reduced agricultural prices, which could force people into other riskier forms of employment (2:-1). Factor 2 also fears 'uncontrolled and unplanned' migration in corridors (3:-2) will create new pressures and competition for land, water and resources (28:-1, 17:-4) and exacerbate local tensions (9:-2).

Factor 3: Development corridors are recreating existing inequalities and will not deliver on the Agenda 2030 pledge to 'leave no one behind'

Nine participants are significantly associated with this factor. Two are most involved with Kenya's Northern Corridor, three with LAPSSET, two with Mtwara and two with SAGCOT. Factor 3 is significantly correlated with Factor 1 ($p < .01$), which could be taken as evidence that three factors is too many. Factor 3 was nevertheless retained as a unique factor since it was felt to capture a qualitatively distinct point of view, with different priorities and emphases given expression within it (c.f. Watts and Stenner, 2012).

Like Factor 1, underlying Factor 3 is an infrastructure-led vision of development, in which achieving other development objectives through development corridors depends on realising supportive infrastructure (6:+4; 30:+3, 17:0). Transportation infrastructure particularly is needed to open up underdeveloped regions to additional forms of public and private investment and development assistance (5:+3) that had previously "*been too expensive*" (T21). This will support the development of broader business enabling conditions, for example, through access to new technologies, knowledges and energy (4:+1, 10:+1, 7:+2). New forms of connection will open up "*communication channels*" (K12), learning opportunities between people and regions (27:+1) and spur innovation and upgrading (29:+1). Development of current and planned corridor infrastructure is also fundamental to supporting safe migration and mobility of people (3:+2) and enabling exports and trade (20:+2). However, while Factor 3 assumes that corridors will support economic growth, the development being mobilised through corridors is not currently inclusive (15:0) or likely to reduce extreme poverty (24:-4) or inequality (1:-3); representing a direct threat to the Agenda 2030 pledge that 'no one will be left behind'.

Respondents emphasised that quality corridor infrastructure, investments and programmes only reach certain areas, and suggested that corridor approaches to development may further exclude other regions, not within the corridor, from development opportunities. But even within corridors themselves, Factor 3 believes corridors will reproduce – or exacerbate – existing patterns of inequality. Corridors "*will unlock the potential for economic activities. So, you will begin to see increased opportunities. People will be opening up shops, businesses, left right and centre… where there is supporting infrastructure*", K19 explained. But many jobs will not be decent and safe (2:0) and, like Factor 2, Factor 3 emphasises that mobilising participation in market economies doesn't necessarily enhance the wellbeing and livelihood security of poor populations: Respondent T31 observed of a community within SAGCOT corridor "now… *women spend so much time farming that they don't have time to grow veggies… They are malnourished for an area where there is food*" (12: -2).

Instead, corridor developments mostly benefit "*the big guns"* (K12), rather than small-scale producers and entrepreneurs who face additional barriers to participating in markets, such as access to finance or regulatory barriers (25:-1, 23:-1, 4:+1). "*A lot of these developments ideally suit your conglomerates, your government institutions, your large companies, your corporates [who] are able to regionally trade. But to become inclusive, you'd have to consider the small-scale people*" (K19). "*Those who are advantaged get even richer, and the poorer become poorer comparatively*" (T25).

Factor 3 emphasises that corridors create winners and losers, with the most marginalised, who are least able to negotiate their needs – particularly given patterns of corruption and bribery (14:-2) – likely to bear the brunt of the costs and be even further marginalised from resources on which they depend. Conflicts around land grabs and land compensation in corridors was emphasised as a particularly salient example of this dynamic (28:-3): "*Local communities may not actually get access to some of these developments. So, natural resources being used actually may negatively impact local communities who have their own ways of utilising those resources, especially when it comes to water*

and pastoral land" (K12). These inequalities mean it will be hard for corridors to support peaceful and inclusive societies (9:-1).

Many of the challenges for inclusion in corridors arise from over-emphasis on infrastructure, which by-passes communities, and insufficient consideration of the "*soft things*" (T35) that enable local communities and their activities to benefit. As K19 explained of the experience of the town of Isiolo along a new road in the LAPSSET corridor, "*it's basically a transit town... [People passing through] don't even spend time sleeping or spending money in Isiolo. So, they are not feeling… that development*".

To "*put rural people at the centre and heart of the strategy*" (T31), it is necessary to look at the "*bigger picture*" (K03) barriers that prevent marginalised populations from participating in and benefitting from corridor environments. This means understanding corridors to be constituted not only by core infrastructure investments, but as a broader, more interconnected set of plans, policies, programmes and projects that can be implemented in an integrated way, to harness development synergies, support broader enabling conditions for communities within a corridor and "*help mobilise people in that area to take those opportunities"* (T21). "*A development corridor is about seeing the whole system*" (T25) and "*integrating the individual components [so they]… work together"* (K15) informants explained.

4. Discussion

4.1 Uneven progress towards SDGs in corridors

Development corridors are associated with a broad range of development objectives. Indeed, the majority of statements within the Q-set were routinely recognised by participants as development objectives associated with corridors. Through the lens of these diverse development objectives, in this paper we have identified three qualitatively distinct imaginaries of development corridors that exist among development actors, across five development corridors in East Africa. The participants whose responses defined each factor were heterogeneous. As such – and emphasising that actor type is often not a good proxy for perspective (c.f. Cuppen et al., 2010) – the factors can be understood to capture viewpoints of stakeholders involved in Kenyan and Tanzanian corridors, from a range of sectors.

Each factor produced through our Q-Methodology analysis articulates shared assumptions about the nature of development corridors and of the ways in which they are likely to support, or limit, achievement of the SDGs within the 2030-time horizon. In doing so the factors highlight perceived inequalities in progress towards SDG goals and targets in corridor development trajectories (Table 3); which provide notable opportunity for learning and reorientation.

