



# Delivering the Sustainable Development Goals through development corridors in East Africa: A Q-Methodology approach to imagining development futures

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## ABSTRACT

In this paper we advance a novel approach to integrated assessment of the ways in which the Sustainable Development Goals (SDGs) are likely to manifest and interact within a given development context, using Q-Methodology and the conceptual framing of imaginaries. We apply this to development corridors and identify three qualitatively distinct imaginaries of SDG futures that exist among stakeholders 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 and construct explanatory logics around the ways in which SDG trade-offs and synergies are likely to manifest within corridors. Our analysis suggests that SDG goals and targets are mostly synergistic in corridor landscapes, but that interactions can be multi-dimensional. We also (1) identify specific clusters of goals and targets that may 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 threaten progress towards other goals and targets. Particularly, the analysis identifies biodiversity conservation (SDG14/SDG15), sustainability (SDG11, SDG12, SDG13), secure and equal access to land (SDG2.3) and inequality reduction (SDG10) to be likely trade-offs to other development gains in current corridor trajectories. The research emphasises the need for more integrated corridor governance to achieve the SDGs efficiently, as a whole and for all. The method is flexible and could be applied to enable rapid assessment of SDG trajectories within other development contexts.

## 1. Introduction

Development corridors play an important and resurgent role in development practice in sub-Saharan Africa and attract a lot of development finance from national and international sources. With their aim of fast-tracking multi-sectoral and multi-actor development within a given geography, they are widely positioned as a tool to deliver on the Sustainable Development Goals (SDG) agenda. The SDGs are intended to be “integrated and indivisible” (United Nations, 2015: 5), with goals interdependent and of equal importance. Yet the SDGs interact and actions towards individual goals can produce trade-offs and synergies that may support or constrain progress towards others (Nilsson et al., 2016).

Managing and maximising implementation of the SDGs within a given development context therefore, theoretically, requires integrated and systemic approaches to development planning and monitoring, that support strategic ex-ante consideration of SDG interactions and prioritisation of development trade-offs. Governments, however, are poorly organised and lack tools to identify, test and monitor development pathways that balance and plan for SDG interactions. As such, corridors are currently emerging with limited strategic oversight as to how different corridor policies, projects and programmes will interact, and support or hinder delivery of different SDGs.

In this paper we propose and apply an innovative application of Q-Methodology, based on SDG goals and targets, as a participatory method

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for holistically identifying potential and emergent SDG trade-offs and synergies upstream within a given development context. We apply this approach to explore stakeholder imaginaries of the development futures being mobilised in development corridors in East Africa. Our analysis identifies collectively envisaged SDG interactions and trade-offs within current corridor trajectories that can be considered in policy and planning and demonstrates the utility of the method for reflexive governance. We suggest this method could be applied to enable rapid participatory assessment of development trajectories and SDG interactions in other contexts.

In the sections that follow we, first, position the growth of development corridor initiatives within the SDG framework. Following this, we highlight the barriers to achieving strategic planning and ongoing assessment of SDG interactions within development corridors in current governance frameworks and using existing tools. We then present our approach to identifying imaginaries of SDG futures, before presenting and discussing our results.

### 1.1. Development corridors and the SDGs

Development corridors are programmatic frameworks for spatially targeted investment, aimed at organising defined territories to foster human development via economic growth, often across multiple economic sectors. The material practice of corridors, and the nature of corridor investments, varies significantly. However, 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 have become a powerful development paradigm and focal points for overseas development assistance (Enns, 2018). Large developing nations seeking to expand their sphere of influence and access to emerging markets are also partially funding many of Africa's development corridors.<sup>1</sup> In this context, national governments are directing their limited public sector resources towards corridors, aiming to attract development and private sector finance and foreign direct investment. Over 30 corridors, at various stages of planning and development, are in progress in Africa (Laurance et al., 2015) and corridors are often positioned as flagship initiatives in national development policies (Schindler and Kanai, 2019).

Countries have also signed up to deliver the Sustainable Development Goals (SDGs) within their own national contexts by 2030. This United Nations-led development framework is mobilised around 17 development goals, 169 targets and a commitment to 'leave no one behind' (United Nations, 2015). National development blueprints and sectoral policies link development corridors to development objectives that crosscut the SDGs, and national and international development discourse generally assumes that development corridors will contribute to SDG achievement (e.g. Gu et al., 2019). Yet, the SDG agenda explicitly recognises that the SDGs can produce a range of positive and negative interactions<sup>2</sup>(United Nations, 2015) and recent research has begun illustrating that corridors do not universally produce 'development' across all SDGs; Rather they often result in large-scale social, political, economic and environmental trade-offs, generate uneven impacts and exclude vulnerable populations (Bersaglio et al., 2020; Chome, 2020;

<sup>1</sup> Most notably China, through various regional development strategies such as 'One belt, one road', has become one of Africa's major investors (Gu et al., 2019).

<sup>2</sup> Using coal to further energy access targets under Goal 7, for example, could accelerate climate change and ocean acidification, counteracting progress to Goals 13 and 14 (Nilsson et al., 2016).

Enns, 2019; Hughes, 2019; Lawer, 2019; Lesutis, 2019a, 2019b).

### 1.2. Strategic planning for the SDGs within development corridors

Areas of differentiated development progress and SDG trade-offs are not natural inevitabilities of corridors (Lesutis, 2021). Instead, corridors are products of hegemony, through which contested visions of factors such as development (Enns and Bersaglio, 2020; Tups and Dannenberg, 2021), modernity (Müller-Mahn, 2020), globalised capitalism (Aalders, 2021; Lesutis, 2019a), connectivity (Graham et al., 2015), mobility (Enns, 2018) centralised planning (Schindler and Kanai, 2019), and other social, economic and political interests, interact and vie for influence. Trade-offs can emerge as certain SDG targets gain privilege and influence through a wide range of actors. Within corridor landscapes in East Africa, Bersaglio et al. (2020) suggest that, to date, SDG9 on infrastructure development is being prioritised over and above environmental and social goals, reflecting the emphasis on infrastructure and industrialisation within national development strategy and the priorities of key donors and investors.

In this context, strategic planning for SDG interactions and monitoring of the type of development being mobilised in corridors – and for who – is critical to coherent policy development and to enabling accountability and critical reflexivity around the distributional impact of investment and policy choices. Interdependencies across the SDGs mean that integrated, systems-thinking is required and interactions between SDGs need central attention (Boas et al., 2016). However, there are notable barriers to achieving such high-level and cross-sectoral strategic planning within existing corridor governance and development infrastructure, due to, first, disjointed governance and, second, inadequate assessment tools.

Firstly, opportunities for coherent cross-sectoral and joined up governance are limited at national levels, by fragmented SDG domestication, which is often concentrated 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). At corridor levels, meanwhile, corridors are mobilised through a series of independent public and private investments, programmes, projects and institutions, which intersect the institutional mandates of different government departments, seek numerous public and private benefits and interact and develop incrementally within a corridor landscape with limited oversight (Gannon, 2022). African governments sometimes create a single national point of coordination for corridors (see corridor agencies in Table 1). However, they too are limited in their capacity to evaluate or balance the environmental, social and economic dimensions of the SDGs within corridor landscapes for reasons including failure – and a lack of political authority or incentive – to develop high-level strategic policies that consider SDG trade-offs and cumulative and synergistic impacts (ibid.).

