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Erratum: In the original publication of this article an incorrect version of Table 2 was published. Table 2 was corrected on 30 September 2024.

Research

African futures: a review of scenarios for Indigenous and local people and nature in Africa

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ABSTRACT. There is global understanding of the use of scenarios in addressing continued environmental change in Africa. Scenarios are a powerful tool for exploring uncertainties posed by the Anthropocene. As such, there are increasing calls for the use of scenarios in participatory research to inform policy and decision making. However, very limited research has tackled the integration of Indigenous and local people in participatory scenario planning. This study is an attempt to review knowledge on existing research involving Indigenous and local people in scenario planning in Africa. To do so, we undertook a semi-systematic review of scenario planning for people and nature in Africa of 68 case studies. We found that most of the research on participatory scenarios for people and nature in Africa is undertaken and led by researchers affiliated with institutions outside of Africa and there is a lack of active participation of Indigenous and local communities (IPLC). Of those studies conducted, agriculture and economics are the most common topics covered in the scenarios developed. The findings from this study call for more integration of Indigenous peoples and local communities with their associated knowledge in visioning processes and scenario development and a more inclusive approach to working with researchers based on the African continent for enhanced agency, ownership, and access.

Key Words: *Africa; Anthropocene; Indigenous and local knowledge; participation; scenario; semi-systematic review; visioning*

INTRODUCTION

Human activity is now considered the primary driving force of environmental change around the globe and has placed the Earth in a new era defined as the Anthropocene (Crutzen and Stoermer 2013, Steffen et al. 2015). This anthropogenic pressure is the leading cause of climate change, biodiversity loss, and environmental degradation (Biggs et al. 2008, Odada et al. 2009). Africa, with its rapidly growing population and associated increasing demands on natural resources, faces a serious threat to local livelihoods (Reinhardt et al. 2018). There is an undeniably great need to maintain and improve capacities to enable the well-being of these communities and reverse the trends of negative environmental change (Chitakira et al. 2012, Reinhardt et al. 2018, Archer et al. 2021). Scenario planning (SP) is a key tool used in dealing with the complexity of social-ecological changes to analyze sustainability issues and plan for better futures (Reinhardt et al. 2018).

Scenario planning is also referred to as scenario analysis or scenario thinking and is a strategic planning device (Reilly and Willenbockel 2010, Batrouni et al. 2018). The term "scenario" as it is used today was defined in the 1960s as "hypothetical sequences of events constructed for the purpose of focusing attention on causal processes and decision points" (Kahn and Wiener 1967, as cited in Reilly and Willenbockel 2010:3049, Batrouni et al. 2018). During this time, the use of scenarios was introduced as part of strategic business planning, spearheaded by companies such as General Electric and Royal Dutch Shell (Batrouni et al. 2018). Scenarios are visionary tools that help stakeholders to identify plausible future trajectories of their systems (Batrouni et al. 2018, Bondé et al. 2020). From their business orientated origins, scenarios have since been used in a wide variety of disciplines including the sustainability sciences. They are used to forecast the impacts of environmental problems such as climate change and biodiversity loss in social-ecological systems (Duinker and Greig 2007, Acosta et al. 2016, Batrouni et al. 2018). For example, they have been used in the Global Environment Outlook (GEO) as well as in the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) assessments to explore possible futures (Pereira et al. 2021). The Millennium Ecosystem Assessment scenarios were the first scenarios with an emphasis on social-ecological systems (MEA 2005), building upon other environment-related efforts, such as the IPCC climate scenarios.

Scenario planning offers an opportunity to explore long-term uncertainties for complex systems without the need to assign probabilities to the outcomes (Reilly and Willenbockel 2010). There are different typologies (Acosta et al. 2016) used to categorize scenarios, but we follow the three typologies suggested by Reilly (2010) namely: projections, exploratory scenarios, and normative scenarios. We chose Reilly's categories for their conciseness and considered them adequate for our analysis. Projections are future estimates in which the system continues along a-business-as-usual path with no major policy changes (see the Middle of the Road Shared Socio-economic Pathway of the IPCC; O'Neill et al. 2016, IPCC 2018). Although exploratory scenarios are most useful when the uncertainties within or outside of the system cannot be managed under a modeling framework, they often have a quantitative model simulation to inform the predominantly qualitative outputs (the Millennium Ecosystem Assessment scenarios provide a good example of exploratory scenarios; MEA 2005). Lastly, normative scenarios develop toward targeted futures (Reinhardt et al. 2018), an example of which are scenarios developed using the Nature Futures Framework of the IPBES Task Force on Scenarios and Models (Durán et al 2023).