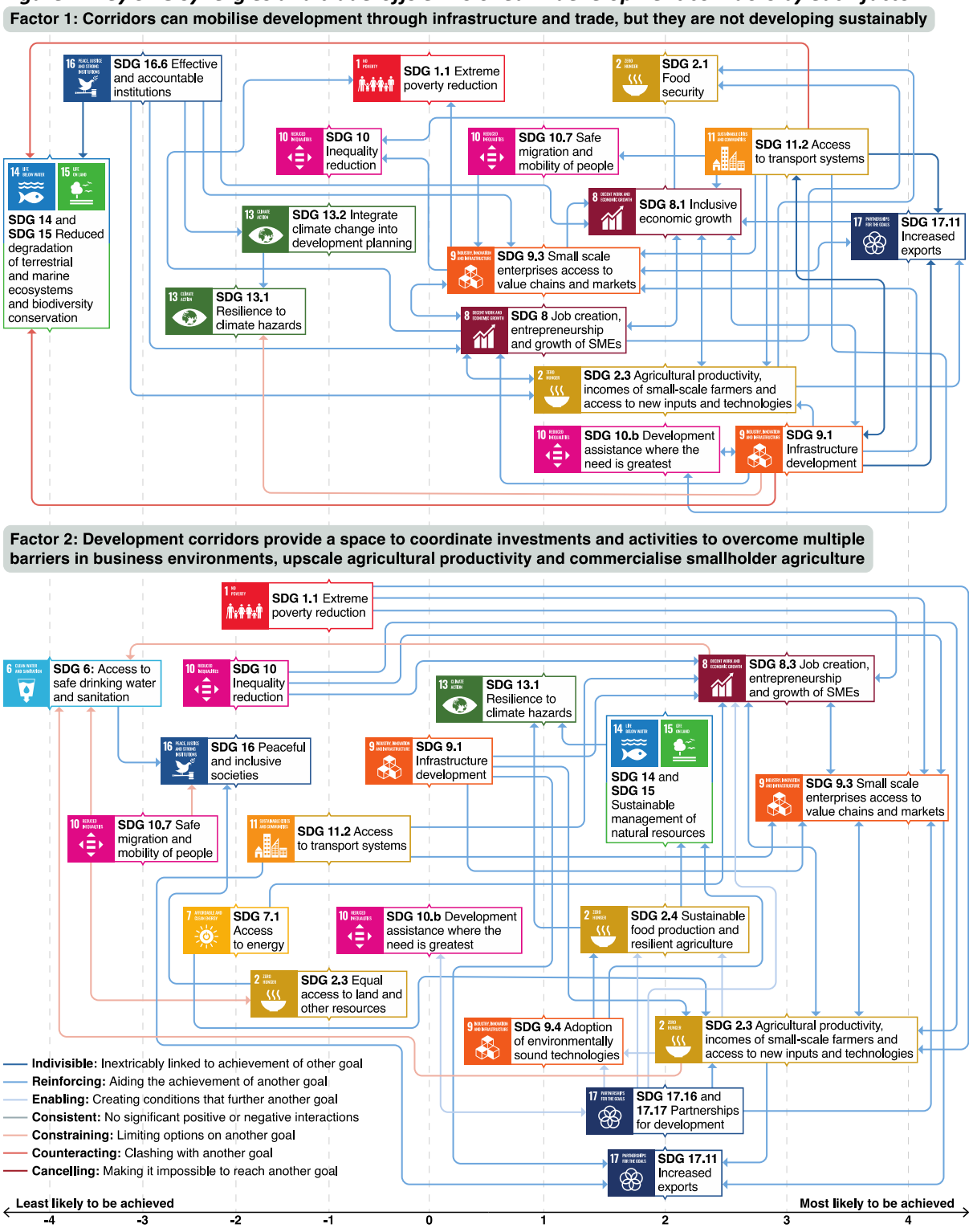
Table 3: SDG goals and targets most and least likely to be achieved through current corridor trajectories according to each factor.

Factor	SDGs least likely to be achieved through corridors	SDGs most likely to be achieved through corridors
1	SDG15 Life on Land SDG 14 Life under water SDG16.6 – Effective institutions SDG1.4 – Access to land	SDG17 - Trade SDG9.1 – Infrastructure SDG11.2 – Transport
2	SDG10.7 – Safe migration SDG6 – Clean water and sanitation SDG16.6 – Effective institutions	SDG9.3 – Value chain integration SDG2.3 – Agricultural productivity SDG8.3 – Entrepreneurship
3	SDG1 – Extreme poverty SDG10 – Reduced inequalities SDG1.4 – Access to land	SDG9.1 – Infrastructure SDG11.2 – Transport SDG10 – Development Assistance