Secondly, policymakers lack tools to consider and appraise the relationships between the SDGs and planned corridor interventions over time and space (ICSU, 2016). Environmental assessment (EA) processes are intended to identify and consider multiple interacting activities and impacts upstream of development interventions, to mitigate risks and leverage opportunities and synergies in the design and development of mega-projects. Yet, current application of these tools is often very limited in scope (e.g. focused at the level of individual projects, rather than considering interactions across corridor infrastructure and activities).<sup>3</sup> Academic analysis of SDG interactions, meanwhile, has been largely theoretical (Nilsson et al., 2016), published in grey literature (ICSU, 2016; Miola et al., 2019) or focused on individual goals

<sup>3</sup> Environmental assessments are also often employed downstream of an intervention (Hipondoka et al., 2016; Thorn et al., 2022) and face issues of robustness, representation and enforcement (ibid; Makaba and Munyati, 2018; Tshibangu, 2018).

**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 upgrading of Isiolo airport are complete and others, 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, although development of the SGR beyond Naivasha is stalled after China refused further loans.
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. Ithemi 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 waterway infrastructure, alongside border posts and supporting service facilities. Rehabilitation of the current meter gauge railway is underway and the government is soliciting financing for a standard gauge railway.

(Bersaglio et al., 2020; Fuso Nerini et al., 2018; Singh et al., 2018). Within EA processes and beyond, policymakers have therefore lacked a rubric for assessing the way in which the SDGs interact as a whole within given contexts and for identifying which interactions are the most important to address in policy.

A notable exception in this research landscape is the approach to assessing SDG interactions developed by Weitz et al. (2018). This depends on selecting a subset of SDG targets and scoring their interactions through expert judgement using a scale developed in Nilsson et al. (2016), before using network analysis to visualize interactions. This approach, however, is very time-consuming and depends on expert judgement to implement. Ongoing innovation to develop user-friendly approaches to integrated assessment of SDG progress and interactions within given contexts is therefore desirable. In corridors, new approaches need to be responsive to the notable data gaps that persist (Thorn et al., 2022) and which limit SDG monitoring more generally.

### 1.3. A Q-Methodology approach to imagining the SDGs in development corridors

In response to these gaps, in this paper we advance an empirical approach to integrated assessment of the ways in which development corridors are likely to shape delivery of the SDGs and of the way in which SDG interactions and trade-offs manifest through the application of Q-Methodology. To do this, through a Q-Methodology exercise, we ask actors involved in designing, delivering and monitoring five major corridors in East Africa, to represent their perspective on which SDGs corridors are most likely to support the achievement of, by the year 2030. This is achieved via a statement-sorting activity, using statements based on key SDG goals and targets associated with corridors, with factor analytic techniques used to interpret shared perspectives among respondents.

We conceptualise the shared perspectives represented through the study factors as *imaginaries*. Imaginaries are a central concept in the social sciences with a long history of diverse application. They have been used in development corridors literature to explore logics deployed to legitimate the creation of corridors as modes of development and as

specific modes of 'future-making' (Müller-Mahn, 2020: 158). In this study, imaginaries have rather more limited scope wherein, through a formulation based on SDG goals and targets, we define boundary categories through which the lens on corridors is cast downstream, to explore not the corridor concept itself, but the SDG futures that are envisaged through corridors. The imaginaries in our study nevertheless retain many core conceptual characteristics of imaginaries identified within broader literatures. Most notably they are inherently future-oriented and socially-held (see for example Taylor, 2002; Jasanoff, 2015; Milkoreit, 2017). Through the Q-Methodology statement sorting exercise participants represent their expectations of future corridor development trajectories. Meanwhile, the Q-Methodology factors are used to produce representations of shared articulations of these imagined futures. Our imaginaries, therefore, build on Strauss (2006) assertion that scholars can use imaginaries to study social understandings that emerge in response to experience of concrete, material conditions.

Framing the Q-Methodology factors in terms of imaginaries has several functions, including allowing us to bound the scope of the knowledge produced through our analysis. Imaginaries clarify our analytical focus on how people imagine development trajectories, the expectations they hold about SDG interactions and the assumptions that underlie these expectations. Imaginary traditions (e.g. Anderson, 1983; Castoriadis, 1987) offer a framework to conceptualise the creativity inherent to processes of 'anticipation' and 'imagination' (Appadurai, 2013: 286–299), and the way in which social constructions of corridor futures move across time and space, situated in learning and experience (Aalders, 2021; Enns and Bersaglio, 2020). Imaginaries literatures also provide a conceptual framework to understand the way in which collective imagination, shared cultural resources and power shape development outcomes (Jasanoff, 2015; Milkoreit, 2017), which helps conceptualise the performative – and mediated – nature of imaginaries in corridors (Mkutu et al., 2021; Müller-Mahn, 2020; Müller-Mahn et al., 2021). Empirical enquiry into imaginaries also has an established function in reflexivity, wherein considering and debating the desirability of envisaged futures can diagnose problems, to guide decision-making and inform policy reorientation (Milkoreit, 2017). As

Neuman and Hull, : 782) (2009) surmise, "if we cannot imagine, then we cannot manage".

Q-Methodology is often used to understand the socially and culturally situated subjective worlds in which people develop meanings towards a given object of study (e.g. Gannon and Hulme, 2018) and it has some limited precedent in the study of imaginaries (Parkins et al., 2015; Rodhouse et al., 2021). 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 are interpreted according to the ways in which themes and ideas (statements) are configured and connected by participants. Our application of Q-Methodology is therefore particularly suited to exploring 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 and of the trade-offs and synergies that are – or are not – likely to be realised. The potential for Q-Methodology to produce multiple factors recognises that imaginaries can be more heterogeneous than singular interpretations of this concept would suggest.<sup>4</sup> Our application of Q-Methodology therefore recognises that while some cultural understandings may be shared, imaginaries may be fractured with respect to others (Strauss, 2006). Through the inclusion of a diverse range of participants within the study, we are able to put various, and potentially competing, forms of expectation surrounding corridor outcomes into conversation; to broaden the scope of the envisaged futures we engage with through this study and to qualitatively explore the desirability of these envisaged futures from a range of perspectives.

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 diverse actors involved in the design, delivery and monitoring of five corridors. These corridors have different focal development objectives, but are all identified as key, or flagship projects for enabling socio-economic transformation within 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).

## 2. Material and methods

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

In Q-Methodology, respondents sort a set of 'Q-statements', pre-defined by the researcher, onto an approximately-normally distributed grid, according to what they deem to be meaningful, in response to a given question, or sorting instruction. The resulting 'Q-sorts' are then compared in a by-person factor analysis, that identifies patterns of association between the sorts and generates a small number of factors which are used to interpret shared meanings within the data (Watts and Stenner, 2012). 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.

<sup>4</sup> For example, Castoriadis (1987) influential interpretation of the concept of the social imaginary has a rather more universalising and unifying meaning.