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Robust scenario analyses often require a participatory approach that engages as many stakeholders as possible (Jiren et al. 2021). However, sometimes being more targeted with who is included and why, and ensuring there is space for deep and "safe enough" conversations is important (Pereira et al. 2018, 2020). Further, when dealing with local-level anticipatory capacity building, it is recommended that a place-based, bottom-up methodology, which takes advantage of different knowledge systems present within stakeholder groups, is used (Capitani et al. 2019). These knowledge systems include Indigenous and local knowledge (ILK) systems that are part of the biocultural heritage of Indigenous peoples and local communities (IPLC) within social-ecological systems (McElwee et al. 2020). The undertaking may take on a multiple evidence approach recognizing that ILK and scientific disciplines can be complementary (Tengö et al. 2014). A recent review (McElwee et al. 2020) of the IPBES global assessment on the inclusion of ILK in large-scale assessments showed that when it comes to scenario processes, the potential benefits of ILK inclusion are:

- long term social-ecological system knowledge that could inform, interpret, and improve projections;
- adaptive approaches and practices that would enable better information sharing and transitions;
- the provision of policy guiding information on important local values.

We conducted this review, against this background, to assess the inclusion of IPLC and/or their knowledge and practices within environmental focused SP processes conducted in Africa. The delineation of the terms "local" and "Indigenous" for people and knowledge are often complex and subjective, particularly in Africa, and as such, we did not attempt to distinguish between the two, choosing instead to sit within the context of the IPBES, Decision IPBES 5/1, Annex II, definition that states:

> *Indigenous and Local knowledge Systems are in general understood to be dynamic bodies of integrated, holistic, social and ecological knowledge, practices and beliefs pertaining to the relationship of living beings, including people, with one another and with their environments. Indigenous and local knowledge is grounded in territory, is highly diverse and is continuously evolving through the interaction of experiences, innovations and various types of knowledge (written, oral, visual, tacit, gendered, practical and scientific). Such knowledge can provide information, methods, theory and practice for sustainable ecosystem management.*

As part of this process of actively including more diverse knowledge systems, in particular ILK in assessment reports, in June 2022 during the 9th plenary session, IPBES welcomed the Nature Futures Framework (NFF) that has been developed by the IPBES Task Force on Scenarios and Models. The aim of this framework is to facilitate more diverse value perspectives on nature and Mother Earth when thinking about more desirable futures for people and the planet (Pereira et al 2020). The Nature Futures Framework represents the plurality of value perspectives on human-nature relationships that form the foundation for the development of desirable future scenarios for people and nature. The NFF uses a triangle to represent the relative influence of three value perspectives on the relationship between people and nature in which each corner has a corresponding nature value, and the interior of the triangle represents a continuum or gradient between these three value perspectives (Durán et al. 2023). The three value perspectives are Nature for Nature (NN), which emphasizes intrinsic values for nature, Nature for Society (NS), representing largely instrumental values for nature, and Nature as Culture/One with Nature (NC), which refers to relational values. As such, all the potential locations within the triangle relate to each of the three corners and thus offer some combination of all three value perspectives (Durán et al. 2023). It is important to bear in mind that the vertices, or corners, of the triangle offer extreme cases of what could be considered specific value perspectives to navigate to a desirable future for nature. We chose to use this framework in our analysis to contribute to the ongoing work of the IPBES assessments. A core aspect of the NFF is to enable participatory processes that ensure the inclusion of diverse voices in scenario processes and in particular of IPLCs. As well as inclusive participation, which is a core aspect of the IPBES work ethic and conceptual framework (McElwee et al. 2020), the emphasis on equal regional representation is also a core aspect of the intergovernmental process. It is generally well recognized that there is a dominance of Global North and in particular researchers from Western Europe and other groups (WEOG) countries in academic publishing (Demeter 2020, Hedding and Breetzke 2021). By situating our research within these focus areas of IPBES, the findings of this review can help to elucidate where there are key gaps of representation and research that need to be addressed in the participatory scenario planning community.

The main questions of our study were:

1. What are the primary purposes and methodology of the SP activities and how do they relate to the NFF?
2. How often are SP processes initiated by African institutions, and what features distinguish them from those led by overseas institutions?
3. How often do IPLC participate in the development of scenarios and what features distinguish them from those that have no IPLC participation?
4. How often do the social-ecological futures envisioned include ILK and/Indigenous local practice (ILP)?