4.2 SDG interactions in corridors

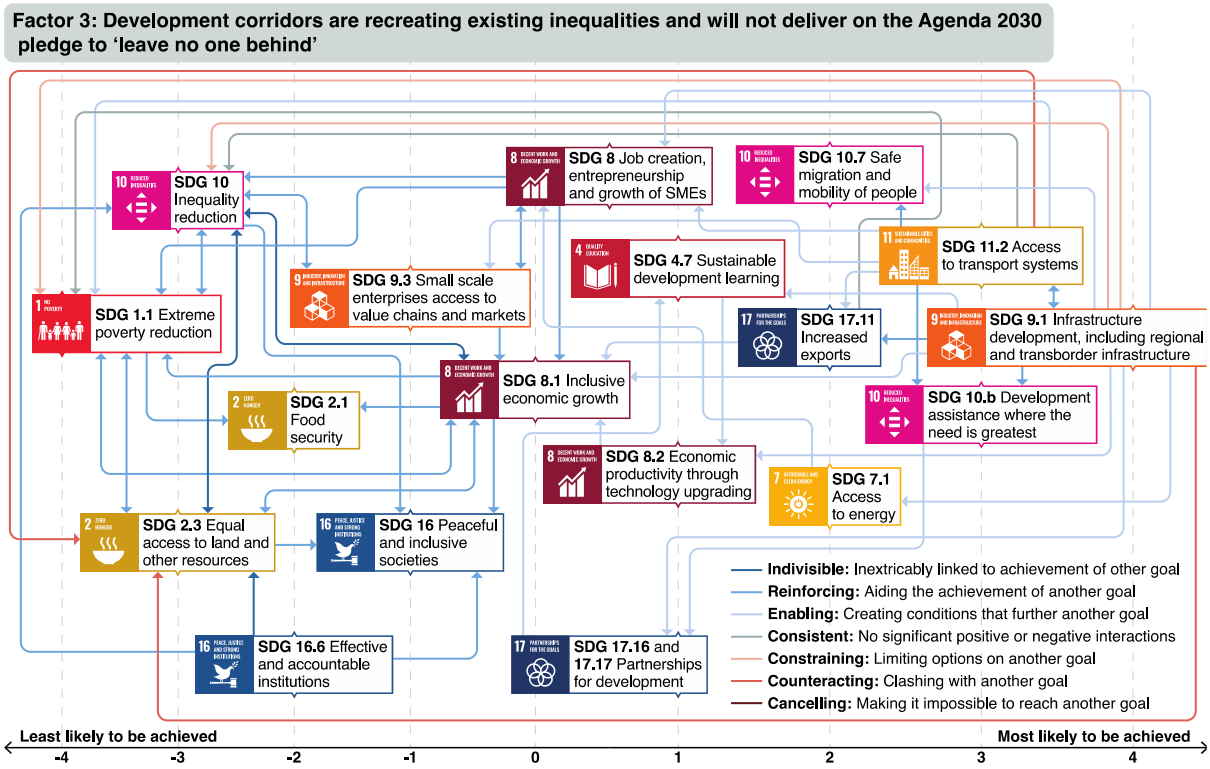
Each factor also constructs its own explanatory logics around the way in which SDGs goals and targets interact within corridor landscapes. Key SDG interactions interpreted through the factors are represented in Figure 2. Here we use the framework developed by Nilsson et al. (2016) to characterise the nature (reinforcing or counteracting, and uni- or bi-directional) and strength of interactions between different SDG goals and targets. In this figure, we do not aim to comprehensively map all possible interactions between the SDGs, or that were articulated by respondents. Rather, the intention is to illustrate the most prominent interactions in each factor interpretation. By presenting these synergies along the same x-axis as is employed in the Q-Methodology analysis, Figure 2 also indicates the perceived relative likelihood of these interactions occurring within corridors.

Figure 2: Key SDG synergies and trade-offs envisioned in development corridors by each factor.



SDG interactions interpreted through the Q-Methodology factors are represented using Nilsson et al.'s (2016) seven-point SDG interaction framework. Uni-directional relationships (objective A affects B, but B does not affect A) are indicated with a uni-directional arrow, and bi-directional relationships (objective A affects B, and B affects A) are indicated with a bi-directional arrow. Key SDG goals and targets for each factor are arranged along an x-axis, according to the position their corresponding Q-statement was given on the Q-Methodology grid. In instances where an SDG goal or target is represented in more than one Q-Methodology statement, the ranking that the SDG goal or target is given on the Figure 2 x-axis is an average rank of the corresponding Q-Methodology statements for that factor.

Figure 2 continued.



As illustrated in Figure 2, key interactions between SDG goals and targets in development corridors are mostly perceived to be synergistic, with progress towards one goal or target aiding the achievement of others (c.f. International Council for Science, 2016). However, Figure 2 also emphasises the inherent interconnectedness of the SDGs by illustrating that interactions can be multi-dimensional, with progress towards a given goal or target having potential to result in complex feedback loops and to produce cascading impacts.

4.2.1 Key SDG synergies in development corridors

Some key SDG synergies identified through the factors converge around infrastructure development in corridors. Across all three factors there is notable agreement that a backbone of supportive infrastructure (SDG9.1 and SDG11.2) is needed in development corridors; to connect remote regions (SDG11.a); to enable trade and exports (SDG17.11); to attract and remove barriers to further investment (SDG10.b); to mobilise an enabling environment for businesses (SDG2.3/SDG8.3); to support (agricultural) value chain development (SDG2.3/SDG9.3); and to support economic productivity and growth (SDG8.1 and SDG8.2).

For all factors 'getting the infrastructure right' is therefore fundamental to maximising the opportunities for corridors to achieve all other SDGs. Yet, participants represented by all factors highlighted shared anxieties around achieving corridor infrastructure ambitions, outlining a history of projects being delayed and failing to be completed, for reasons including: (1) litigation, (including from land disputes and incorrectly followed consultation and environmental and social impact assessment processes); (2) insecure financing arrangements and challenges securing investment; and (3) unstable political commitment, with corridors coming in and out of fashion with regime change and shifting policy agendas. These challenges, informants emphasised, are exacerbated when infrastructure is transnational in scope.

All factors, nevertheless, understand that infrastructure is a necessary – but not sufficient – condition to achieve inclusive development through corridors. Factor 2 emphasises opportunities corridors present to support broader business enabling environments and value chains, through development of strategic partnerships, coordination of public and private agricultural investments, and development of soft, as well as hard, infrastructure. Comparatively, Factor 1 and Factor 3, do not envisage such synergies being mobilised in current corridor trajectories. For these factors, corridors are typically on course to manifest as largely infrastructure, or 'transport corridors' (Hope and Cox, 2015), that remain detached from deliberate strategies to build broader connections to livelihoods and small enterprises, and which, alone, will not support inclusive economic growth. Since the respondents that define Factor 2 are primarily drawn from the SAGCOT corridor, which focuses specifically on integrating value chains and nucleus farms in supportive eco-systems, there is likely opportunity for cross-corridor learning on maximising development synergies.

4.2.1 Key SDG trade-offs in development corridors

The factors also articulate areas where corridor activities, in pursuit of some SDG goals and targets, are understood to be actively constraining progress towards others; and, thus, where greater policy coherence could support SDG implementation efficiency and effectiveness. For Factor 1, ecosystem and biodiversity conservation (SDG14/SDG15) and sustainability (SDG11, SDG12, SDG13) goals are positioned as direct trade-offs to other development gains through corridors, particularly as a result of insufficient integration of environmental and sustainability policy in corridor infrastructure development. Water insecurity (SDG6), meanwhile, arising especially from insufficient assessment of resource base limitations and from increased demand stemming from the corridor (SDG10.7/SDG8.3/SDG2.3), is also identified as a notable risk in corridors, particularly by Factor 2.