### 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. We ensured that core development objectives of each SDG were captured within at least one of the Q-statements. Key strategic corridor policy documents<sup>5</sup> were also examined to tailor the Q-set to reflect the overall character and relative emphases of development ambitions attached to 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 identified overlap between the development objectives linked to corridors in policy documents and the full list of SDG goals, targets and indicators (UN General Assembly, 2019). 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 Table 2 below, with the primary SDGs that informed the construction of each statement also identified.

### 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, and works best when participants have 'well developed' perspectives on the research subject (Brown, 1980). Our 35 participants were sampled on these principles. Each had significant experience of designing, implementing or monitoring development action through corridors, from different sectors and at different scales. This included respondents from national and regional corridor management institutions, as well as key national implementing ministries, departments and agencies (MDA) and representatives from overseas development partners and international finance institutions. We also included respondents from NGOs and community based-organisations, which have been powerful actors in promoting accountability within corridors (Enns, 2019; Sulle, 2020). 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 (Fig. 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, the way in which the statements related to one another, and the meanings they attached to these envisaged futures.

The Q-sorts of all participants were analysed using purpose-built Q-software, PQMethod. We used centroid factor analysis to extract factors based on similarly organised sorts and varimax rotation to produce the most orthogonal (uncorrelated) factors possible. The sorts of participants with statistically significant factor loadings ( $p < .01$  level) were used to construct ideal-typical sorts for each factor (Watts and Stenner, 2012). Triangulated and enriched by the qualitative data, these estimated arrays were used to construct narrative interpretations of the imaginaries of SDG trajectories represented through the factors.<sup>6</sup> 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. Annex 2 in SI identifies participant factor loadings and the participants whose Q-Sorts were used to generate the factor estimates. Z-scores (normalised item scores which facilitate cross-factor comparison)

<sup>5</sup> E.g. the SAGCOT Investment Greenprint (Shames et al., 2013).

<sup>6</sup> Crib sheets, presented in SI, were developed to support this process.



**Table 2**  
Factor Q-sort values for each statement and each factor.

Q-Statements	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 mobilise 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

for each of the Q-statements 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). A narrative interpretation of each factor is now offered. 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. “[26:–4]” indicates statement 26 being ranked at –4).

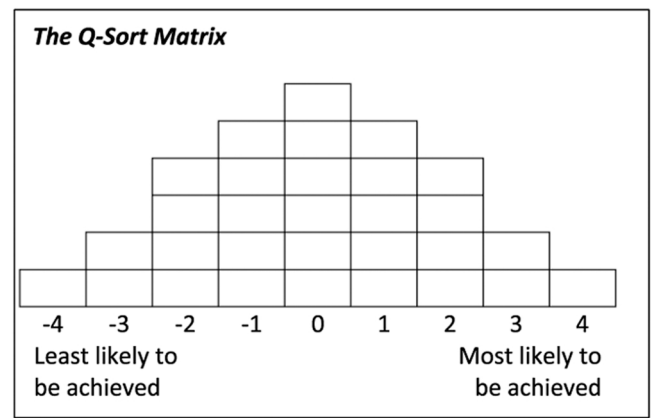


Fig. 1. The Q-Sort Matrix.

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. Four have most experience with Kenya’s Northern Corridor, two with the LAPSET Corridor, one with Tanzania’s Central Corridor and three with SAGCOT 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, wherein achievement of all other corridor development objectives depends on the realisation of rural and transborder infrastructure (6:+3, 30:+3), to link 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), 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 “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” and producers “will be able to access [new] inputs and other technologies” (K07) (29:+1). “New enterprises cropping up” (K17) is an inevitable outcome of market forces (4:+1, 25:+1), meaning corridors are 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” (K17), and because “income for the small-scale [producers and] traders is enhanced” (K10). Government and other development actors will also be able to reach new regions at reduced costs (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). As such, many of the ways in which corridor benefits manifest will be fortuitous, rather than arising from deliberate strategic planning. For example, 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 often not that sustainability and environmental protection policies don’t exist, but that they are not reliably implemented. “*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 investment criteria. “*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 and upscale agricultural productivity

Four participants are significantly associated with this factor. Three are primarily engaged with SAGCOT corridor and one with Kenya’s Northern Corridor.

Factor 2 characterises a vision of development corridors often associated with ‘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, “*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 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. 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 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.

These opportunities are possible since corridors offer space to enhance, coordinate and link investments and to develop partnerships and more cooperative forms of development planning (10:+2, 16:+1, 5:0). Indeed, 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 roles of both SAGCOT Centre and the Northern Corridor Transit and Transport Coordination

Authority in enabling this coordination, were emphasised by participants. However, informants suggested that corridors “*break silos and [facilitate new forms of] dialogue*” (T23) more generally.

These new forms of interactions also support learning, including through “*farmer demonstration*” (T24) and can therefore also support uptake of technologies, including those that support resilience (8:+1, 22:+2, 18:+1). New forms of accountability and scrutiny can also emerge. “*By encouraging information sharing and partnership, you are accountable to a [shared] vision and other stakeholders*”, T28 explained. And corridors support 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) and reduce hunger (12:+1).

Yet, Factor 2 also denotes caution, emphasising 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).

New vulnerabilities created through market-led agricultural development strategies in corridors are also emphasised. 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).

### 3.3. Factor 3: Development corridors exacerbate 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 LAPSET, two with Mtwara and two with SAGCOT. Factor 3 is significantly correlated with Factor 1 ( $p < .01$ ). It was nevertheless retained as a unique factor since it was felt to be sufficiently qualitatively distinct as to illuminate different assumptions (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 corridors depends on realising supportive infrastructure (6:+4; 30:+3, 17:0). However, while Factor 3 assumes that corridors will support economic growth, the development being mobilised through corridors is not 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 suggested that corridor approaches to development further exclude other regions, not within the corridor, from development opportunities. But even within corridors, 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*”, K19 explained. But many jobs will not be decent and safe (2:0) and mobilising participation in market economies doesn’t necessarily enhance the wellbeing and livelihood security of poor populations. “*Now women spend so much time farming that they don’t have time to grow veggies... They are malnourished*”, respondent T31 observed of a

community within SAGCOT (12:–2).

Factor 3 emphasises that corridors create winners and losers. Corridor developments will mostly benefit “the big guns” (K12), rather than small-scale businesses, 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” (K19). Comparatively, the most marginalised, who are least able to negotiate their needs are likely to bear the brunt of the costs and be even further marginalised from resources on which they depend. “Those who are advantaged get even richer, and the poorer become poorer comparatively”, T25 explained. Conflicts around land grabs and land compensation in corridors were emphasised (28:–3) (c.f. Bersaglio et al., 2020): “Local communities may not actually get access to these developments. So, natural resources being used may negatively impact local communities who have their own ways of utilising those resources” (K12). These inequalities mean it will be hard for corridors to support peaceful and inclusive societies (9:–1).

Many of the challenges for inclusion will 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 a town in Isiolo along a new road in the LAPSET corridor, “it’s basically a transit town. [People passing through] don’t even spend time sleeping or spending money. So, they are not feeling... that development”.

To “put rural people at the centre and heart of the strategy” (T31), it will be 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 explained.