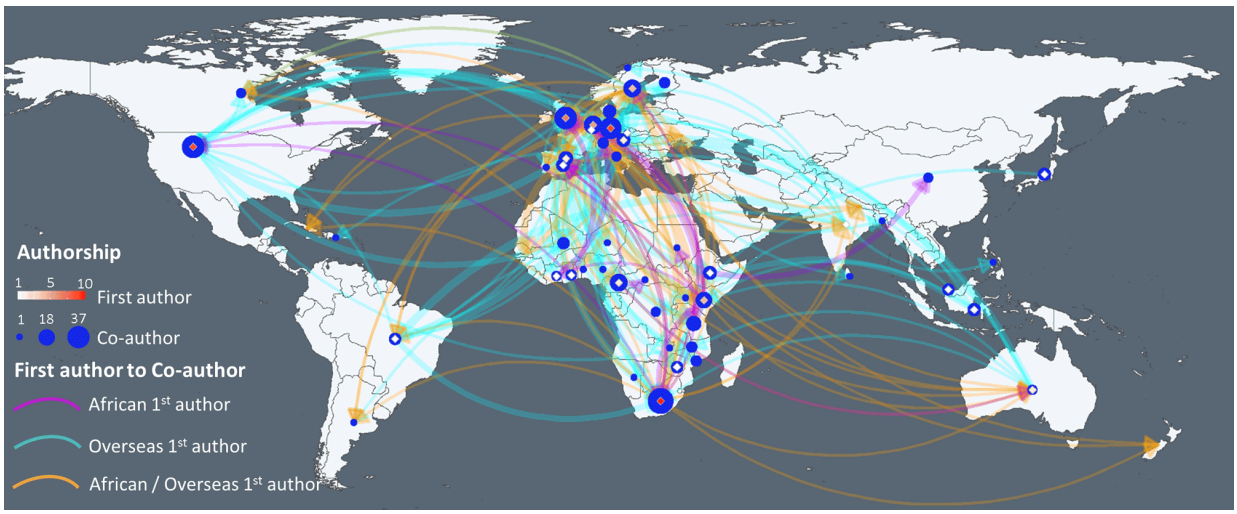
METHODS

Semi-systematic literature review

We selected 68 case studies to review scenario planning for people and nature in Africa with the limiting factor being that they included ILK in scenarios and/or IPLC participation in the scenario building. These articles were selected using a semi-systematic review that consisted of four steps.

We began with the 12 case studies of scenarios with ILK that had been included as part of the IPBES Africa Assessment (Archer et al. 2018). These were used to develop and test the data extraction protocol that consisted of a formatted Microsoft Excel spreadsheet. To create this template, we carefully read through the articles to assess which variables we would need to answer our research questions.

Fig. 1. Cartography of authors' affiliations across the world. The size of the blue dot illustrates the frequency of authors from that country



Second, to retrieve articles from the scientific databases (Web of Science, Scopus, and ScienceDirect), we used the Boolean search: Title/Keywords/Abstract: Africa AND (scenario OR futures OR visions OR foresight OR pathways anticipation OR anticipatory) AND (ecosystem OR biodiversity OR Nature) AND (Indigenous OR local OR traditional). We also conducted a search in the JSTOR database, but we adapted the string to account for the limitation on the number of characters allowed on that database. The adapted string consisted of a two-step search:

(1) Africa AND (scenario OR futures OR visions OR foresight OR pathways anticipation).

(2) Articles retrieved from the first step were then screened using the terms (ecosystem OR biodiversity OR Nature) AND (Indigenous OR local OR traditional).

Third, we carried out a Google Scholar search using the string: Africa AND (scenario OR futures OR visions OR foresight OR pathways anticipation OR anticipatory) AND (ecosystem OR biodiversity OR Nature) AND (Indigenous OR local OR traditional). Only articles in the first 20 pages that fit our criteria were included because there were more than a million results altogether and further investigation was not feasible.

All the articles collected were then screened by the content of their titles and abstracts to ascertain if they fit the following criteria: (1) they were in English and accessible to the research team; (2) had scenario or visioning processes that included Indigenous, traditional, or local knowledge, practice or people; and (3) were in or included African case studies. Data were then extracted from the selected articles using the protocol we developed. During this data collection, if an article referenced another article that provided a more detailed account of the same scenarios, we searched for the latter article, and if found, used it instead of this initial article. Likewise, if the article referenced another study that fit our criteria but had not been collected using the aforementioned database and web scraping, the article was added to our literature corpus.

Data analysis

We conducted a quantitative content analysis and coded the final set of 68 papers using Microsoft Excel. We developed the coding scheme to include variables that would help to answer the research questions. The main variables of the coding scheme were author institution country, region and/or country of study, scope of study, participation of IPLC in SP, inclusion of ILK or IPLC practices in scenario, Nature Futures Framework (NFF) value perspectives, scenario typology, SP method, output type, scenario timeframe, scenario parameters, and purpose of SP. Summary statistics and visualizations were conducted in Microsoft Excel and R Programming software (R Core Team 2022), mainly dplyr (Wickham et al. 2023) and ggplot2 (Wickham 2016) packages. R scripts used are available at the following github repository: https://github.com/bravemaster3/AfricanFuture_ScenarioReview

RESULTS

All 68 studies reviewed were of human-nature futures envisioning activities that had included ILK in their scenarios and/or involved IPLC in the creation of the scenarios and/or developed using data collected from IPLC. The papers spanned 19 years starting from the year 2002 to 2021.

Geographical representation

In these publications, we observed a dominance of overseas affiliated researchers in lead authorship. Authors based solely at an African institution led 18 (27%), those based at both African and overseas institutions led only 9 (13%), and most 41 (60%) of the studies were led by non-African based researchers. Figure 1 illustrates the geographical relationships between authors. Of the first authors based in an African country, the majority are from South Africa. South Africa also dominates the total number of authors involved in the publications, but this is more evenly shared across the continent (represented by the size of the blue dot in Figure 1).

