LIRA 2030

Africa

FINAL EVALUATION REPORT

rr responsive research

Leading Integrated Research for Agenda 2030 in Africa (LIRA 2030) was a 6-year programme to strengthen research capacity for sustainability in Africa. The programme was implemented by the International Science Council in partnership with the Network of African Science Academies (NASAC). LIRA 2030 is supported by the Swedish International Development Cooperation Agency (Sida). Upon the completion of the LIRA programme, an independent evaluation panel of the Responsive Research Collective was appointed to review the programme. This report is the outcome of the evaluation process.

Acknowledgements

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Executive summary

Leading Integrated Research for Agenda 2030 in Africa (LIRA 2030) is an innovative and highly experimental programme conducted by the International Science Council (ISC) in partnership with the Network of African Science Academies (NASAC) and financed by the Swedish International Development Cooperation Agency (Sida) between 2016 and 2021. It pursued a multiplicity of objectives to build capacity and strengthen integrated research for sustainable development at the science–society interface in urban Africa. The specific feature of the LIRA programme is tackling the goals of the Agenda 2030 by combining scientific research with transformational action through transdisciplinary research for sustainability. In a unique manner, this has been realized by implementing a programme with early career researchers (ECRs) centre stage. Researchers have been trained, accompanied and supported to lead and conduct transdisciplinary research on sustainable urban development in Africa in partnership with civil society organizations (CSOs)/non-governmental organizations (NGOs), local communities, industry and governmental institutions. Sustainable urban development has been tackled by 28 teams across the African continent. Integration has been conducted at different levels: between researchers from different academic fields; between academic researchers and research partners from diverse sectors, institutions and communities; and between academic researchers and research partners from different countries. The boundaries that have been crossed in LIRA have, thus, not only enabled interdisciplinary collaboration – necessary for sustainability research – but also collaboration to link knowledge production and action to transform unsustainable situations. To foster research collaboration within Africa and to strengthen context-sensitive approaches, the programme enabled intercultural, cross-country and pan-African research and research community building. Furthermore, the programme mobilized financial and institutional support to enable a type of research that does not fit the existing funding schemes or organizational and administrative structures of academic and other societal institutions.

LIRA 2030 has been a highly complex endeavour. The implementing organizations, researchers and partners have converted their projects into a real learning journey. At multiple stages and in different actor constellations, reflection accompanied action, and self-evaluative activities contributed to constant learning and quality improvement. This final evaluation has taken these efforts as a starting point to systematize, complement and deepen insights into the factors contributing to key achievements and challenges, and to learn about the continued effects and project legacy to provide recommendations for future programmes. It assessed how LIRA 2030 has performed against the objectives of the programme. More specifically, the evaluation aimed at identifying factors contributing to the key achievements and challenges of LIRA projects and to find out how the programme structure and programme-level activities contributed to these. Further, the continued effects of the programme for LIRA grantees and the societal effects of transdisciplinary research in project contexts and beyond were analysed. Particular emphasis was on strengthening collaborative research and knowledge co-production, institutional conditions for transdisciplinary sustainability research and trainings for transdisciplinarity that take into consideration contextual conditions and particular needs.

The formative and dialogical evaluation approach, operationalized in a sequential, multi-staged mixed methods design, allowed for learning *with* and *for* representatives of all involved groups while learning *from* LIRA 2030 by producing sound, evidence-based results to create transferable recommendations for future international programmes. The intercultural evaluation team combined Western and Indigenous, decolonizing evaluation methodologies and involved approximately 45 persons from the LIRA 2030 programme and projects in workshops and 50 persons in a survey. Insights were gained from different perspectives, including grantees, academic partners, members of local communities, CSOs)/NGOs and government representatives, amongst others.

The design of the LIRA 2030 programme contributed significantly to make it highly impactful at multiple levels. Funding trandisciplinary research combined with trainings, accompaniment, networking and career support turned out to be a powerful strategy to advance both leadership for transdisciplinary sustainability research and sustainable urban development across Africa. LIRA 2030 enabled spaces for experimentation with collaborative research and knowledge co-production at the science–society interface with a large variety of different approaches conducted in different contexts and actor constellations. The extensive training programme and programme-level activities to accompany and support ECRs' career development and research significantly extended the number of trained transdisciplinary sustainability research scholars in Africa. Networking opportunities for LIRA grantees and collaborators in research forums, conferences and through collaborative training activities not only enabled mutual learning and advanced transdisciplinary research capacities, but also strengthened an emergent network of leading African scholars able to bring reflexive, context-sensitive and situated approaches to their work. One of the main challenges encountered by LIRA grantees relates to institutional conditions for such research. Academic institutional environments are not yet sufficiently prepared and supportive for research that crosses boundaries between disciplines and societal sectors. Another significant challenge for all those involved in LIRA projects has been the time frame of just 2 years: to successfully build transdisciplinary consortia and research environments, and to implement research that not only pursues epistemic, but also transformative objectives tackling unsustainable situations, requires longer funding periods. This is even more so the case in programmes that not only fund research projects, but also pursue objectives of career advancement, pan-African networking and cross-project collaboration.