#### 4. Discussion

Development corridors are associated with a broad range of development objectives: The full range of statements within the Q-set (and thus the full range of SDGs) were routinely recognised by participants as development objectives associated with corridors. Through our analysis we have identified three qualitatively distinct imaginaries of SDG futures within development corridors that exist among development actors, across five 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 – the factors can be understood to capture imaginaries 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 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 signal priority areas for policy consideration. The analysis also indicates a range of SDGs which are more overlooked within corridor landscapes. Most notably, SDG5 on gender equality was given limited consideration within the set of corridor policy documents that were examined to inform the Q-set and was not considered to be a likely outcome in corridors by any factor.

##### 4.1. SDG interactions in corridors

Each factor constructs its own logics around the way in which SDGs

**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	SDG 15 – Life on land SDG 14 – Life under water SDG 16.6 – Effective institutions	SDG 17 – Trade SDG 9.1 – Infrastructure SDG 11.2 – Transport
2	SDG 1.4 – Access to land SDG 10.7 – Safe migration SDG 6 – Clean water and sanitation SDG 16.6 – Effective institutions	SDG 9.3 – Value chain integration SDG 2.3 – Agricultural productivity SDG 8.3 – Entrepreneurship
3	SDG 1 – Extreme poverty SDG 10 – Reduced inequalities SDG 1.4 – Access to land	SDG 9.1 – Infrastructure SDG 11.2 – Transport SDG 10 – Development assistance

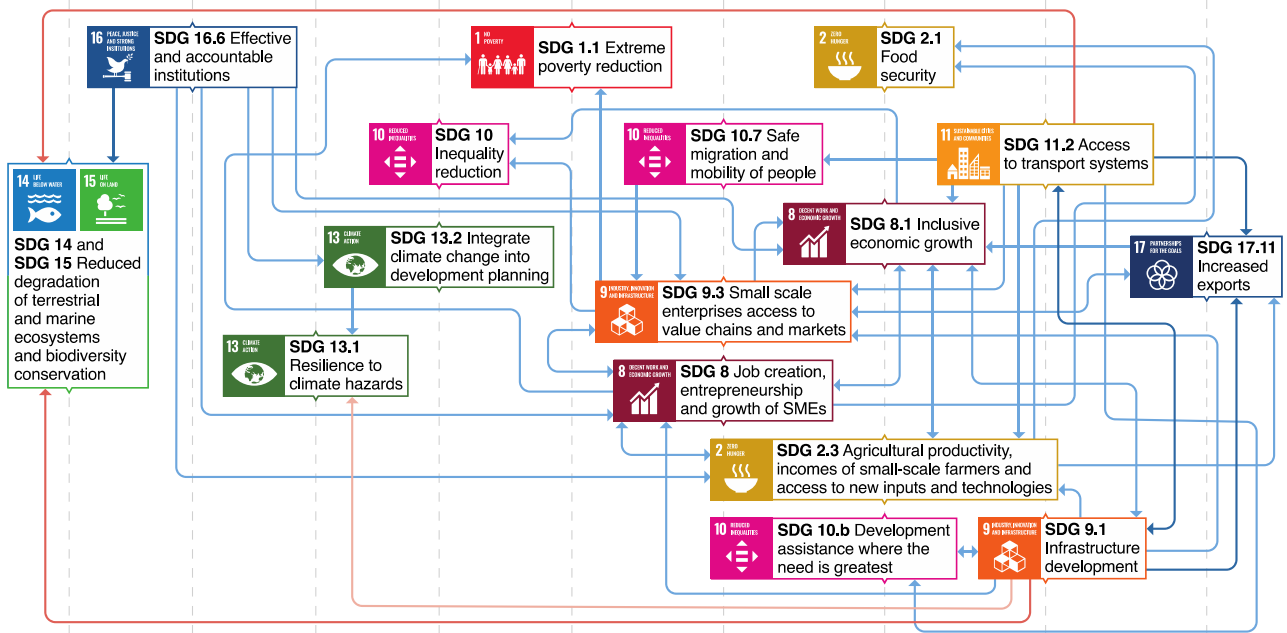
goals and targets interact within corridor landscapes. Key SDG interactions interpreted through the factors are represented in Fig. 2. We use the framework developed by Nilsson et al. (2016) to characterise the nature (reinforcing or counteracting, and uni- or bi-directional) and strength of interactions between different SDG goals and targets. In this figure, we do not aim to comprehensively map all possible interactions between the SDGs that were articulated by respondents. Rather, we illustrate the most prominent interactions in each factor interpretation. Fig. 2 illustrates that, within the imaginaries, 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. ICSU, 2016). However, it also emphasises that interactions can be multi-dimensional, with progress towards a given goal or target having potential to result in complex feedback loops and produce cascading impacts. Notably there is very high consistency of direction of influence across imagined SDG interactions between the factors.

##### 4.1.1. Key SDG synergies in development 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) (c.f. Bersaglio et al., 2020). ‘Getting the infrastructure right’ is therefore fundamental to maximising the opportunities for corridors to achieve all other SDGs (c.f. Schindler and Kanai, 2019). Participants represented by all factors, nevertheless, 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 EIA 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 infrastructure as a necessary – but not sufficient – condition to achieve inclusive development through corridors. Factor 2 emphasises opportunities corridors present to support broader business enabling environments, value chains (SDG9.3), agricultural productivity (SDG2.3) and job creation (SDG8.3), through development of strategic partnerships, coordination of public and private agricultural investments, and development of soft, as well as hard, infrastructure (c.f. Gannon et al., 2021). Comparatively, Factor 1 and Factor 3, do not envisage such synergies being mobilised in current corridor trajectories. For these factors, corridors are on course to manifest as ‘transport corridors’ (Hope and Cox, 2015), that remain detached