In terms of the regions under study, we observed a higher representation of South-Eastern African nations and a great underrepresentation of the North African nations (Table 1). In

Table 1. Region of study.

Study region	Lead author affiliation			Grand total
	African	African/ overseas	Overseas	
East Africa	28%	44%	27%	29%
Southern Africa	50%	0%	24%	28%
West Africa	6%	33%	22%	19%
Central Africa	11%	11%	2%	6%
North Africa	0%	0%	2%	1%
Multiregional	0%	0%	18%	10%
Continental/worldwide	6%	11%	2%	4%
Grand total	100%	100%	100%	100%

total, of the papers reviewed, 42% focused on or included East Africa, 39% Southern Africa, 32% West Africa, 18% Central Africa, and 6% North Africa (including continental and worldwide focused scenarios).

Upon stratifying the analysis of NFF value perspectives by lead author affiliation (Fig. 2), we observed consistent trends (note that 5% of African-led studies were excluded as thematic determination was inconclusive). Notably, all papers led by African institutions featured the nature for society (NS) perspective, with 50% solely representing this perspective, while the remaining 45% incorporated elements of nature for nature (NN) and nature as culture (NC). Similar patterns were evident in other groups: the hybrid group, comprising authors from both African and overseas affiliations, demonstrated 44% solely focused on NS. The overseas group revealed over 61% emphasizing NS, with the remaining scenarios integrating elements of NC and NN. However, none of the author groups exclusively focused on NC or NN scenarios.

Overview of scenario category, timescale, and creation method

In general (Table 2), the most common future time horizon was more than 25 years from the time of its construction. However, medium (> 10–25 yrs.) and short (0–10 yrs.) futures were also undertaken. Twenty percent of all the papers used more than one scenario development process. The most used single process was participatory (35%) followed by participatory modeling methods (as described in Table 2; 22%), 15% used expert modeling, and only 9% relied solely on expert generation. Participatory is defined as SP processes that involve stakeholders other than the researchers involved in the study. Participatory modeling involved dialogue with stakeholders to collect data for the models, such as content analysis of interviews conducted with IPLCs without direct involvement of stakeholders in the scenario creation process as in Cartwright et al. 2013, Boone and Lesorogol 2016, Aleman et al. 2017, and Capitani et al. 2019.

Most of the scenarios developed were explorative (49%), followed by predictive (21%), and the least frequent were normative (10%). Twenty-one percent of the studies included more than one scenario type or a mixed scenario type, such as Enfors et al. 2008, who used a largely exploratory approach with aspects of prediction for scenario formation methodology to envision futures of the Makanya Catchment in Tanzania.

Of the studies undertaken, the majority (56%) did not actually include ILPCs in the creation of the scenarios (Table 3). This participation was unclear in 3% of the papers.

In most cases, the SP exercise was undertaken to build knowledge and develop policy guidance (Table 4). Although many knowledge-building scenarios also involve policy guidance and decision making, only a few have a focus on generating a shared vision. No studies are solely for awareness raising.

Overview of scenario themes

We also investigated where the highest intersections in themes lay (Fig. 3) and found that the five topmost pairings were as follows: agriculture/aquaculture-economics (75%), agriculture/aquaculture-food (75%), economics-food (69%), economics-human development (66%), and agriculture/aquaculture-ILK (66%).

Differences in scenarios based on IPLC participation

We observed notable similarities and differences in the prominence of themes when the data were segregated into studies that included IPLCs directly in the scenario processes versus those that did not (Fig. 4). In scenarios created with and without IPLC involvement, agriculture/aquaculture and economics were prominent, 93% and 86%, respectively, compared to 92.11% and 78.95%, respectively, in non-IPLC studies as were food (75% vs. 76%) and ILK (75% vs. 65%). Additionally, topics such as energy/mining (25% vs. 31%) and marine/coastal (7% vs. 13%) had notably lower occurrence rates in both groups, indicating lesser emphasis irrespective of IPLC involvement.

In terms of notable differences, IPLC-included studies demonstrated higher emphasis on topics such as governance (82% vs. 58%), human development (82.14% vs. 65.79%), water resources (82.14% vs. 60.53%), environmental threats (78.57% vs. 57.89%), human population dynamics (78% vs. 47%), climate change (71.43% vs. 44.74%), and biodiversity (60.71% vs. 47.37%) compared to non-IPLC studies.

DISCUSSION

Geographical representation

In their paper, Swart et al. (2004) outlined the nine research challenges to sustainability that can benefit from scenario analysis:

- combining qualitative and quantitative analysis;
- engaging stakeholders;
- reflecting multiple stresses and functional complexity;
- integrating across themes and issues;
- accounting for volition;
- recognizing a wide range of outlooks;
- spanning spatial scales;
- accounting for temporal inertia and urgency; and
- reflecting uncertainty.