As best articulated through Factor 3, all of the factors also understand corridors to be reproducing existing inequalities and producing new forms of exclusion and, therefore, view current corridor trajectories as inconsistent with SDG10 on reducing inequalities within countries and with the Agenda 2030 pledge to 'leave no one behind'. The factors emphasise that not all corridor communities will be able to benefit equally from corridor opportunities, with more marginalised populations facing additional barriers to entrepreneurship (e.g. access to finance) and to accessing new, decent, employment opportunities (e.g. due to lack of required training) within the corridor. But all factors also emphasise that existing patterns of inequality are replicated in the risks of SDG trade-offs in corridors and suggest corridors may increase vulnerabilities among the most marginalised. For Factor 3, achieving secure and equal access to land (SDG2.3) is inextricably linked to achievement of equitable development through corridors. Yet, perversely, Factor 3 considers corridors to be directly compromising progress towards SDG2.3, as insecure or unenforceable land and resource rights and competition for land from infrastructure (SDG9.1), migrants (SDG8) and new investors (SDG8.3) in corridors, threaten access to land and natural resources that corridor communities depend upon for their livelihoods.

Increased vulnerabilities that may arise as smallholders and pastoralists are forced, or encouraged, to seek employment within other economic activities along corridors (SDG8.3), or to participate in unstable markets (SDG9.3), were emphasised by participants across all factors. So too were risks to other SDGs arising from a lack of planning and protection for migrants in corridors (SDG8), particularly by Factor 2. The factors, meanwhile, also indicate a range of SDGs which are more overlooked within corridor landscapes. Most notably, SDG5 on gender equality was not considered to be a likely outcome in corridors by any factor, and it was given limited consideration within the set of corridor policy documents that were examined to inform the Q-set.

4.3 Enhancing the SDG agenda through corridors

The factors in this research identify opportunities for realising the SDGs in development corridors. But they also identify risks: SDGs that are at risk of being left behind in corridors and SDGs for which implementation, under corridor trajectories, is anticipated to constrain progress towards other SDGs. Yet these risks and interactions are not intrinsic to the development of corridors themselves and participants – and the study factors – did not view any of the SDGs to be fundamentally incompatible. Instead, many of the weaknesses and trade-offs in the implementation of SDG objectives in corridors could be managed through enhanced governance and strengthened institutions and rights within corridor landscapes.

Corridors are a product of their broader institutional and political environments, so many corridor governance challenges can be addressed at national levels. Many of the migration challenges that surround corridors, for example, could likely be addressed through regulatory frameworks and legal instruments that support migrants' rights and freedom of movement (Newborne and Gansaonré, 2017; Wade et al., 2017) and integration of migration planning across rural and urban scales (Qaisrani et al., 2018; Qaisrani and Salik, 2018). Similarly, equitable and sustainable development in corridors is likely to require notable investments in land tenure institutions and in reforming weak land tenure to protect corridor communities, and women in particular (PRIndex, 2020), who may otherwise lose access to resources, rather than benefit from the arrival of a corridor. However, the idea that governance challenges often coalesce around policy enforcement, rather than an absence of sustainability, environmental protection and inclusion policies, was an idea echoed by respondents from all factors, in both Kenya and Tanzania. Respondents suggested, for example, that there is little evidence of climate risks being integrated in the design of Kenya's development corridors, despite Kenya having a strongly developed climate change strategy and institutional structures. Equally, it's notable that the institutional landscape is an area where our research suggests stakeholders consider corridors to be currently performing least well: Statement 14, 'Build effective, accountable and transparent institutions' was the statement considered 'least likely to be achieved' in corridors (based on average ranking on the Q-Methodology grid) across all factors.

To address the range of conflicts and synergies across SDG objectives that this research demonstrates can be mobilised through corridors, a coordinated, cross-sectoral response, that considers cumulative, multi-sector impacts and integrates development action is required. Corridors are focal points for development action in the activities of multiple sectors and create new spaces where actors interact. They, therefore, appear responsive to coordinating actors to harness synergies, negotiate priorities and minimise trade-offs across SDGs. However, it is apparent that such policy coherence is not yet being maximised. Overcoming the currently fragmented and siloed corridor and SDG governance landscapes should be a development priority for national governments, if the opportunities of corridors to deliver the SDGs are to be maximised and local and marginalised communities are to benefit.

For this to be achieved, existing literature on policy coherence and integration suggests the importance of cross-sectoral coordination needs to be recognised at a high-level (Office of the President) and accompanied by investments in fostering a supportive institutional and policy environment (Averchenkova et al., 2019; Newell et al., 2019; Pardoe et al., 2018). Reaffirming and strengthening responsibilities for delivering and coordinating on the SDGs among corridor coordinating authorities such as LCDA and SAGCOT Centre – as well as across ministries, departments and agencies more generally – is likely to be key, with monitoring frameworks strengthened on these terms. Establishing, enhancing, enabling and resourcing inter-ministerial and multi-stakeholder corridor fora may support inter-agency strategic management of SDG interactions in corridors and support policy coherence. So too may consultative and participatory development of an overarching

corridor strategy, which sectoral ministries can use to update and review their own policies and plans. Since power is an important factor in understanding cross-sectoral cooperation (Cairns and Krzywoszynska, 2016), strategies to enforce or compel different ministries, departments and agencies active within corridors to seek collaborative action alongside their own internal mandates, are also likely to be required. These may include national governments empowering corridor coordinating authorities, or other corridor coordinating mechanisms, to encourage cooperation, and allocating specific budgets for cross-sectoral corridor planning and projects.

Systematically considering and evaluating the relationships between the SDGs and corridor interventions, over time and space, however, is no easy task and investments in capacity building and tool development to support policy makers to navigate integrated planning will be required (International Council for Science, 2016; Nilsson et al., 2016). Indeed, some respondents described deriving value from the Q-Methodology exercise itself for supporting reflection on the nature of the SDG interactions in corridors. Respondent K19 explained: "*It's a very nice [method]… I'm going to steal this idea and use it just to spark discussions. We have an M&E meeting next week… I'll have this side as the things we've achieved and then the things that we have not achieved… We can also talk about what were the assumptions, what were the challenges, why have we not achieved this, what are the lessons that came out*".