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



**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**

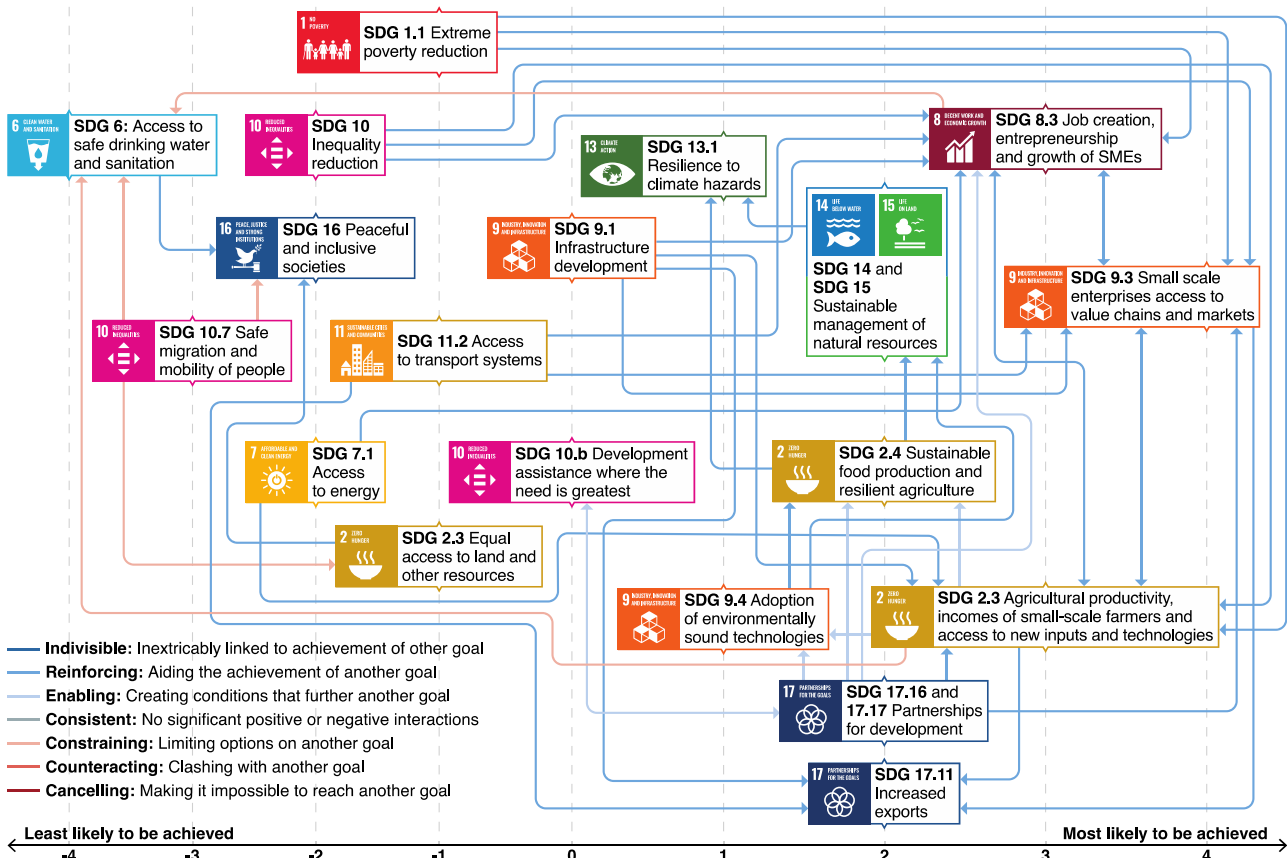


Fig. 2. Key SDG synergies and trade-offs envisioned in development corridors by each factor. SDG interactions interpreted through the Q-Methodology factors are represented using Nilsson et al.'s (2016) seven-point SDG interaction framework. Uni-directional relationships (objective A affects B, but B 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 Fig. 2 x-axis is an average rank of the corresponding Q-Methodology statements for that factor.



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

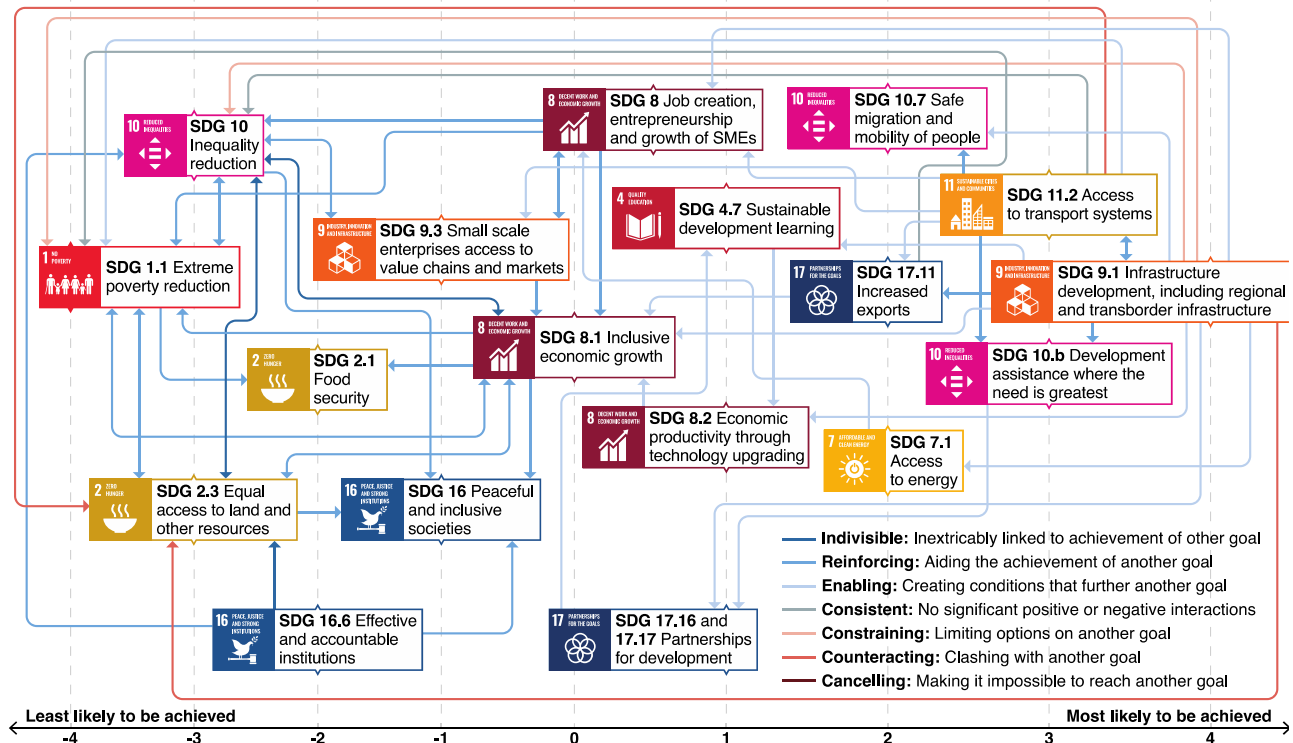


Fig. 2. (continued).

from deliberate strategies to build 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, this suggests notable opportunity for cross-corridor learning.

#### 4.1.2. SDG trade-offs in corridors

The factors also articulate areas where corridor activities, in pursuit of some SDG goals and targets, are anticipated to actively constrain 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 in corridors (c.f. Bersaglio et al., 2020); an interaction respondents credited particularly to 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.

The factors also suggest existing patterns of inequality are replicated through SDG trade-offs in corridors (c.f. Lesutis, 2021), meaning current corridor trajectories are inconsistent with SDG10 on reducing inequalities and the Agenda 2030 pledge to 'leave no one behind'. 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) and ineffective compensation schemes threaten access to land and natural resources that corridor communities depend upon for their livelihoods (c.f.

Bersaglio et al., 2020). All factors also emphasised that communities such as smallholders and pastoralists may experience heightened vulnerabilities as they are forced, or encouraged, to seek employment within other economic activities along corridors (SDG8.3), or to participate in unstable markets (SDG9.3).

#### 4.2. Enhancing the SDG agenda through corridors

The development corridor futures envisioned through this research suggest opportunities for realising the SDGs in development corridors. But they also identify risks: SDGs that are at risk of being forgotten in corridors and SDGs which may be constrained or compromised by current corridor trajectories. Yet these risks and interactions are not intrinsic to the development of corridors themselves and participants did not view any of the SDGs to be fundamentally incompatible (c.f. ICSU, 2016). Instead, respondents highlighted that 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 (c.f. Bersaglio et al., 2020).