Reinhardt et al. (2018) postulated that the comparison of different scenario assessments can reveal the pros and cons of addressing these challenges. In our study, we compared SPs in terms of who initiated, participated in, and the purpose and content of the scenarios. The proxy for initiator used was the geographical location of the institution that the lead author was affiliated with. We

Fig. 2. Percentage of studies with scenarios that had a focus or aspect of the NFF value perspectives. The three value perspectives are nature for nature, nature for society, and nature as culture/one with nature. Note: NFF = Nature Futures Framework.

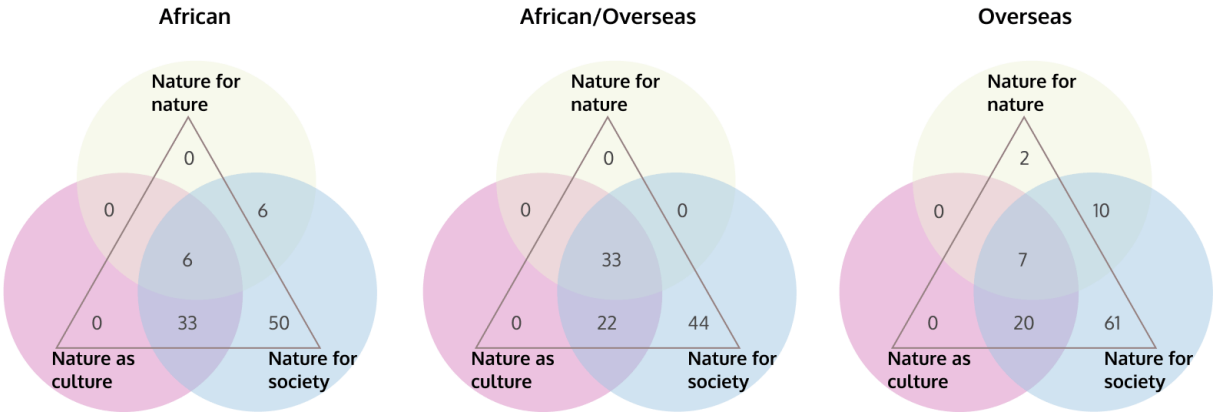


Table 2. Type of scenarios and methods used in the reviewed studies. Note: IPLC = Indigenous peoples and local communities; SP = scenario planning; ILK = Indigenous and local knowledge.

	African	African/ overseas	Overseas	Percent of studies
Scenario category				
Explorative	33%	67%	51%	49%
Predictive	33%	11%	17%	21%
Normative	22%	22%	2%	10%
Multiple trends	11%	0%	30%	21%
	100%	100%	100%	100%
Method used				
Participatory	44%	22%	34%	35%
Participatory modeling[†]	17%	22%	24%	22%
Expert modeling	17%	11%	15%	15%
Expert generated	6%	11%	10%	9%
Multiple methods used	16%	34%	17%	19%
	100%	100%	100%	100%
Scenario time projection in years: short (0–10), medium (> 10–25), and long (> 25)				
Short	17%	11%	24%	21%
Medium	17%	44%	32%	29%
Long	39%	22%	37%	35%
Multiple times	12%	0%	2%	3%
Unclear	17%	22%	5%	10%
	100%	100%	100%	100%

[†] Participatory modeling refers to instances in which the authors modeled based on data collected from IPLCs (via focus groups, interviews, etc.) but in which the SP process itself did not include IPLC and the scenarios did not include ILK.

Table 3. Percentage of studies by lead author affiliations with Indigenous peoples and local communities (IPLC) participation in creating scenarios and/or Indigenous and local knowledge (ILK) in scenarios.

IPLC participation in creating scenarios	Scenarios with ILK	Lead author affiliation			
		African	African/ overseas	Overseas	Grand total
No	Yes	28%	67%	46%	44%
Yes	Yes	44%	22%	34%	35%
No	No	17%	0%	12%	12%
Yes	No	6%	0%	5%	4%
Unclear	Yes	0%	11%	2%	3%
Yes	Unclear	6%	0%	0%	1%

welcome a cautious interpretation of the results that considers the limitation of the data available to us given the literature that was accessible.

We found there were more researchers affiliated to institutions outside Africa (60%) vs. within (27%), leading studies to envision futures for nature and people that include ILK or engage IPLC in the processes. Within our sample, we also had a few (13%) lead researchers who lay in the intersection, having affiliations at both categories of institutions. From these figures, we contend that these scenario building activities for people and nature futures were largely driven by non-African institutions.