The opportunity for SEA approaches to be revised and enhanced to support coordinated re-alignment of development corridors with an integrated development agenda, out to 2030 and beyond, should also be investigated by researchers, national governments and their development partners. SEA has been widely advanced as a systems-oriented approach to explore potential interactions across different policies, investments, projects, institutions and sectors, to support assessment of potential conflicts and synergies across high-level development objectives and to assess their anticipated cumulative outcomes to inform decision making (e.g. Hegazy, 2015; Madrid et al., 2011). Thus, amidst fragmented policy landscapes, SEA has potential to support strategic reorientation of environmental, social and economic interactions in SDG implementation within corridor landscapes. Yet while many countries have adopted SEA regulations and guidance, low technical standards (Hipondoka et al., 2016; Makaba and Munyati, 2018), and lack of enforcement and political buy-in (Retief, 2007; Tshibangu, 2018), limit its current contribution, and there is limited evidence of SEA processes being used to support timely, strategic decision making across corridors.

5. Conclusions

Development corridors are focal points for national and international development investment and if countries are to deliver on their commitments under Agenda 2030, it is vital that development corridors support the realisation of the SDGs. Yet, despite their power in development discourse, corridors are rather nebulous entities, that evolve iteratively, through the actions and investments of multiple national and international public and private actors, typically with sub-optimal strategic oversight and monitoring. As such, while it is apparent that corridors can produce a range of large-scale social, political, economic and environmental trade-offs, the kind of development that is being realised through corridors – and for whom – has been poorly understood.

Using a Q-Methodology approach, based on SDG goals and targets, we have identified three qualitatively distinct imaginaries of development corridors that exist among development actors active within five development corridors in East Africa. Each Q-Methodology factor emphasises different ways in which the SDGs interact and interconnect in development corridors, identifying opportunities and risks in current corridor trajectories for delivering on the SDGs, as well as SDG synergies to harness and trade-offs to manage. The factors suggest SDG goals and targets are mostly

synergistic in corridor landscapes, creating conditions that aid the achievement of each other. However, the factors also identify specific clusters of goals and targets that are considered to be directly mutually reinforcing and thus which should be strengthened and addressed in parallel, to upscale and maximise development within corridors.

Though these dimensions of analysis, the different perspectives mobilised through the three factors support the identification of measures to increase the efficiency and effectiveness of SDG implementation in corridors and suggest innovation and solution pathways. Of particular note, Factor 2, identifies a cluster of goals and targets it considers to be supportive of the development of broader business enabling conditions, to aid the integration of small-scale farmers into value chains in corridors. Harnessing these synergies in corridors may offer a means of overcoming some of the key risks of corridors identified by Factor 1 and Factor 3: Namely that corridors remain merely 'transport corridors', that fail to benefit local communities (Factor 1) – or even further disenfranchise them (Factor 3). Since respondents defining Factor 2 are primarily drawn from the SAGCOT corridor, which focuses specifically on integrating value chains and producers in supportive eco-systems, this example also suggests opportunities for cross-corridor learning.

The factors also identify ways in which, in current corridor trajectories, progress towards some SDGs is likely to directly threaten progress towards other goals and targets, including those on biodiversity conservation (SDG14/SDG15), climate resilience and sustainability (SDG11, SDG12, SDG13), water security (SDG6), inequality reduction (SDG10) and land and resource security (SDG2). However, participants did not view any of the SDGs to be fundamentally incompatible in corridors. Instead, these interactions signal priority areas for policy reorientation, and where new or strengthened safeguards are required, to maximise positive SDG interactions and minimise negative ones.

If the SDGs are to be achieved efficiently, and as a whole, managing potential trade-offs and harnessing synergies across multiple interacting policy domains requires coordinated and strategic decision-making across often siloed sectors and government departments. Corridors, which create new spaces in which actors interact, and are a focal point in the activities of multiple sectors, may be a particularly effective space to harness more integrated forms of development and to amplify and upscale achievement of the SDGs. Yet, such opportunities for integrated governance in corridors are not currently being maximised.

In this paper we have suggested ways to strengthen policy coherence in corridors, such as through development of overarching corridor strategies, enhancing SDG monitoring and allocating specific budgets for cross-sectoral coordination in corridors. We have also highlighted an urgent need for tools and approaches that can support policy makers to identify synergies and trade-offs across the SDGs, including in specific development contexts, to navigate integrated planning. As part of these efforts, we have called for further examination of the role that enhanced SEA processes may be able to play in supporting reorientation of corridor development to coherently deliver on the SDG agenda and ensure corridors align with the Agenda 2030 pledge to ensure that no one is left behind. Further, while earlier research has primarily focused on examining binary interactions between SDGs (Fuso Nerini et al., 2018; International Council for Science, 2016; Singh et al., 2018), our study factors emphasise the multi-dimensionality of SDG interactions, illustrating that progress towards a given goal or target can result in cascading interactions across multiple SDGs. Advancing literatures on SDG interactions will require greater consideration of these multiplicities.

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Author contributions

K.G. and L.P led the research design and data collection. K.G led the analysis, interpretation, manuscript writing and figure design. D.C. and S.S. led the funding acquisition and contributed to research design and interpretation. E.N and T.N. contributed to data collection and interpretation. All authors discussed and reviewed the manuscript.