At the project level, multiple achievements have been identified from different actor perspectives. For representatives of CSOs/NGOs and community members, key achievements relate to collaboration with academics, learning about differences, sharing experiences and sustainability transformations at a community level. Similarly, collaboration and mutual learning with different stakeholders, as well as contributions to improve the environment and people's lives, are key achievements for grantees and academic collaborators, as are sharing and networking with colleagues, awareness raising of transdisciplinary research and scientific contributions to the field. LIRA grantees particularly value capacity building through workshops and trainings, the transdisciplinary research approach to fostering sustainable pathways and strategies, and scientific contributions to their fields. Many achievements encountered at the project level constituted significant challenges at the same time, and factors enabling certain achievements have hampered reaching others. This applies to research collaboration across sectors, with challenges in building comprehensive and stable transdisciplinary teams, expectation management, power dynamics and issues of trust. Transdisciplinary collaborations with communities, particularly Indigenous communities, are confronted with the colonial heritage in Africa, including academia's historical role of extracting knowledge, in some cases for use in domination. In consequence, particular attention needs to be paid to trust-building, equal opportunities in research-related decision-making and respectful dealing with co-produced knowledge. There is great potential for transdisciplinary forms of research to contribute to establishing a new culture of research and research environments that overcome structural barriers in bringing together the knowledge and action necessary to confront unsustainable situations and practices. Language posed a significant challenge on all levels – from disseminating calls for proposals to knowledge co-production at the science–society interface. In transdisciplinary research language is not only a matter of communication, but of high epistemic relevance. Particularly when working with Indigenous and local communities, taking into consideration traditional worldviews, conceptual work is of great importance and requires particular attention.

LIRA 2030 made a significant difference to enhancing the capacity for transdisciplinary sustainability research and in improving unsustainable situations in urban Africa. The programmes' goals have been clearly met. LIRA 2030 is a highly valuable source for others to learn from: for funders developing adequate funding schemes; for programme-implementing institutions to learn about designing transdisciplinary sustainability research programmes; for scholars, in particular ECRs, to gain insights into the potential, and prepare for the challenges, of such research; for research partners from diverse sectors and communities to prepare for collaboration at the science–society interface; for university administrators to adapt institutional environments to become more supportive of transdisciplinary sustainability research; and for trainers of future programmes.

The programme environment of LIRA 2030 – with a European funder from the developing cooperation sector, leading international and African science institutions implementing the programme, and scholars and research collaborators from the African continent conducting transdisciplinary sustainability research – poses a particular learning opportunity in decolonizing research and international collaboration. It encourages participants– those representing both the colonizing and colonized sides of history – to expose themselves to the epochal challenge of overcoming (cultural) hegemony, unequal opportunities, and creating just and equitable futures that value equally different ways of knowing, acting and being.

Beyond the recommendations provided in this report, we encourage viewing the different features and dimensions of programmes tackling such complex endeavours as balancing acts that require attentive navigation, continuous critical reflection, flexibility and adaptability, and a responsive implementation practice to provide conditions that serve the needs of all involved. This will strengthen context-sensitive and situated research with strong potential to make a difference to people and the environment.

1 Introduction

The programme 'Leading Integrated Research for Agenda 2030 in Africa' (LIRA 2030) was conducted by the International Science Council (ISC) in partnership with the Network of African Science Academies (NASAC) and financed by the Swedish International Development Cooperation Agency (Sida). It consisted of research grants for early career researchers (ECRs) to conduct transdisciplinary sustainability research in urban Africa and a series of programme-level activities to build capacity and strengthen leadership, increase scientific knowledge and its use for sustainable urban development, foster research collaboration in Africa, and enhance financial and institutional support for transdisciplinary research internationally. The three calls for proposals invited research on 'Understanding the energy–health and health–natural disaster nexuses in African cities' (2016), 'Advancing the implementation of SDG 11 in cities in Africa' (2017) and 'Pathways towards sustainable urban development in Africa' (2019). Proposals had to take a transdisciplinary research approach and to involve a minimum of two African countries. Between 2016 and 2021, 28 projects with researchers from 22 African countries and a duration of 2 years were funded in three cohorts, with some being extended to integrate knowledge from different projects across the continent. In the course of the programme, a series of training and networking activities, annual research forums and project site visits were conducted. To support ECRs' career advancements and to strengthen African research contributions internationally, grantees were involved in a series of international conferences, high-level sustainability-related policy processes and global reports. The communication strategy of LIRA 2030 further supported dissemination of research results to diverse audiences, ranging from local communities to international policy-makers, while enhancing ECRs' science communication strategies. In addition, the LIRA programme was used to promote transdisciplinary sustainability research in local and international scientific communities and science policy and funding institutions with high-level network-building and agenda-setting contributions. The way and manner the multiple objectives have been pursued, LIRA 2030 broke new ground. Putting scientific advancements and leadership of African ECRs centre stage, while promoting transdisciplinary research approaches that contributed to transformations of unsustainable situations and fostered rethinking sciences' role in society, can be considered a unique effort.

To assess such a complex endeavour, this evaluation took a dialogical and formative approach. It aimed at learning from and with grantees, academic and societal research collaborators, trainers and representatives of the programme-implementing institutions. The intercultural evaluator team, with members from Botswana, Mexico/Brazil, South Africa and Switzerland/Austria, combined Western methodologies with indigenizing and decolonizing perspectives. It approached the multiple dimensions, objectives and activities of LIRA 2030 with a multi-staged sequential mixed methods design. Document analysis of project and programme reports was combined with a narrative-centred SenseMaker survey (SM survey) as well as focus groups and group discussions that have been conducted in a series of workshops. Results of previous (self-)evaluation activities were taken into consideration as complementary resources.

The overall objective of this evaluation was to grasp how a funding programme that pursued so many different objectives – in a highly intertwined way – worked. More specifically, we assessed the continued effects of the LIRA 2030 programme and its projects' legacies as well as factors contributing to key achievements and challenges to learn for future programmes. While not all dimensions of the programme could be explored with the same depth, we managed to open up multiple perspectives on LIRA projects, with 50 project participants from academia, the governmental and civil society institutions and organizations, the economic sector and local communities participating in the SM survey and 32 engaging in dialogical formats. At the programme level, we engaged 11 persons in workshops. The rich insights testify to the huge

value and potential of the funding approach that LIRA 2030 took. It confirms the timeliness of research that combines epistemic goals with transformational intentions and interventions into concrete situations and social fabrics in a time of sustainability crisis where urgency meets complexity.