We hypothesize that this is attributable to two possible drivers, the first being funding and a lack thereof in the African context to undertake participatory activities. It is the experience of the authors that running participatory processes, especially with under-represented groups, who may be in more remote areas, is a very costly affair and requires a lot of time and planning to get right. Even in well-funded projects, the ability to undertake several in-depth workshops in remote areas is often prohibitive. The inequity in global funding models that often exclude or marginalize partners from the Global South is relatively well recognized (Skupien and Ruffen 2020, Flint et al. 2022). In the context of climate change funding, Africa receives at most 3.8% of global funding, and African institutions receive only 14.5% of total funding (Overland et al. 2021). Such inequity is bound to be a core driver of our findings that very few African institutions lead the research being undertaken on participatory scenario planning and ILK.

The second driver is the interests and capacities of researchers to undertake participatory scenario research. We are not aware of any specific studies that have been undertaken to ascertain the

Table 4. Overview of the purpose of each study. Note: IPLC = Indigenous peoples and local communities.

Purpose of study	Lead author affiliation			IPLC participation		Percent of studies
	African	African/ overseas	Overseas	Yes	No	
Decision support	6%	11%	2%	4%	5%	4%
Knowledge building	39%	44%	49%	43%	48%	46%
Policy guidance	6%	0%	7%	0%	10%	6%
Multipurpose	50%	44%	41%	54%	38%	44%
Total	100%	100%	100%	100%	100%	100%

specific research interests or focus areas of African researchers in the context of scenario planning and sustainability. However, a paper by Pouris and Ho (2013) highlighted an emphasis on the continent on medical and natural resources disciplines to the detriment of disciplines supporting knowledge-based economies and societies. This could be another reason why there are fewer activities driven and undertaken by African researchers, which, to rectify would require both funding and a reconfiguration of priorities toward social sciences and humanities research that also engages diverse knowledge systems. Capacity development, such as reformed curricula and funding models would be needed to enable such a shift.

Overall, our analysis shows that non-African led research is over-represented among scenarios referencing ILK on the African continent. This is unsurprising to the authors given that most research funding continues to come from non-African institutions. We were unable to find other publications that have quantified this dynamic and think it warrants further attention because the under-representation of African-led research into Africa's possible futures can directly influence the inclusivity and diversity of the scenario processes undertaken. We especially encourage further research that investigates the implications of this under-representation by directly comparing the scenarios that emerge from African-led and non-African led SP processes.

Overview of scenario themes

From our study, we found the most important aspects of the futures systems in the studies reviewed were agriculture/ aquaculture and economics. Other important themes included governance, human development and population dynamics, infrastructure/technology, water resource, environmental threats such as pollution, illegal wildlife harvest and poaching, food, ILK, and climate change. This could reflect a focus of the research question itself (i.e., being set by the researchers to undertake a scenario process around food and agriculture) or a general emphasis on these topics arising from the participatory process itself. A more in-depth comparative analysis should be considered for future research, perhaps supplemented with a more qualitative review of the scenarios, including interviews with researchers and local stakeholders to better understand the stakeholder and regional dynamics of these or similar research activities (Johansson 2021, Ratner et al. 2022). Further, we recognize that 68 cases are not a particularly high number for a quantitative analysis on topic areas.

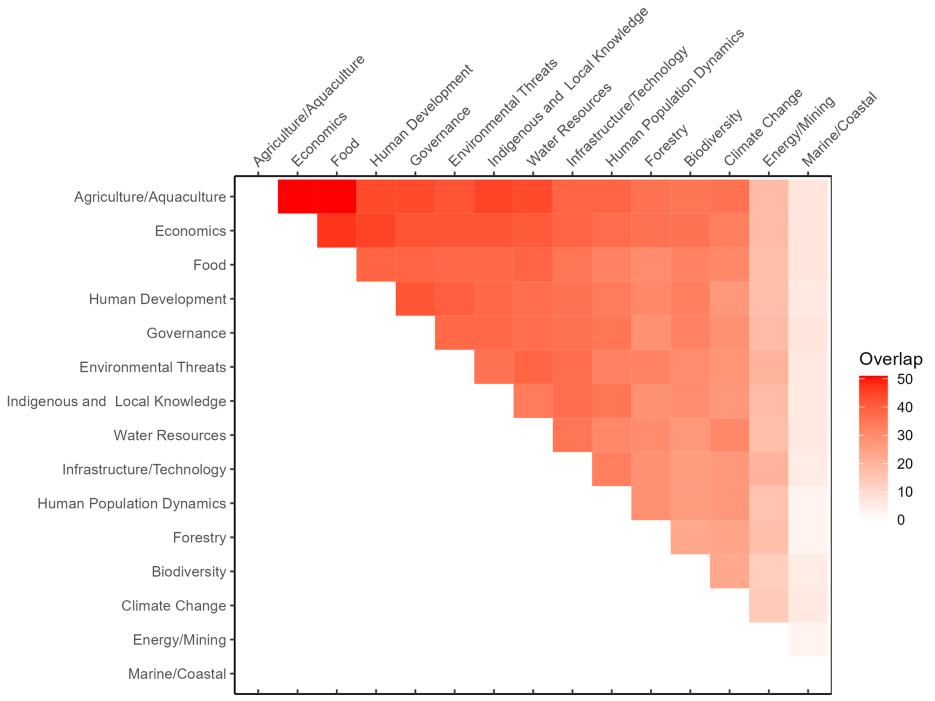
We can speculate some of the reasons for these trends, though there is no causal link we can attribute to these findings because studies do not tend to explain the contextual factors and underlying rationale of why a specific project was undertaken, rather than just the need to address a research gap. That being said, it is interesting to note that food systems, infrastructure, natural resource management, and climate change were dominant themes; all of which are large subjects that tend to attract significant funding internationally. It is probably safe to say that pollinators, extinction, and migration are smaller topics than the aforementioned, and so it is not surprising they are not dominant. Perhaps a more refined thematic coding would have allowed a more nuanced discussion on these themes, which is something to note for further research. What might also be interesting to track is whether there is any specific research emerging aligned with the IPBES assessment process. For example, were the pollinator papers associated with the IPBES Pollinator assessment published in 2016, and if so, would there then be some research associated with the invasive alien species assessment published in 2023? This was indeed the case for European scenarios on invasive alien species (see Perez-Granados et al. 2023), although not with an ILK focus. Perhaps similar thematic trends can be associated on the African continent too, enabled both by funding allocated to address gaps in these topics by funding bodies like Biodiversa, as well as anticipatory research undertaken by assessment experts who know that publications will be needed for the assessment process.