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 migration planning across scales (Wade et al., 2017). Similarly, equitable and sustainable development in corridors is likely to require notable innovation around land tenure, to protect corridor communities, who may otherwise lose access to resources, rather than benefit from the arrival of a corridor. The idea that governance challenges often coalesce around policy enforcement, rather than an absence of sustainability, environmental protection and inclusion policies, was also echoed by respondents 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's relatively advanced climate policy framework. In this regard, it is notable that 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.

It will, however, be difficult to address and plan for the range of trade-offs and synergies across SDG objectives that this research suggests are being mobilised through corridors without a coordinated, cross-sectoral response, that considers and manages cumulative, multi-sector impacts and integrates development action. Corridors are focal points for the activities of multiple sectors and create new spaces where actors interact. They, therefore, appear responsive to integrated development planning and 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 (Gannon, 2022).

To overcome currently fragmented and siloed corridor and SDG governance landscapes, that limit holistic management of SDG trade-offs and synergies, existing literature on policy coherence and integration suggests cross-sectoral coordination needs to be championed at a high-level (Office of the President) and accompanied by investments in institutional and policy environments (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 – as well as across MDA more generally – is likely to be key. Establishing, enhancing and resourcing inter-ministerial and multi-stakeholder corridor fora, meanwhile, may provide an environment for inter-agency strategic management of SDG interactions in corridors and policy coherence (Curran et al., 2018). Since power is an important factor in understanding cross-sectoral cooperation (Cairns and Krzywoszynska, 2016), strategies to compel or motivate different MDAs active within corridors to seek collaborative action alongside their own internal mandates, may also be required.

Consultative and participatory development of an overarching corridor strategy, that plans for and addresses trade-offs and synergies in corridors, and which sectoral ministries can use to update and review their own policies and plans, may also support coherence. An overarching corridor strategy could also allow the public sector to more clearly signal direction to other corridor stakeholders, such as the private sector and investment communities; which is especially salient in corridors, where multiple actors vie for influence and co-produce and finance corridors. The imaginaries identified through the factors in our study proved to have significant rhetorical value; allowing stakeholders to debate the desirability of envisaged futures and to diagnose risks, opportunities and solution-pathways. Thus, ongoing reflexive engagement with the SDG futures imagined through these factors provides notable scope to support the design of such policies; through negotiation of desired futures and identification of priority areas for policy re-orientation. Notably clusters of positive linkages between SDGs identified in this analysis, which cut across the mandates of different MDA, also have potential to motivate new forms of cross-sector collaboration. The factors therefore offer a pathway to reorient modes of 'future-making' that shape development outcomes in corridors (Müller-Mahn et al., 2021).

#### 4.3. Q-Methodology as a tool to imagine SDG futures

Through this research we have also demonstrated the utility of our application of Q-Methodology as a response to the need for user-friendly approaches to holistically envisage SDG interactions and development trajectories within given contexts. Our approach is not incumbered by data gaps and, yet, the study factors have parallels with findings in other

corridor literatures,<sup>7</sup> suggesting they hold wider salience. Unlike the method developed in Weitz et al. (2018), our approach is relatively quick and easy to apply<sup>8</sup> and it enables inclusion of perspectives from a wide range of stakeholders. The method is also flexible and could be applied, or adapted, for rapid appraisal of SDG interactions within other fragmented development governance contexts and to explore SDG outcomes and interactions at different stages in development action: From design and conception, to monitoring and iterating strategies and reviewing outcomes. For example, it could be used within inter-governmental fora to support stakeholders to position their work within the context of other SDG activities, to anticipate and plan for SDG synergies and trade-offs and to review progress. Respondent K19 also proposed the value of applying the approach as a scaffold for communication at programme level: "It's a very nice [method]... I'm going to steal this idea and use it to spark discussions. We have an M&E meeting next week... I'll have this side [of the scale] as the things we've achieved and then the things that we have not achieved [the other side]... We can also talk about what were the assumptions [and] challenges and why have we not achieved this". The method could also be adapted to alternative and future integrated development frameworks, including any which supersede the SDGs.

It is notable that 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 and 'provocative' in their nature (Watts and Stenner, 2012). However, this approach was not only best suited to achieve our research aims, but also enabled us to include a wider range of stakeholders within the data collection: For many participants, a typical set of Q-Methodology statements could have appeared confronting, or even alienating, given the politically sensitive nature of the development environments in which they are operating.

## 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, development corridors must 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 way in which development corridors may support or limit achievement of the SDGs has been poorly understood.

In this research we have advanced a novel approach to integrated assessment of the ways in which the SDGs are likely to manifest and interact within a given development context, using Q-Methodology and the conceptual framing of imaginaries. Through this approach 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 ways in which the SDGs interact and interconnect in development corridors, which have a high degree of consistency in their direction of influence across the factors.

The factors suggest that SDG goals and targets are mostly synergistic in corridor landscapes, creating conditions that aid the achievement of each other. The factors also identify specific clusters of goals and targets that are considered to be directly mutually reinforcing and thus which could be strengthened and addressed in parallel, to upscale and

<sup>7</sup> E.g. the threat of corridors to the 'leave no one behind' agenda c.f. Lesutis (2021).

<sup>8</sup> Watts and Stenner (2012) provides a step-by-step guide to conducting Q-Methodology statistical processing.

maximise SDG progress within corridors. Factor 2 particularly 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 corridor value chains. Harnessing these synergies 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 marginalise them (Factor 3). Since respondents defining Factor 2 are primarily drawn from the SAGCOT corridor, this suggests opportunities for cross-corridor learning.

The factors also identify SDGs that are at risk of being overlooked in current corridor trajectories and 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). It is notable, however, that participants did not view any SDGs to be fundamentally incompatible with corridors. Instead, they suggested these interactions signal priority areas for policy reorientation, and where new or strengthened safeguards are likely required.

The SDG futures imagined through the Q-Methodology factors allowed stakeholders to debate the desirability of envisaged futures and to diagnose risks, opportunities and solution-pathways. Grand development plans in Africa often progress slowly and the corridors in this study are at different, but, in most cases, early, stages of development. The SDG futures imagined through these factors could therefore offer a framework for reflexive decision-making, to negotiate desired futures and identify priority areas for policy reorientation, that anticipate and plan for development trade-offs and opportunities and avoid locking-in undesirable futures. Yet, although corridors create new spaces in which actors interact, and are a focal point in the activities of multiple sectors, opportunities to jointly design, implement and appraise strategic action on the SDGs are currently limited by fragmented corridor governance landscapes.

The approach to SDG assessment advanced in this research facilitates a systems-view of SDG trajectories that supports exploration of how all SDGs may interact within a given context. It is a flexible tool that could be applied, or adapted, to support rapid assessment of development futures and reflexive decision-making within other development contexts. Although earlier research has primarily focused on examining binary interactions between SDGs, 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 literature on SDG interactions will require greater consideration of these multiplicities.

#### CRedit authorship contribution statement

**Kate Gannon:** Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - original draft, Writing - review & editing. **Laetitia Pettinotti:** Conceptualization, Methodology, Investigation, Data curation. **Declan Conway:** Funding acquisition, Conceptualization. **Swenja Surminski:** Funding acquisition, Conceptualization. **Edward Ndilanha:** Investigation, Data curation. **Tobias Nyumba:** Investigation, Data curation. All authors discussed and reviewed the manuscript.