This report is organized as follows: in Chapters 2 and 3, the evaluation approach and objectives of this evaluation are described, followed by an outline of the evaluation methodology (Chapter 4), with details provided in the annex to this report, and the limitations of this evaluation (Chapter 5). The Results section (6) is organized into nine sub-chapters. Firstly, an overall perspective on findings regarding programme features that enabled achievements and contributed to challenges in LIRA 2030 projects is presented. We identified five programme features that significantly contributed to make LIRA 2030 a unique and impactful programme and discuss five other aspects that may be related to the challenges grantees and collaborators encountered. From there we take a more detailed look at the programme structure, the achievements and challenges of projects and relevant contributing factors, and insights into grantees' scientific and leadership advancements, societal effects and the legacies of LIRA projects. The final sub-section presents future-oriented results related to knowledge co-production, institutional conditions and training programmes. In Chapter 7, conclusions drawn from the evaluation are summarized, and in Chapter 8 recommendations are provided in sub-chapters for different audiences.

2 Evaluation approach

The LIRA final evaluation team decided to take a formative and dialogical approach to evaluate the programme. We built on the various results from previous (self-)evaluations and further explored the programme from multiple perspectives, engaging with actors who initiated, managed and implemented the programme and the 28 projects that form its core. The evaluation is dialogical in the sense that we prioritize narrative research methods to capture stories of lived experiences wherever possible. It is formative in that the evaluation design provided an opportunity to learn along with those being evaluated, while at the same time delivering systematic insights into LIRA and recommendations for future programmes. Thus, this evaluation is both process and outcome oriented and aimed at learning *from*, *with* and *for* relevant stakeholders. It acknowledges that different positions and perspectives on a subject under evaluation have different epistemic qualities. An outsider perspective can bring forth insights and learnings from afar, retrospectively combined and interpreted. It is impartial with regards to the assessment of the performance under evaluation, while it may be invested in the sense that it prioritizes a certain research culture or approach (in our case, transdisciplinary sustainability research combined with decolonizing practices). The insider perspective brings forth lived experiences and interactional expertise that allow for profound understanding of the inner workings of processes and teams. To benefit from these different qualities, this evaluation approach combines both.

We approached this evaluation aware of the concerns around the insufficient integration of sociocultural aspects in evaluation theory and practice (Kawakami et al. 2007, Hood et al. 2015) and the call to restructure power relations in the global construction of evaluation knowledge production to give space to those whose voices have been muted by the evaluation discipline and its colonial attitude that whatever is from the Global North is considered to be superior (Chilisa et al. 2016, Villanueva 2021). There is concern about the blind reliance on Western-based evaluation, models and frameworks when conducting evaluation in low- and middle-income countries (Jeng 2012). Worse still, evaluation is a field born out of the need to account for funds spent on projects and to ensure compliance, and thus tends to emphasize accountability and compliance using prescribed frameworks and models to monitor process and report outcomes. 'Colonialism is embedded in all areas of international assistance which includes evaluations' (McKay 2022: 9). In response, development partners and funders in general have started to listen and are seeking ways of integrating knowledge systems; in Africa, there is a call for a 'Made in Africa' evaluation – and African governments are responding. Evaluators are developing Indigenous evaluation methods, tools and frameworks, and adapting mainstream evaluation frameworks. We bring this emerging and growing focus to our evaluation process, analysis and reporting.

In a sense, this evaluation approach has taken up the collaborative character of the programme and the learning attitude of those involved. It seeks to further the objective of Sida and the ISC to strengthen the autonomy of African scholars when working with funds from the Global North and to decolonize international collaboration. Equally to the actors involved in LIRA 2030 programme, those contributing to this evaluation come from European and formerly colonialized countries. Evaluators come from Botswana, Brazil, Mexico, South Africa and Switzerland/Austria, with backgrounds in different realms of integrated (urban) sustainability research, transdisciplinarity and evaluation methodologies. With this heterogeneity of expertise and perspectives it was possible to combine Western methodologies with Indigenous and decolonizing perspectives, specifically African methodologies (Gaotlhobogwe et al. 2018, Mertens et al. 2016, Chilisa 2012), and to employ a gender- and culturally sensitive framework that recognizes multiple value systems and researchers' and research partners' realities and

ways of knowing, acting and being (Mbava & Chapman 2020). Western approaches are contextualized to make them culturally relevant (Chilisa et al. 2016). This integrative approach allowed the evaluators to value the uniqueness of Indigenous and African methods and knowledge as well as to see things through the lenses of communities – that is, how they define success and how they measure it as opposed to seeing success only from a funder's perspective (Tirivanhu 2022). Decolonization refers to a critique of the dominance of Euro-Western language and thought, and cultural and academic imperialism, while Indigenization is a process of acknowledging, valuing and respecting Indigenous worldviews, knowledges and perspectives and recognizing that they are just as important as other worldviews (Smith 2012).

The design of the final LIRA evaluation aimed at creating both opportunities for written contributions and spaces for virtual encounters for critical dialogue. The tendency towards success bias in project and programme reporting was tackled by creating a shared understanding of the overall objective of this evaluation: to learn together and from each other to foster and improve integrative collaborative research and action on urban sustainability in Africa. The evaluation design has been adjusted slightly from the inception report. The majority of adjustments formed part of the sequential design we pursued. As part of the formative dimension of the evaluation we asked LIRA grantees in an introductory event about their needs from and expectations of the evaluation and learned from their concerns. They expressed interest in:

— further learning about projects and others' experiences, particularly from a decolonial angle
— gaining feedback and orientation for future projects
— learning about the success and limitations of transdisciplinary sustainability research
— providing recommendations for institutional transformation
— identifying further learning and capacity building needs
— and reaching strategic actors for transdisciplinary research

Participants of the introductory event further recommended:

— considering general evaluation fatigue
— taking previous (self-)evaluation results into account
— engaging with collaborators from LIRA projects from different sectors while collaborating closely with PIs in communicating with them
— and keeping the evaluation process as simple as possible (see Annex 5).