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SUPPLEMENTARY INFORMATION: Imaginaries of Development Corridors: Delivering the Sustainable Development Goals through development corridors in East Africa

Annex 1: Corridors included within the study sample

Corridor	Background	Geography	Components envisaged	Status	Corridor authority
Lamu Port South Sudan Ethiopia Transport Corridor (LAPSSET)	LAPSSET Corridor is described as the first largest Game Changer Infrastructure Project initiated and prepared under Kenya's Vision 2030 development strategy, without external assistance that aims to foster transport linkage and promote regional socio-economic development in northern parts of Kenya.	The envisioned corridor extends 2,000km, from the coastal town of Lamu to South Sudan and Ethiopia, traversing counties in northern Kenya (Olago et al., 2019)	32 berth port at Lamu; Interregional highways; Crude oil pipeline; Product oil pipeline; Interregional standard gauge railway lines; 3 international airports and 3 resort Cities: at Lamu, Isiolo and Lake Turkana; Multipurpose High Grand Falls Dam (hydropower and irrigation); a series of development zones along the corridor (special economic zones; export processing zones and agricultural growth zones) in value addition centres.	Some of these elements are in progress. For instance, construction of the first three berths at Lamu Port is ongoing. The airport in Isiolo is already complete although it is not yet operational. The road that links Isiolo with Moyale on the Ethiopian border is complete.	LAPSSET Corridor Development Authority (Kenya)
Northern Corridor	The Northern Corridor was initiated through a treaty and associated protocols between Kenya, Rwanda, Uganda, Burundi, Democratic Republic of Congo in 1985 to facilitate trade and movement of people and goods to stimulate economic and social development. The agreement was revised in 2007 and South Sudan acceded in 2012. The Standard Gauge Railway (SGR) forms part of both the East Africa Railways Master Plan.	The envisioned corridor extends from the Port of Mombasa, across the Southern counties of Kenya and connects to Uganda, South Sudan, Rwanda, Burundi and Democratic Republic of Congo through its planned road and rail networks.	High speed SGR from Mombasa to Nairobi, western Kenya, Uganda and potentially DRC; Expansions to the Road Network; Crude oil pipeline; Product oil pipeline; Port of Mombasa improvements; Weighbridges, Borders & One Stop Border Points; Inland Waterways; Inland Container Depots. Other initiatives planned in the vicinity of the SGR include Konzo Techno City and Naivasha industrial city.	The first and second phases of the SGR project from Mombasa to Naivasha via Nairobi is complete. Development of the third phase of the railway, to Kisumu is stalled due to financing challenges. The Naivasha Dry Port was completed in June 2020.	Northern Corridor Transit and Transport Coordination Authority (NCTTCA)

Mtwara Development Corridor	Mtwara was conceptualised in 1992 by Tanzania, Malawi, Mozambique, Zambia to facilitate regional integration, poverty reduction and to stimulate broad economic growth through expanding industrial production and enhancing exports (JDI, 2009).	The envisioned corridor aims to connect the Port of Mtwara with southern Tanzania, northern Mozambique, eastern Malawi and eastern Zambia through road, rail and waterway access.	Railway line (850 km) from Mbamba Bay to Mtwara port; Mtwara port expansion project and upgrading of Mbamba Bay port; Construction and rehabilitation of 800kms of roads; Coal power plant; Mchuchuma Coal and iron ore mining operations; Liganga iron and steel complex; Telecommunications; Construction of Unity Bridge.	Sections of road, such as Mtwara to Songea, are completed. So too is Unity Bridge. The Government of Tanzania is seeking finance for the railway line under public private partnership (PPP).	No designated corridor authority. Initiative under the Ministry of Infrastructure Development
Southern Agricultural Growth Corridor (SAGCOT)	SAGCOT was initiated under the previous (fourth) President Kikwete, as part of the *Kilimo Kwanza* - Agriculture First – strategy focused on developing large-scale commercial farming. It's stated vision is to support "a transformed, commercially viable agriculture sector in Tanzania that enhances food security, improves livelihoods and ensures environmental sustainability".	SAGCOT pursues a cluster approach that aims to integrate different value chains and nucleus farms in a supportive eco-system and along a backbone of rail, road and power infrastructure (SAGCOT, 2018). The six designated clusters – Ihemi, Mbarali, Sumbawanga, Kilombero, Ludewa and Rufiji – stretch across central Tanzania to Zambia and Lake Malawi.	The cluster approach of SAGCOT aims to geographically concentrate interconnected companies, specialized suppliers, service providers and associated institutions for value chain development through improvements in the business environment such as infrastructure projects, addressing policy constraints and establishing business linkages. Rehabilitation of the Tazara railway which links Lusaka in Zambia to Tanzania's capital Dar es salaam also overlaps the SAGCOT territory.	Ihemi Cluster was the first to be established and more recently the Mbarali Cluster. SAGCOT Centre has facilitated 5 Commodity Value Chain Strategic Partnerships (Tomatoes, Dairy, Soya, Tea and Potatoes) in Ihemi Cluster (SAGCOT, 2018)	SAGCOT Centre Limited
Central Corridor	In 2006, the Governments of Burundi, Democratic Republic of Congo, Rwanda, Tanzania and Uganda established The Central Corridor Transit Transport Facilitation Agency (CCTTFA), to "promote transport utilisation of the Central Corridor… [and] reduce the costs of transit transport for land-locked Member States".	The envisioned corridor aims to connect the port of Dar es Salaam in Tanzania with Rwanda, Uganda, Burundi and Democratic Republic of Congo.	Planned developments include upgrading and development of port, rail, road and water way infrastructure, alongside border posts and supporting services facilities. There is interest in upgrading the current meter gauge railway to standard gauge, which would require construction of a new railroad.	Rehabilitation of the current meter gauge railway is underway, goods processing infrastructure is in design phases and the government is soliciting financing for a standard gauge railway (CCTTFA, 2019).	Central Corridor Transit Transport Facilitation Agency (CCTTFA).

Annex 2: Factor matrix indicating participant demographics, participant factor loadings (which represent a participant's affinity to a factor) and defining sorts used in the construction of factor estimates.