IPLC participation in SP processes

The IPBES has highlighted the crucial importance of engaging IPLC in the further development of scenarios (IPBES 2021). We found that studies including participation of IPLC (41%) were less common than those that did not (56%; Table 2), although this is not a significant difference. Very few studies (3%) were not explicit about the participation of IPLC (Asubonteng et al. 2020, Gatune et al. 2021). Further scrutiny revealed that teams led by African authors were the most likely (56%) to engage IPLC in scenario development, whereas teams led by authors with both African and non-African affiliations demonstrated the lowest IPLC participation rate (22%), despite including ILK elements in all (100%) their projected futures. Authors from overseas were also inclined (82%) to involve ILK in their scenarios, surpassing the mixed-affiliation authors with a 39% IPLC participation.

As a result, we believe that more in-depth studies are necessary to fill this gap and develop scenarios based on a variety of perspectives and values. However, because much of the ILK related to scenarios has not been documented (IPBES 2021), focusing on published and peer-reviewed publications may have limited outcomes. In the peer-reviewed literature, this remains a significant gap that can be addressed by more inclusive research. There is a need to foster inclusivity and an openness to appreciate more diverse knowledge systems and what they have to offer sustainability initiatives within the research community, especially in the context of local interventions. It is vital that communities can showcase this knowledge in which they are ready and willing to share it. The scenarios developed focused among others on vegetation structure (Aleman et al. 2017), forest conservation and livelihoods (Sandker et al. 2009), agriculture (Obiri et al. 2007), global climate change within African social-ecological systems (Dixon et al. 2003), land degradation and land

Fig. 3. Matrix of the total number of times two themes appeared together out of n = 68 papers.



cover (Dougill et al. 2010, Gibson et al. 2018), and ecosystem services (Boone and Lesorogal 2016). As mentioned by van Notten et al. (2003), SP exercises can be either participatory or expert led depending on the subject, the nature of data, the time scales, and the spatial scales ranging from local to global or sometimes across scales (Biggs et al. 2007). However, more inclusive participation by IPLC groups needs to be encouraged, especially in addressing the gap on normative or target-seeking scenarios to capture a more diverse set of perspectives of what alternative futures are possible and available. The authors encourage further research to investigate how IPLC participation (or lack thereof) is reflected by the breadth of possible futures articulated by SP processes. This inquiry might include direct cross-study comparison of scenario contents, the language used to describe the scenarios, and/or the study's framing of the future itself (Terry et al. 2024).

Futures that include Indigenous local knowledge (ILK)

Several studies have identified the merits of the rehabilitation of degraded ecosystems based on ILK identified by Indigenous peoples and local communities (Briggs 2005, Heneidy and Waseem 2007, Ngara and Mangizvo 2013, Kanene 2016, Hill et al. 2020). As recognized by the IPBES (Hill et al., 2020), Indigenous knowledge contributes greatly to sustainability in Africa, having allowed people to live in harmony with nature for generations (Briggs 2005). However, there are few global-scale scenarios that engage ILK or are developed in collaboration with IPLC (IPBES 2021).

Our dataset comprises a subset of scenario developments related to nature that integrate elements of Indigenous, local, and traditional knowledge and/or practices, particularly focused on studies concerning Africa. Our findings underscore a notable gap: the absence of meaningful participatory involvement of IPLC in these processes (see Table 3). A striking 82% of the scenarios developed included ILK, despite only 40% of the studies involving IPLC participation.