3 Evaluation objectives and questions

The overall purpose of this process is to evaluate how LIRA 2030 has performed against the objectives of the programme. To operationalize the evaluation objectives proposed by the ISC we synthesized and coded these and the primary objectives of the LIRA programme for use in the evaluation matrix (see Annex 1).

ISC objectives:

— Factors contributing to key achievements and challenges (ISC 1)
— Continued effects and project legacy (ISC 2)
— Contributions and recommendations for future programmes through lessons learned (ISC 3)

LIRA objectives:

— Strengthen ECRs' capacities to practise transdisciplinary research for sustainable development in Africa (LIRA 1)
— Strengthen scientific knowledge and leadership on Agenda 2030 (LIRA 2)
— Foster research collaboration in Africa (LIRA 3)
— Enable financial and institutional support for transdisciplinary research/practice (LIRA 4)
— Increase production and use of knowledge for sustainable urban development in Africa (LIRA 5)

These objectives were distributed in the mixed methods design (see Chapter 4), with several overlapping for the purpose of triangulation and integration. The sequentiality of the mixed methods evaluation design allowed for building stepwise information on previous findings, selecting thematic focuses and refining evaluation questions for next steps. The following overall evaluation questions have been addressed. Detailed evaluation questions and methods for each component are provided in the evaluation matrix (Annex 1).

Q 1: How were LIRA projects experienced from different roles/perspectives?

Q 2: Which factors contributed to key achievements and challenges of LIRA projects?

Q 3: What are the continued effects of the programme for grantees and societal effects in project contexts and beyond?

Q 4: What were the main components of the LIRA programme and how have these been implemented?

Q 5: How has the LIRA programme contributed to key achievements and challenges of LIRA projects?

Q 6: How can collaborative research and knowledge co-production be strengthened and up-scaled to foster sustainable development in urban Africa?

Q 7: How can institutional conditions for transdisciplinary sustainability research be strengthened in Africa?

Q 8: How can trainings for transdisciplinarity be designed to strengthen and promote African research approaches that take into consideration contextual conditions and needs?

4 Evaluation methodology

The evaluation has been organized in three phases that considered learning *from*, *with* and *for* relevant stakeholders (see **Figure 1**). We linked these phases through the sequential mixed methods evaluation design (Fetters et al. 2013), which takes into consideration the multiplicity of objectives of the LIRA programme. Integration was realized between different perspectives of researchers and collaborators from different sectors and communities, and types of data through building, triangulating and merging of qualitative, quantitative, written and verbatim data.
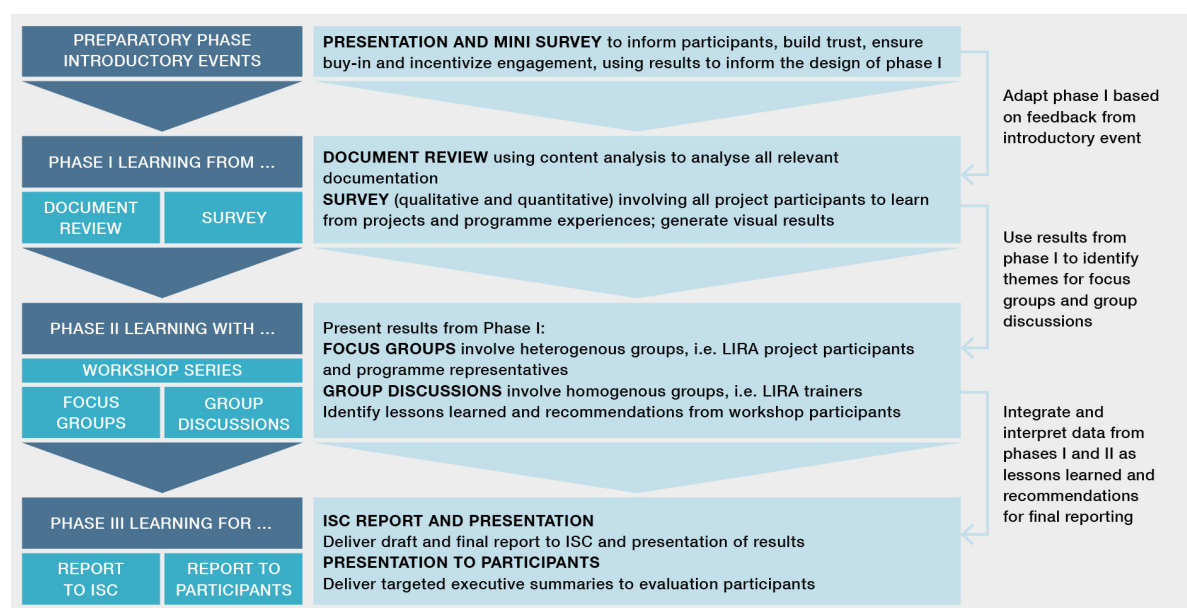
Figure 1: Phases of the sequential, mixed methods evaluation design

An evaluation matrix provides an overview of all activities conducted during the evaluation, including purpose, participating stakeholders, questions asked and addressed evaluation objectives as well as the type of data gathered and method of analysis (see Annex 1). The methods applied in this multi-staged sequential mixed method design were composed of a document analysis, an SM survey and dialogical formats (introductory events and workshops), with focus groups and a group discussion to combine collective reflection, discussion and learning with data gathering (see **Figure 1**). The introductory events in the preparatory phase were targeted to PIs only and aimed at informing about the final evaluation process, clarifying its purposes, building trust and creating co-responsibility for the process amongst PIs to contribute to the final evaluation. In Phase I, the evaluation team learned from final project reports (PI perspective) and programme-related documents (ISC perspective) by conducting a relational content analysis, and from a SM survey that gathered qualitative (narrative) and quantitative data, involving a broad range of stakeholders who collaborated in LIRA projects. Phase II was targeted to learn with actors from the LIRA programme and projects. Workshops focused on collaborative research and knowledge co-production, institutional conditions to strengthen transdisciplinary sustainability research and training programmes. A detailed description of the application of methods and how these have been triangulated, integrated and complemented with previous (self-)evaluation results is provided in Annex 3.