#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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#### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.envsci.2021.12.013](https://doi.org/10.1016/j.envsci.2021.12.013).

#### References

- Aalders, J.T., 2021. Building on the ruins of empire: the Uganda Railway and the LAPSET corridor in Kenya. *Third World Q.* 42, 996–1013. <https://doi.org/10.1080/01436597.2020.1741345>.
- Anderson, B., 1983. *Imagined Communities: Reflections on the Origin and Spread of Nationalism*. Verso, London, UK.
- Appadurai, A., 2013. *The future as cultural fact. Essays on the Global Condition*. Verso, London, UK.
- Averchenkova, A., Gannon, K.E., Curran, P., 2019. Governance of climate change policy: A case study of South Africa. Grantham Research Institute on Climate Change and the Environment Policy Report.
- Bersaglio, B., Enns, C., Karmushu, R., Luhula, M., Awiti, A., 2020. How development corridors interact with the sustainable development goals in East Africa. *Int. Dev. Plan. Rev.* 43, 1–26. <https://doi.org/10.3828/idpr.2020.7>.
- Boas, I., Biermann, F., Kanie, N., 2016. Cross-sectoral strategies in global sustainability governance: towards a nexus approach. *Int. Environ. Agreem.: Polit. Law Econ.* 16, 449–464. <https://doi.org/10.1007/s10784-016-9321-1>.
- Brown, S.R., 1980. *Political subjectivity: Applications of Q Methodology in Political Science*. Yale University Press, New Haven, CT.
- Cairns, R., Krzywoszynska, A., 2016. Anatomy of a buzzword: the emergence of ‘the water-energy-food nexus’ in UK natural resource debates. *Environ. Sci. Policy* 64, 164–170. <https://doi.org/10.1016/j.envsci.2016.07.007>.
- Castoriadis, C., 1987. *The Imaginary Institution of Society*. MIT Press, Cambridge.
- CGIAR, 2016. *Agricultural Growth Corridors: Mapping Potential Research Gaps on Impact, Implementation and Institutions*. Rome, Italy.
- Chome, N., 2020. Land, livelihoods and belonging: negotiating change and anticipating LAPSET in Kenya’s Lamu county. *J. East Afr. Stud.* 14, 310–331. <https://doi.org/10.1080/17531055.2020.1743068>.
- Curran, P., Dougill, A., Pardoe, J., Vincent, K., 2018. Policy coherence for sustainable development in sub-Saharan Africa Grant. Res. Inst. Clim. Change Environ. Policy Brief., p. 8.
- Enns, C., 2019. Infrastructure projects and rural politics in northern Kenya: the use of divergent expertise to negotiate the terms of land deals for transport infrastructure. *J. Peasant Stud.* 46, 358–376. <https://doi.org/10.1080/03066150.2017.1377185>.
- Enns, C., 2018. Mobilizing research on Africa’s development corridors. *Geoforum* 88, 105–108.
- Enns, C., Bersaglio, B., 2020. On the coloniality of ‘new’ mega-infrastructure projects in East Africa. *Antipode* 52, 101–123. <https://doi.org/10.1111/anti.12582>.