No.	Country	Main corridor involved in	Gender	Sector and respondent specialism[Ψ]	Factor 1	Factor 2	Factor 3
01	Kenya	Northern	M	National NGO (conservation)	-0.0794	0.0807	**0.6133***
02	Kenya	Northern	M	Overseas aid agency (market access and trade)	**0.6584***	0.3297	0.3655
03	Kenya	Northern	M	Community organisation (social and economic)	0.1254	0.2065	**0.5799***
04	Kenya	LAPSSET	F	Sub-national development authority (horticulture development)	**0.4969***	0.3831	0.1138
05	Kenya	Northern	F	Sub-national development authority (planning)	**0.6413***	-0.1741	0.1499
06	Kenya	Northern	M	National government (environment)	0.3587	-0.2431	0.4000
07	Kenya	Northern	M	National government (transport, trade and development)	**0.6890***	0.1015	0.2162
08	Kenya	Northern	M	Regional (East Africa) multi-lateral government authority (monitoring and evaluation)	0.3686	**0.6043***	0.1140
09	Kenya	Northern	M	Community organisation (social and environmental)	0.5357	-0.2937	0.4940
10	Kenya	Northern	M	National government (transport, trade and development)	**0.7240***	0.0905	0.3426
11	Kenya	LAPSSET	M	Regional (Africa) multi-lateral development agency (development strategy)	0.3103	-0.2123	0.4259
12	Kenya	LAPSSET	F	National government (transport and infrastructure)	0.4137	-0.0532	**0.7927***
13	Kenya	Northern	F	Academia (Chinese infrastructure in Africa)	0.2857	-0.2825	0.1867
14	Kenya	LAPSSET	M	National government (regional integration, economic analysis)	0.4916	-0.3320	0.5522
15	Kenya	LAPSSET	F	National government (energy and minerals)	0.4391	-0.0077	**0.6729***
16	Kenya	Northern	M	National government (regional development)	0.0315	0.0640	0.2774
17	Kenya	LAPSSET	M	National government (agriculture)	**0.5561***	-0.0100	0.0480
18	Kenya	Northern	F	Multilateral aid agency (public private partnerships)	0.5549	0.0838	0.5690
19	Kenya	LAPSSET	M	Private sector (infrastructure and value chain development)	0.1193	-0.1636	**0.4929***

20	Tanzania	SAGCOT	M	International NGO (sustainable value chains)	0.1271	0.6727	0.5752
21	Tanzania	Mtwara	M	National government (industrial development)	0.3980	0.2030	**0.5473***
22	Tanzania	SAGCOT	M	International NGO (conservation, partnerships)	-0.0746	0.2957	-0.0273
23	Tanzania	SAGCOT	F	Partnership body (value chains and partnerships)	0.0415	**0.6691***	0.2397
24	Tanzania	SAGCOT	F	International NGO (conservation, natural resource management)	0.1027	**0.6621***	-0.1539
25	Tanzania	Mtwara	M	Development partner (trade and infrastructure)	0.2152	0.2677	**0.4882***
26	Tanzania	SAGCOT	M	National NGO (agricultural development)	**0.4755***	0.4095	-0.0243
27	Tanzania	SAGCOT	M	Multi-stakeholder platform (agriculture)	**0.5645***	0.2435	0.1214
28	Tanzania	Mtwara	M	Academic (natural resources and environment)	0.0424	0.4519	0.1093
29	Tanzania	Central	M	Multilateral aid agency (trade and transport)	0.4509	0.1857	0.0754
30	Tanzania	Mtwara	M	Multi-lateral government body (transport)	0.1859	0.3641	0.2119
31	Tanzania	SAGCOT	F	International NGO (social environment and business)	-0.3155	-0.0547	**0.6670***
32	Tanzania	SACGOT	M	Multi-stakeholder platform (conservation)	0.0675	**0.5543***	-0.2473
33	Tanzania	Central	M	National government (transport)	**0.5735***	0.0285	-0.0871
34	Tanzania	SAGCOT	F	Multilateral aid agency (agriculture)	0.2927	0.3189	0.0688
35	Tanzania	SAGCOT	M	National government (Investment)	0.1056	0.0882	**0.5390***
% variance explained by factor:					***16***	***11***	***16***

Ψ *Sector descriptions are provided with the maximum detail possible, while ensuring anonymity for participants. E.g. Government ministries, departments, agencies, state-owned enterprises etc are all categorised as 'national government' for the purposes of preserving anonymity.*

** Defining sorts, produced by participants that load positively on only one factor at $p < .01$, are indicated with an asterisk.*

Confounded sorts (that load significantly onto more than one factor) were not used in the calculation of factor estimates.

Annex 3: Factor Crib Sheets.

To aid interpretation of the way in which the statements are configured and connected by participants, crib-sheets were developed, based on a design by Simon Watts (Watts & Stenner, 2012: 150-155).

FACTOR 1 CRIB SHEET

Item ranked at +4:

20**. Increase national exports and enable trade

Items ranked at +3:

6. Build sustainable and resilient infrastructure, including rural and transborder infrastructure
30. Increase access to safe and sustainable transport systems

Items ranked higher by Factor 1 than by any other factor:

20**. Increase national exports and enable trade (4)
30. Increase access to safe and sustainable transport systems (3, tied with Factor 3).
12. Reduce hunger and improve food security and nutrition (2)
15. Support inclusive and sustainable economic growth (2)
2**. Support employment and decent and safe jobs (1)
9**. Support peaceful and inclusive societies (0)
24*. Reduce extreme poverty (0)
1*. Reduce inequality (-1)

Item ranked at -4

26**. Reduce the degradation of terrestrial and marine ecosystems and reduce the loss of biodiversity and extinction of species

Items ranked at -3:

14. Build effective, accountable and transparent institutions
28. Support secure and equal access to land and other natural resources

Items ranked lower by Factor 1 than by any other factor:

26**. Reduce the degradation of terrestrial and marine ecosystems and reduce the loss of biodiversity and extinction of species (-4)
14. Build effective, accountable and transparent institutions (-3, tied with Factor 2).
28. Support secure and equal access to land and other natural resources (-3, tied with Factor 3).
18. Strengthen resilience to climate-related hazards and natural disasters (-2, tied with Factor 3)
27. Support education, increase skills and promote lifelong learning opportunities (-2, tied with Factor 2)
8**. Support the development, transfer and dissemination of environmentally sound technologies for national development (-1)
21. Support healthy lives and increase access to health-care services (-1)
19**. Integrate climate change mitigation and adaptation into development planning (-1)
10**. Encourage effective partnerships that mobilize and share knowledge and resources to achieve national development objectives (0)
11. Support sustainable management and sustainable use of natural resources (0)
29. Support higher levels of economic productivity through diversification, technological upgrading, innovation and value addition (0, tied with Factor 2)
4. Support entrepreneurship and encourage growth of small enterprises including through access to inputs, affordable credit and technology (1, tied with Factor 3)
16. Support positive linkages between urban and rural areas by strengthening national and regional development planning (1, tied with Factor 2).
13. Support the empowerment of women and girls (2)