The evaluation aimed at actively engaging with all stakeholder groups involved in initiating, managing and implementing the LIRA programme and the 28 projects. These include the ISC/NASAC management and trainer team, representatives of the Scientific Advisory Committee (SAC), PIs, academic partners (including team members), representatives of CSOs/NGOs,

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community members and community leaders, university administrators, representatives from the private sector, service providers, media and the public sector/government. We managed to gather valid data for 190 contacts and to engage 50 persons in the SM survey, with a balanced participation of men and women, and 32 in interactive formats, 19 of them women, 16 men (identification by first names only). At the programme level, 11 persons responsible for implementing the programme as managers, advisors and trainers were involved in workshops (for details see Annex 2). In addition, regular meetings with ISC representatives supported the gathering of documents for evaluation and contact data of PIs and the SAC. Further, they supported the evaluation team to understand and navigate through the complex programme and in decisions related to the sequential mixed methods design of this evaluation.

5 Limitations, challenges and adaptation strategies

Working formatively, particularly in remote online environments, over a limited period of time required a certain degree of methodological agility. The approach we pursued proved to be flexible and robust enough to respond to unexpected developments in the evaluation process while producing evidence-based results. The number of participants and the diversity of roles in LIRA 2030 provided sufficient insights into LIRA experiences to address the evaluation objectives. However, we also faced limitations and challenges related to language, evaluation fatigue, electricity failure, previous evaluations and document formats.

Firstly, an overall limitation that we have to acknowledge refers to conducting an evaluation in English, as only those who speak/understand the language could contribute. Taking a narrative approach requires a high level of linguistic competencies of participants. A large proportion of participants were non-native English speakers. To respond to this limiting factor, we (partially) supported spoken English with written contributions in the chat feature during interactive online events. In conducting an evaluation with participants from across African countries, we also encountered some terminology issues related to technical terms that vary across countries. For instance, while university administrators in some English-speaking countries are associated with university leaders, in others the term administration does not link to leadership. In collecting contact data from involved stakeholders per project we did not manage to identify a significant number of leading personnel of universities as we asked for university administrators. We could not make up this goal by gathering further contact data from programme representatives.

Secondly, in response to our first communication with PIs and during the introductory events, we were quickly confronted with PIs' widespread evaluation fatigue. Some wondered 'why another evaluation' was necessary and complained about a certain over-evaluation due to time-consuming reflections and self-evaluation exercises throughout the programme. This had consequences for the involvement of PIs and the collection of contact data of collaborators from the 28 projects, with PIs being gatekeepers. As a result, collaborators from only 11 projects could be invited to participate by the evaluation team. As further consequences, we had to give up the idea of a systematic multiple site evaluation (Stainbrook et al. 2015), as this would have required even stronger engagement of PIs and we could not conduct interpretation sessions with SM survey participants. Only a limited number of results could be jointly assessed with those having shared insights into their lived experiences in LIRA projects. In response to these circumstances, we shifted to personalized communication with all involved and intensified communication with those who had not been involved in evaluation activities before.

Thirdly, conducting the final evaluation online made the significant digital divide between world regions and countries visible. We faced severe hurdles in conducting regular meetings of the evaluation team, in particular with our colleague from South Africa, with scheduled and spontaneous power cuts having increased significantly over the period of the evaluation. Likewise, for several participants from various African countries, in particular South Africa, participation in the introductory events and workshops was not possible for the same reason. Consequently, the number of participants was significantly lower than expected based on registrations. As we anticipated this challenge, we offered two parallel sessions of the introductory event and Workshop I. In the evaluation team we augmented bilateral meetings and shared recordings of all regular team meetings.

Fourthly, due to the multiple reflection and (self-)evaluation activities we encountered during the preparatory phase and the first stage of document analysis, we had to adjust some of the envisioned activities. As a consequence, we reduced the number of questions related to ECRs and the transdisciplinary approaches applied in the projects, added emphasis on institutional

conditions for transdisciplinary sustainability research and used results of the learning studies and the ISC (2020) report as complementary findings for this final evaluation.

Finally, one of the major questions that we had intended to address was to find out if communities have been affected in a positive way as a result of the programme and to balance the funders' measurement of success with that of the community. With regard to the success perceived by the communities, not much information could be reached through the PIs' final project reports. They were given well-structured guidelines with little room to report on lived experiences. While there are good reasons to have standard guidelines to prove if objectives had been achieved and to enable comparative learning between projects, this seemed to be a 'bottle neck' or 'put in a box' situation, where PIs were not encouraged to freely express themselves. In part, this limitation could be compensated for by reading stories from community members and leaders gathered with the SM survey and by hearing voices from community members participating in the workshops. In this material we encountered impressive experiences, but contributions were low in numbers.

6 Findings

In this section, we move from an overall perspective on what we found during the evaluation related to programme features contributing to the key achievements and challenges of LIRA projects (Q 5) to more detailed findings at the programme (Q 4) and project level (Q 1 and 2), gathered from different sources and at different stages of this evaluation. At the project level, we distinguish actor perspectives to provide insights into experiences of collaborators in LIRA projects. We then present the continued effects of the programme for grantees and societal effects in project contexts and beyond (Q 3). At the end of the section, we present results from insights gained from future-oriented questions related to collaborative research and knowledge co-production, institutional conditions and training programmes for transdisciplinary sustainability research (Q 6–8).