- Fuso Nerini, F., Tomei, J., To, L.S., Bisaga, I., Parikh, P., Black, M., Borrión, A., Spataru, C., Castán Broto, V., Anandarajah, G., Milligan, B., Mulugetta, Y., 2018. Mapping synergies and trade-offs between energy and the sustainable development goals. *Nat. Energy* 3, 10–15. <https://doi.org/10.1038/s41560-017-0036-5>.
- Gannon, K.E., 2022. Achieving the sustainable development goals through more integrated approaches to development corridor planning. In: Hobbs, J., Juffe-Bignoli, D. (Eds.), *Impact Assessment for Corridors: From Infrastructure to Development Corridors*. United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), Cambridge, UK.
- Gannon, K.E., Crick, F., Atela, J., Conway, D., 2021. What role for multi-stakeholder partnerships in adaptation to climate change? Experiences from private sector adaptation in Kenya. *Clim. Risk Manag.* 32. <https://doi.org/10.1016/j.crm.2021.100319>.
- Gannon, K.E., Hulme, M., 2018. Geoengineering at the “edge of the world”: exploring perceptions of ocean fertilisation through the haida salmon restoration corporation. *Geo: Geogr. Environ.* 5, 1–21. <https://doi.org/10.1002/geo2.54>.
- Government of Kenya, 2018. *Third Medium Term Plan 2018–2022*. The National Treasury and Planning Treasury, Government of the Republic of Kenya, Nairobi, Kenya.
- Graham, M., Andersen, C., Mann, L., 2015. Geographical imagination and technological connectivity in East Africa. *Trans. Inst. Br. Geogr.* 40, 334–349. <https://doi.org/10.1111/tran.12076>.
- Gu, J., Corbett, H., Leach, M., 2019. Introduction: the belt and road initiative and the sustainable development goals: opportunities and challenges. *IDS Bull.* 50, 1–22. <https://doi.org/10.19088/1968-2019.136>.
- Hipondoka, M.H.T., Dalal-Clayton, D.B., van Gils, H., 2016. Lessons learnt from voluntary strategic environmental assessments (SEAs) in Namibia. *Impact Assess. Proj. Apprais.* 34, 199–213. <https://doi.org/10.1080/14615517.2016.1192829>.
- Hope, A., Cox, J., 2015. *Development Corridors*. EPS-PEAKS Topic Guide. Coffey International Development.
- Hughes, A.C., 2019. Understanding and minimizing environmental impacts of the Belt and Road Initiative. *Conserv. Biol.* 33, 883–894. <https://doi.org/10.1111/cobi.13317>.
- ICSU, 2016. *A guide to SDG interactions: from science to implementation*. Int. Counc. Sci. doi:DOI: 10.24948/2017.01 ICISU.
- Jasanoff, S., 2015. Future imperfect: science, technology and the imaginations of modernity. In: Jasanoff, S., Kim, S.-H. (Eds.), *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. The University of Chicago Press, Chicago and London, pp. 1–33.
- Laurance, W.F., Sloan, S., Weng, L., Sayer, J.A., 2015. Estimating the environmental costs of Africa’s massive “development corridors. *Curr. Biol.* 25, 3202–3208. <https://doi.org/10.1016/j.cub.2015.10.046>.
- Lawer, E.T., 2019. Examining stakeholder participation and conflicts associated with large scale infrastructure projects: the case of Tema port expansion project, Ghana. *Marit. Policy Manag.* 46, 735–756. <https://doi.org/10.1080/03088839.2019.1627013>.
- Lesutis, G., 2021. Infrastructure as techno-politics of differentiation: Socio-political effects of mega-infrastructure in Kenya. *Trans. Inst. Br. Geogr.* 1–13. <https://doi.org/10.1111/tran.12474>.
- Lesutis, G., 2019a. How to understand a development corridor? The case of Lamu Port – South Sudan – Ethiopia – Transport corridor in Kenya. *Area* 52, 1–9. <https://doi.org/10.1111/area.12601>.
- Lesutis, G., 2019b. Spaces of extraction and suffering: neoliberal enclave and dispossession in Tete, Mozambique. *Geoforum* 102, 116–125. <https://doi.org/10.1016/j.geoforum.2019.04.002>.
- Makaba, L.P., Munyati, C., 2018. Strategic environmental assessment implementation and effectiveness bottlenecks: lessons from Botswana. *Environ. Dev.* 26, 86–99. <https://doi.org/10.1016/j.envdev.2018.05.001>.
- Milkoreit, M., 2017. Imaginary politics: climate change and making the future. *Elementa* 286, 5. <https://doi.org/10.1525/elementa.249>.
- Miola, A., Borchardt, S., Neher, F., Buscaglia, D., 2019. Interlinkages and policy coherence for the Sustainable Development Goals implementation: An operational method to identify trade-offs and co-benefits in a systemic way. Joint Research Centre (JRC). European Commission, Luxembourg. <https://doi.org/10.2760/472928>.
- Mkutu, K., Müller-Koné, M., Owino, E.A., 2021. Future visions, present conflicts: the ethnicized politics of anticipation surrounding an infrastructure corridor in northern Kenya. *J. East Afr. Stud.* 15, 707–727. <https://doi.org/10.1080/17531055.2021.1987700>.
- Müller-Mahn, D., 2020. Envisioning African futures: development corridors as dreamscapes of modernity. *Geoforum* 115, 156–159. <https://doi.org/10.1016/j.geoforum.2019.05.027>.
- Müller-Mahn, D., Mkutu, K., Kioko, E., 2021. Megaprojects—mega failures? The politics of aspiration and the transformation of rural Kenya. *Eur. J. Dev. Res.* 33, 1069–1090. <https://doi.org/10.1057/s41287-021-00397-x>.
- Neuman, M., Hull, A., 2009. The futures of the city region. *Reg. Stud.* 43, 777–787. <https://doi.org/10.1080/00343400903037511>.
- Newell, P., Taylor, O., Naess, L.O., Thompson, J., Mahmood, H., Ndaki, P., Rurangwa, R., Teshome, A., 2019. Climate smart agriculture? Governing the sustainable development goals in Sub-Saharan Africa. *Front. Sustain. Food Syst.* 3, 1–15. <https://doi.org/10.3389/fsufs.2019.00055>.
- Nilsson, M., Griggs, D., Visbeck, M., 2016. Map the interactions between sustainable development goals. *Nature* 534, 320–322. <https://doi.org/10.1038/534320a>.
- Pardoe, J., Conway, D., Namaganda, E., Vincent, K., Dougill, A.J., Kashaigili, J.J., 2018. Climate change and the water–energy–food nexus: insights from policy and practice in Tanzania. *Clim. Policy* 18, 863–877. <https://doi.org/10.1080/14693062.2017.1386082>.
- Parkins, J.R., Hempel, C., Beckley, T.M., Stedman, R.C., Sherren, K., 2015. Identifying energy discourses in Canada with Q methodology: moving beyond the environment versus economy debates. *Environ. Sociol.* 1, 304–314. <https://doi.org/10.1080/23251042.2015.1054016>.
- Republic of Tanzania, 2016. *National Five Year Development Plan 2016/17 - 2020/21*. Ministry of Finance and Planning, United Republic of Tanzania.
- Rodhouse, T.S.G.H., Pesch, U., Cuppen, E.H.W.J., Correljé, A.F., 2021. Public agency and responsibility in energy governance: a Q study on diverse imagined publics in the Dutch heat transition. *Energy Res. Soc. Sci.* 77, 77. <https://doi.org/10.1016/j.erss.2021.102046>.
- Schindler, S., Kanai, J.M., 2019. Getting the territory right: infrastructure-led development and the re-emergence of spatial planning strategies. *Reg. Stud.* 0, 1–12. <https://doi.org/10.1080/00343404.2019.1661984>.
- Shames, S.A., Scherr, S.J., Friedman, R., 2013. *Green Growth Opportunities for Businesses and Investors: Greenprint for the Southern Agricultural Growth Corridor of Tanzania (SAGCOT)*. Dar es Salaam.
- Singh, G.G., Cisneros-Montemayor, A.M., Swartz, W., Cheung, W., Guy, J.A., Kenny, T.A., McOwen, C.J., Asch, R., Geffert, J.L., Wabnitz, C.C.C., Sumaila, R., Hanich, Q., Ota, Y., 2018. A rapid assessment of co-benefits and trade-offs among sustainable development goals. *Mar. Policy* 93, 223–231. <https://doi.org/10.1016/j.marpol.2017.05.030>.
- Stephenson, W., 1936. The inverted factor technique. *Br. J. Psychol.* 26, 344–361.
- Strauss, C., 2006. The imaginary. *Anthropol. Theory* 6, 322–344. <https://doi.org/10.1177/1463499606066891>.
- Sulle, E., 2020. Bureaucrats, investors and smallholders: contesting land rights and agro-commercialisation in the Southern agricultural growth corridor of Tanzania. *J. East Afr. Stud.* 14, 332–353. <https://doi.org/10.1080/17531055.2020.1743093>.
- Taylor, C., 2002. *Modern social imaginaries*. *Public Cult.* 14, 91–124.
- Thorn, J.P.R., Hobbs, J., Marchant, R.A., 2022. Exploring the potential of scenario planning for more effective environmental assessments: standard Gauge railway development corridor, Kenya. In: Hobbs, J., Juffe-Bignoli, D. (Eds.), *Impact Assessment for Corridors: From Infrastructure to Development Corridors*. United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), Cambridge, UK.
- Tshibangu, G.M., 2018. An analysis of strategic environmental assessment legislation and regulations in African countries. *J. Environ. Assess. Policy Manag.* 20, 1850002. <https://doi.org/10.1142/S1464333218500023>.
- Tups, G., Dannenberg, P., 2021. Emptying the future, claiming space: the southern agricultural growth corridor of Tanzania as a spatial imaginary for strategic coupling processes. *Geoforum* 123, 23–35. <https://doi.org/10.1016/j.geoforum.2021.04.015>.
- UN General Assembly, 2019. Annex: Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development. A/RES/71/313. E/CN.3/2018/2. E/CN.3/2019/2. E/CN.3/2020/2. Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development.
- United Nations, 2015. *Arsenic in the Environment - Proceedings: Proceedings of the Sixth International Congress on Arsenic in the Environment (As2016)*, June 19–23, 2016, Stockholm, Sweden Transform. our World.: 2030 Agenda Sustain. Dev. A/RES/70/1, pp. 12–14. doi: 10.1201/b20466-7.
- Wade, C., Dime, M., Tandian, A., Ehode, L., 2017. *État des lieux des liens entre migration, transferts et résilience au changement climatique au Sénégal. Pathways to Resilience in Semi-Arid Economies (PRISE) Working Paper*. Innovation, Environnement Développement en Afrique (IED Afrique), Dakar, Senegal.
- Watts, S., Stenner, P., 2012. *Doing Q Methodological Research: Theory Method and Interpretation*. Sage, London, UK.
- Weitz, N., Carlsen, H., Nilsson, M., Skånberg, K., 2018. Towards systemic and contextual priority setting for implementing the 2030 agenda. *Sustain. Sci.* 13, 531–548. <https://doi.org/10.1007/s11625-017-0470-0>.