Other distinguishing statements[Ω]:
5*. Encourage development assistance and mobilise domestic and foreign direct investment to support national development where the need is greatest (2)
23*. Increase agricultural productivity and incomes of small-scale food producers (2)
25*. Integrate small enterprises into value chains and markets (1)
22**. Support sustainable food production and resilient agricultural practices (0)
17**. Improve access to safe drinking water and sanitation (-2)

FACTOR 2 CRIB SHEET

Item ranked at +4:
25**. Integrate small enterprises into value chains and markets

Items ranked at +3:
4**. Support entrepreneurship and encourage growth of small enterprises including through access to inputs, affordable credit and technology
23*. Increase agricultural productivity and incomes of small-scale food producers

Items ranked higher by Factor 2 than by any other factor:
25**. Integrate small enterprises into value chains and markets (4)
4**. Support entrepreneurship and encourage growth of small enterprises including through access to inputs, affordable credit and technology (3)
23*. Increase agricultural productivity and incomes of small-scale food producers (3)
10. Encourage effective partnerships that mobilize and share knowledge and resources to achieve national development objectives (2)
11*. Support sustainable management and sustainable use of natural resources (2)
22**. Support sustainable food production and resilient agricultural practices (2)
8. Support the development, transfer and dissemination of environmentally sound technologies for national development (1)
18**. Strengthen resilience to climate-related hazards and natural disasters (1)
26. Reduce the degradation of terrestrial and marine ecosystems and reduce the loss of biodiversity and extinction of species (0)
19. Integrate climate change mitigation and adaptation into development planning (0, tied with Factor 3)
21. Support healthy lives and increase access to health-care services (0, tied with Factor 3)
28. Support secure and equal access to land and other natural resources (-1)
13. Support the empowerment of women and girls (-1, tied with Factor 3)

Item ranked at -4
17**. Improve access to safe drinking water and sanitation

Items ranked at -3:
3**. Support safe migration and mobility of people
14. Build effective, accountable and transparent institutions

Items ranked lower by Factor 2 than by any other factor:
17**. Improve access to safe drinking water and sanitation (-4)
3**. Support safe migration and mobility of people (-3)
14. Build effective, accountable and transparent institutions (-3, tied with Factor 1)

[Ω] Distinguishing statements are statements placed in a statistically different position on the Q-sort grid by participants that load onto a factor, to where participants that load on other factors have placed the same statement (Coogan & Herrington, 2011). Distinguishing statements at $p < .05$ are marked with a single asterisk. Distinguishing statements at $p < .01$ are marked with a double asterisk.

7. Increase access to affordable, reliable and sustainable energy (-2)
9. Support peaceful and inclusive societies (-2)
27. Support education, increase skills and promote lifelong learning opportunities (-2, tied with Factor 1)
2. Support employment and decent and safe jobs (-1)
30**. Increase access to safe and sustainable transport systems (-1)
5**. Encourage development assistance and mobilise domestic and foreign direct investment to support national development where the need is greatest (0)
6**. Build sustainable and resilient infrastructure, including rural and transborder infrastructure (0)
29. Support higher levels of economic productivity through diversification, technological upgrading, innovation and value addition (0, tied with Factor 1)
16. Support positive linkages between urban and rural areas by strengthening national and regional development planning (1, tied with Factor 1)
20. Increase national exports and enable trade (2, tied with Factor 2).

Other distinguishing statements:
24**. Reduce extreme poverty (-1)

FACTOR 3 CRIB SHEET

Item ranked at +4:
6. Build sustainable and resilient infrastructure, including rural and transborder infrastructure

Items ranked at +3:
30. Increase access to safe and sustainable transport systems
5*. Encourage development assistance and mobilise domestic and foreign direct investment to support national development where the need is greatest

Items ranked higher by Factor 3 than by any other factor:
6. Build sustainable and resilient infrastructure, including rural and transborder infrastructure (4)
5*. Encourage development assistance and mobilise domestic and foreign direct investment to support national development where the need is greatest (3)
30. Increase access to safe and sustainable transport systems (3, tied with Factor 1)
3. Support safe migration and mobility of people (2)
7**. Increase access to affordable, reliable and sustainable energy (2)
16. Support positive linkages between urban and rural areas by strengthening national and regional development planning (2)
27**. Support education, increase skills and promote lifelong learning opportunities (1)
29. Support higher levels of economic productivity through diversification, technological upgrading, innovation and value addition (1)
17**. Improve access to safe drinking water and sanitation (0)
19. Integrate climate change mitigation and adaptation into development planning (0, tied with Factor 2).
21. Support healthy lives and increase access to health-care services (0, tied with Factor 2)
13. Support the empowerment of women and girls (-1, tied with Factor 2)
14. Build effective, accountable and transparent institutions (-2)

Item ranked at -4
24**. Reduce extreme poverty

Items ranked at -3:
1. Reduce inequality
28. Support secure and equal access to land and other natural resources

Items ranked lower by Factor 3 than by any other factor:
24**. Reduce extreme poverty (-4)
1. Reduce inequality (-3)

28. Support secure and equal access to land and other natural resources (-3, tied with Factor 1)
12**. Reduce hunger and improve food security and nutrition (-2)
18. Strengthen resilience to climate-related hazards and natural disasters (-2, tied with Factor 1)
22**. Support sustainable food production and resilient agricultural practices (-2)
23**. Increase agricultural productivity and incomes of small-scale food producers (-1)
25*. Integrate small enterprises into value chains and markets (-1)
15**. Support inclusive and sustainable economic growth (0)
20. Increase national exports and enable trade (2, tied with factor 2)

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