6.1 Programme features supporting main achievements

Overall, five main features appeared to be most important in making the LIRA programme unique and valuable in multiple ways:

Firstly, the programme offered and supported **multiple ways of engagement** for ECR grantees and (mainly academic) project collaborators. Due to the multiplicity of objectives pursued by LIRA 2030, these engagement opportunities were of very different natures. They included trainings to familiarize participants with the transdisciplinary research paradigm and according practices, improving capacities in project management, developing diverse dissemination formats for research outcomes, building pan-African and international networks and participating in high-level policy forums and international conferences. Strategic support of LIRA grantees contributed significantly to the success of the LIRA programme. Besides extending the knowledge base and research abilities, and strengthening ECRs' leadership competencies, the programme environment created in LIRA 2030 helped grantees to be heard, read and seen – on international stages, in international journals, in blogs and videos shared with virtual audiences, but also in their research territory during site visits conducted by NASAC. The variety and density of engagement opportunities that complemented the actual research in projects is one of the outstanding qualities of the programme. Not surprisingly, at the same time it has been a source of multiple challenges faced by LIRA grantees and project collaborators, as will be discussed below.

The second particular feature of LIRA 2030 that appeared to be central in the evaluation process refers to **research collaboration and knowledge co-production** at the science–society interface. For many grantees it has been ground-breaking to discover the potential of the transdisciplinary research paradigm and to learn while implementing research with collaborators from multiple sectors and communities. The type and degree of collaboration varied significantly between projects and not all were conducted with an entirely transdisciplinary process. Where this *was* reached, it can be considered a significant achievement considering that it was just a 2-year project conducted by ECRs, aided by a little serendipity in the highly dynamic environments of transdisciplinary research, which are peppered with uncertainties and unknowns. Even where a comprehensive transdisciplinary process was not achieved, spaces of experimentation were created, providing important experience-based learning opportunities for ECRs and collaborators. These opportunities were assessed as highly valuable, instructive, insightful, important, challenging and only in rare cases also problematic. These spaces of experimentation proved to be core elements of LIRA projects for mutual learning in inter- and transdisciplinary teams, to deepen understanding of problematic situations and to co-produce the knowledge and co-design the solutions required to transform these. At the same time, they provided opportunities to learn how to collaborate with diverse stakeholders and communities, to re-think and re-negotiate roles

and responsibilities amongst research participants, and to deepen understanding of the dynamics and power relations of social fabrics. Contributions from project collaborators from different sectors and people from different life-worlds proved the value and potential of such collaborative efforts while at the same time inquiries, doubts, challenges and problematics perceived by research partners indicate the huge societal learning effort that is needed to reconfigure established societal divisions of roles and responsibilities and to normalize research at the science–society interface. Below, we elaborate on different perspectives on project achievements and challenges separately for that reason.

Thirdly, the intense and diverse experiences with research collaboration and knowledge co-production have significantly benefited from the **extensive training programme and accompaniment** of grantees. From the stage of grant application onwards, ECRs have been offered training that introduced the transdisciplinary research paradigm and offered methodological orientation. To offer trainings for ECRs whose pre-proposals have been selected was a strategy that helped to promote this research approach in Africa and contributed to strengthen full proposals. Besides LIRA grantees, about 70 further scholars have been involved. In the course of implementing LIRA 2030, further training needs were identified. These include trainings for Co-PIs to support the implementation of transdisciplinary research in the projects, and with growing experiences, the need to engage with fine-grained methodological, ethical-political and practical issues of transdisciplinary research could be addressed in coaching workshops. Worth mentioning is also the communication strategy of the programme that allowed ECRs to experiment with diverse media and formats in disseminating results. A particular highlight and learning for future programmes is how funded scholars became multipliers by imparting their own knowledge and experiences to students at their universities and collaborators from diverse sectors and communities.

Fourthly, the pan-African scope of the programme significantly contributed to **strengthen an emergent network of leading African scholars** with expertise and a vision for the power of transdisciplinary research to tackle sustainability challenges. With the size of LIRA 2030, a critical mass of transdisciplinary researchers could be gathered, preparing the ground for creatively engaging with the particularities of transdisciplinarity conducted in Africa. This can be considered a significant success of the LIRA programme. The critical encounter with a dominantly Western/European discourse and research practices reflects the leadership qualities that LIRA grantees achieved. To engage with local, national and international sustainability policy arenas, and to present and publish research outcomes and experiences at international conferences and to diverse audiences, have been great opportunities for ECRs to experience the impact transdisciplinary scholars can have even at an early career stage. As enabler of this engagement and networking opportunities, LIRA 2030 made a significant difference. It offered various events for each cohort and across cohorts by adopting the funding scheme to enable cross-project collaboration that brought forth several papers dealing with meta-considerations on transdisciplinary sustainability research in Africa (Odume et al. 2021, Thiam et al. 2021, Thondhlana et al. 2021, Buyana et al. 2022, amongst others). Only Cohort 3 could not fully benefit from these opportunities due to the COVID-19 pandemic. The multiple engagement and discussion opportunities between LIRA grantees have been an important factor to advance transdisciplinary sustainability research in Africa, with a significant number of LIRA grantees continuing to collaborate in research projects.

Fifthly, LIRA 2030 has been extraordinary in the degree of **reflexivity and (self-)evaluation activities** conducted throughout the programme. It has been a real learning journey enabled by all those involved in the programme: programme managers, members of the SAC, PIs and collaborators. The implementation of LIRA 2030 was executed with great openness and a high level of flexibility, with Sida as a funder making agility and necessary adaptations of the programme possible. This learning journey included adjustments of call procedures from cohort

to cohort, the implementation of additional trainings (project support workshops; trainings directed towards Co-PIs), site visits and changes in budget allocation to enable cross-project collaboration activities. Furthermore, it brought forth an additional layer of learning in the form of a self-evaluation learning study (see Annex 3). The changes in the implementation of the programme were thoroughly documented and argued, based on experiences from the management team, SAC expertise, feedback of grantees and evaluations of training activities. Notably, several dimensions of the LIRA 2030 experiences have been shared with international audiences through publications (ISC 2020, Schneider et al. 2021b; Patel et al. 2022).