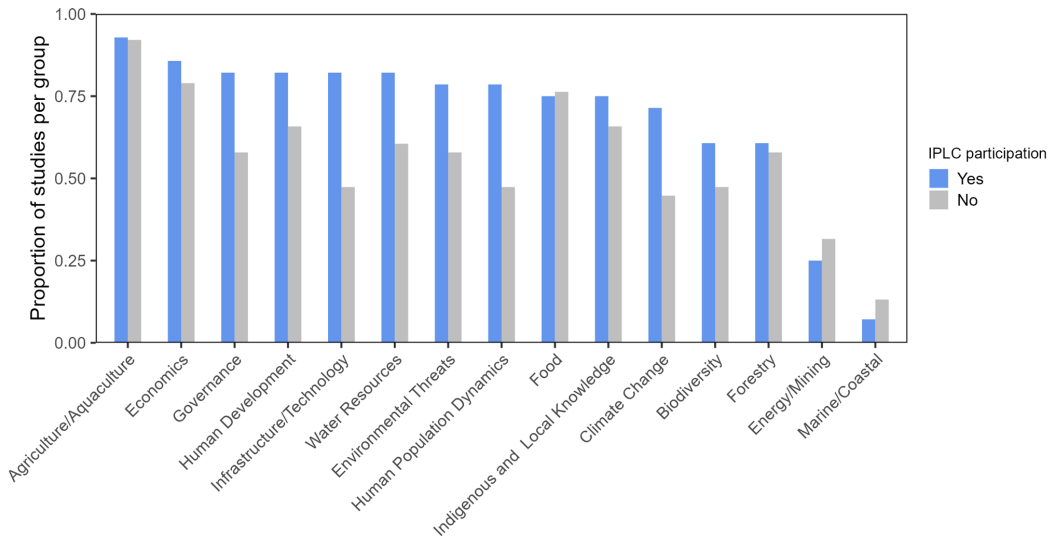
Limitations

We were limited to literature in English, and this probably meant that we missed information that was presented in Swahili, French, Portuguese, Spanish, Arabic, or any other commonly used languages in academic and policy research on the continent. However, as researchers in Francophone and Lusophone countries are encouraged to publish in English, perhaps this may not have had a disproportionate impact on the findings. We were also constrained by time and therefore could not do a comprehensive literature collection on Google Scholar (unlike the other databases), which yielded more than a million hits. It is therefore possible we might have missed some relevant papers from the gray literature. However, our results remain valid for the peer-reviewed literature. Due to the significant amount of potential literature available through Google Scholar, we encourage further research that uses tools such as artificial intelligence. Finally, time and resource constraints also barred us from in-depth investigation of how geographical representation, IPLC participation, and ILK inclusion might manifest within the outputs and framing of the SP studies in our dataset. We encourage further research that compares the language of SP processes across these categories.

CONCLUSION

The semi-systematic literature review method has been widely used by researchers to make important contributions to knowledge creation in many disciplines. The method has been used here to review scenarios for nature and people in Africa that

Fig. 4. Proportion of studies that covered a scenario theme. The proportions are out of the total for each group, i.e., for n = 28 for the group in which the IPLC participated in scenario development and n = 38 for the studies in which IPLC did not participate.



reference ILK or included IPLCs. There were two main findings from this review, the first regarding the global spread of authors leading the reviewed papers and the second concerning the most topics covered in the scenarios of the reviewed papers.

A mapping of lead authors showed there are more researchers affiliated to institutions outside Africa that undertake research on scenarios for nature and people in Africa with the inclusion of ILK in scenarios and/or IPLC participation and/or data collected from IPLCs. However, we also saw that authors on the continent are relatively more likely to involve IPLC participation in creating these scenarios. In all papers reviewed, agriculture/aquaculture and economics were the largest topics covered in the scenarios with or without the participation of IPLCs. Migration of animal species, extinction, and pollinators are less addressed as topics in the scenarios in Africa. Population growth and climate change are considered more in futures created with IPLC participation than those without.

In this review, we offer the only systematic mapping of IPLC scenario research for people and nature on the African continent to point out the gap in participatory processes that include IPLCs directly in scenario development. Further, the review highlights the regional gaps on the continent in which more work needs to include the views and perspectives from under-studied countries like those in Central and North Africa. We hope by sharing this analysis we can influence how and where future research on this important topic is undertaken. Finally, we hope that scenario researchers in Western countries will reflect on how they undertake participatory research on the continent and perhaps they will allow for the voices of local researchers to have a stronger priority (e.g., as lead authors) in the research that is published.

Positionality statement

We are a group of mainly African authors based between African and European research institutions. Of those African affiliations, the majority are based in South Africa. We therefore reflect the disparities of how research on the African continent is undertaken and published. However, we also represent four African nationalities from both Southern and West African regions. We are committed to be more inclusive and reflective in how we undertake research on the African continent and hope to inspire other researchers to use a similar approach.

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Data Availability:

The data and code that support the findings of this study are openly available at the following github repository: https://github.com/bravemaster3/AfricanFuture_ScenarioReview

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