6.2 Main challenges related to programme features

Great achievements can be considered a result of challenges – intended and unintended. While the LIRA programme created an environment for a series of productive challenges for grantees and collaborators, some of them were not intended and serve as an important source of learning for future programmes. We identified five main challenges related to programme features.

Firstly, the variety of engagement opportunities in LIRA 2030 – features that have been identified as supportive for success – were, at the same time, a challenge for grantees. PIs of LIRA projects had to **pursue a multiplicity of objectives** at the same time. In their research projects, PIs had to build, lead and coordinate interdisciplinary academic teams and transdisciplinary alliances for collaborative research and knowledge co-production while also having a leading responsibility for presenting outcomes in different technical languages and in appropriate formats to scientific and societal audiences. Beyond this role and according tasks, the objective of strengthening their personal professional qualities as leaders for a next generation of academics and science policy decision-makers included not only trainings, but also contributions to high-level international events and networking activities. In addition, grantees were expected to collaborate across national boundaries (with the programme requiring institutions from at least two countries, which augmented the complexity of projects significantly) and to mobilize additional funds for their projects. Navigating this multiplicity of objectives in a balanced way posed significant challenges for grantees.

Secondly, working in a dynamic programme environment, LIRA grantees had to **adapt to unforeseen opportunities and tasks**, and with that came an increased workload. In the time frame of a 2-year transdisciplinary research project, this turned out to be a significant challenge for many of the LIRA projects and has been appreciated and problematized at the same time. Appreciated, because reflection and learning were augmented; problematized, because the main objectives of delivering high-level scientific contributions and the improvement of situations at stake in the LIRA projects could not always be achieved in the expected time. Grantees dealt differently with this challenge, with some applying for additional funds to continue and advance in the project, others working on the project beyond the end of the financial support and again others, with difficulty, acknowledging that not all the envisioned results could be achieved.

Thirdly, the **time frame of 2 years** for LIRA projects has been a significant challenge for multiple reasons. Generally, it is a very short time to conduct transdisciplinary research processes. Compared with disciplinary research, this type of research requires team building with actors from different disciplines, societal sectors and communities, the establishment and management of working environments that enable collaboration, and often complex methodological approaches to develop adequate, scientifically sound and socially and culturally robust solutions for unsustainable situations. In order to build a successful transdisciplinary team, a series of often time-consuming processes is required, such as building trust and mutual understanding of objectives, interests, needs and concerns. Where collaboration between scientists and societal actors cannot build on previous experiences, collaborators must also learn how to collaborate while collaborating. In many cases, PIs had to navigate dynamic boundary conditions and adapt their envisioned methodologies to changes in the research field, such as personnel changes at

collaborating institutions, the leave of collaborators or conflicts between involved actor groups. In several cases the scholarly work of PIs, embedded in transdisciplinary research processes, progressed at a pace that did not allow researchers to come up with significant results for the scientific community, and in several cases, it was impossible to make contributions to implementing solutions that have been collaboratively elaborated in the time frame of the projects.

Fourthly, the tempor(e)ality of the LIRA projects was not only challenging due to the short project duration, but also due to a **lack of embeddedness of transdisciplinary research processes in broader collaboration strategies** between involved universities and societal institutions and communities. This is a well-known problematic in the current funding schemes of transdisciplinary research and has been criticized as a project-centred logic that does not do justice to the efforts of building research alliances at the science–society interface and the potential that these bear for transforming research, with an immediate impact on unsustainable situations. The problematic was summarized in a very concise way in one of the workshops:

> *You feel such a loss when you've done something so good, you've involved so many stakeholders, you've built on what the research is going to do and the recommendation you think they could employ and then you say: 'Goodbye. The funding from the research is done and I hope you will use the results'.*
> Participant, Workshop II

From the perspective of research collaborators from societal sectors and communities, the problematic lies in expectations that emerge from positive experiences, having built ties and learned how to effectively contribute to co-produce necessary knowledge, and to improve a situation by collaborating with different academic and social communities and institutions. Lacking opportunities for continued research collaboration can endanger motivation and long-term societal transformations in readjusting societal roles and responsibilities in tackling sustainability challenges. What has been experienced as a structural problem of a project-based funding scheme is significantly related to current institutional environments, with universities playing a key role as enabler or inhibitor of the formation of transdisciplinary research regimes at the local and regional levels.

This leads to another, fifth, challenge particularly encountered by grantees and academic collaborators of LIRA projects. It relates to the features of the LIRA programme only to a minor extent but is mentioned here as it appeared to be a significant factor for challenges in various LIRA projects that might have been reduced by strategically supporting a broader debate and engagement with transdisciplinary sustainability science at grantees' host universities. **Institutional conditions**, mainly conditions at universities, have posed significant challenges in conducting LIRA projects. In the course of the evaluation, we encountered a series of factors that contributed to these. More tangible factors relate, amongst others, to administrative – in particular financial – hurdles, with grantees suffering delays in payments, deficient physical and virtual working environments provided by their institution, and limitations in access to data due to data policies that favour competition rather than collaboration. Other challenges might be referred to as cultural factors, with university environments underestimating and disadvantaging collaborative research, and, more generally, creative and innovative scientific practices that do not fit traditional research regimes. Summarized in the words of a workshop participant, reflecting on the LIRA programme: '[It is not enough] to create policies that are open enough and flexible to allow these new emerging issues while they [universities] continue the traditional path.'

How conditions and expectations can be best balanced, and the needs of creative and innovative scholars be met, how the navigation of the multiplicity of objectives pursued by a programme such as LIRA 2030 can be supported in an efficient way, and how institutional conditions can be improved to support ECRs conducting collaborative sustainability research to augment sciences' contribution to society are the questions that have been tackled in this evaluation and will be

addressed in the Recommendations section. In what follows, we provide more detailed insights into the structure and features of the programme and factors contributing to key achievements and challenges of LIRA projects from different perspectives, followed by insights into the grantees' scientific and leadership advancements, the societal effects and legacy of LIRA projects, and lessons from workshops tackling future-oriented questions.

6.3 Programme structure and implementation process

This programme benefited significantly from the constellation of institutions and actors that implemented LIRA 2030. With ISC and NASAC conducting LIRA 2030, the programme was positioned within leading international and African science policy institutions with a strong vision of the transdisciplinary research paradigm and engaged science being of high relevance for the effective contributions of science to confront the complex problems of our times (ISC 2021). LIRA 2030 was designed to meet several priority areas of the ISC and is in the core of the ISC's action plan; it was also designed as a response to the need for institutional and financial support for research fostering scientific capacity and transformations towards sustainability that is particularly lacking in economically weak countries. With ISC and NASAC responsible for the implementation process, LIRA 2030 profited from the international and pan-African network and proximities to relevant international actors and institutions on the one hand and to African realities on the other. Responsibilities were divided accordingly. The SAC incorporated leading scientists and science policy-makers and not only contributed significantly to project selection, strategic decisions on thematic focuses and programme adaptations over time, but also brought in a huge network ECRs could benefit from. With SAC members actively contributing to annual research forums and engaging personally with LIRA grantees, networking opportunities (and most likely, personal-professional growth) could be enhanced. Without having detailed insights into all members' backgrounds, one would suggest that the committee could, eventually, also have considered someone with expertise in Indigenous research methodologies so that the programme's guidance would have put the importance of Indigenous African ways of knowledge production into the foreground.

The programme's plan to create an African network of around 32 integrated transdisciplinary projects on global sustainability, to communicate knowledge generated to a broad range of audiences, as outlined in the proposal to Sida, and to document good practices and lessons learned for international, solution-oriented research projects, was clearly reached. Slightly lowering the number of financed projects and acquiring additional funding meant 28 projects and impactful cross-project collaborations with a significant output in publications related to the core objectives of LIRA 2030 could be financed and the training programme extended in response to grantees' needs. Beyond LIRA grantees and project collaborators, several other African ECRs benefited from the programme. The fact that the main training programmes were positioned in between pre- and full proposal submission to enhance the quality of transdisciplinary research proposals (which was very positively evaluated by grantees) meant around 100 people (scholars of accepted pre-proposals) could participate in the trainings, which contributed to spread insights into the transdisciplinary research paradigm. Also, the distribution of the three calls for LIRA projects could benefit from the international and pan-African networks of the implementing institutions. Twenty-two countries were involved in LIRA projects. A balanced geographical distribution was purposefully tackled, including strategies to address not only Anglophone but also Franco- and Lusophone countries. However, this was only partially achieved. The blind regional spot of LIRA 2030 was Northern Africa. The importance of language in reaching out to and involving ECRs was also articulated on many occasions during this evaluation. A clear sense of disadvantage was articulated by non-Anglophone scholars – a problem that is not only inherent to LIRA 2030 but the entire science system, with little scope for counteracting. However, the language dilemma is even more important in transdisciplinary research and needs to be tackled

with all possible means – reaching from multilingual calls to additional financial support for translators and publication support. In transdisciplinary research language is not only a matter of communication, but of high epistemic relevance. Particularly when working with Indigenous and local communities, taking into consideration Indigenous and traditional worldviews, conceptual work is an entry point to uncovering differences and enabling mutual learning (Chilisa 2020).

One of the greatest achievements of the LIRA programme was giving women equal opportunities to men to lead the projects. Balance has evolved over the entire programme. While in the first call for pre-proposals only 28% of applicants were women, by the end, half of the projects were led by women. Globally, women are under-represented in science, and ISC/NASAC – through the LIRA projects – have defied the odds. The ISC (2022) has acknowledged that women leaders have a positive impact on policies and strategies to address climate change and made a successful effort in LIRA 2030 to contribute to this.

6.4 Achievements of LIRA projects and enabling factors

As diverse as the objectives and participants of LIRA projects are, multiple achievements have been identified in this evaluation. The most global result comes from the SM survey, where we asked participants to what degree their goals were fulfilled. The question didn't imply any specifications, allowing respondents to share their experiences with goal achievements by positioning themselves between the polarities of completely achieved versus failed to achieve their goals. The overall picture (see **Figure 2**) indicates that nobody, from 50 responses, perceived their participation in the LIRA project as a failure – not even close to failing. The vast majority considered their goals to be completely or close to completely fulfilled. A closer look according to actor groups shows a slightly more differentiated picture. From 11 PIs, it appears that the majority feel quite strongly that they completely achieved their LIRA project goals, with a smaller number acknowledging that they did not fully complete their goals, and one with a slightly negative estimation. About half of academic collaborators experienced complete or nearly complete goal achievement while some indicate that this has been only partially reached. Also, the allocation of experiences from CSO/NGOs and community members is overall positive, with most responses closely allocated to completely fulfilled goals.

Figure 2: Goal achievement participating in LIRA projects (source: SM survey)

Asked for their most significant achievements participating in a LIRA project, **representatives of communities and CSO/NGOs** related to four main dimensions.

— Collaborating with academics
— Learning about differences

- — Sharing experiences
- — Communities implementing results

Collaborating with academics, and participating and contributing to workshops and methodically framed knowledge co-production activities, including co-publishing, were highlighted by several respondents. In a story, a CSO/NGO representative reflected that:

> *The process of designing the research instrument was so rigorous that it spanned quite a time. The outcome however produced some of the best research instruments I have come across in my line of work.*
> Participant, SM survey

Many indicated how informative and instructive the collaboration has been. LIRA projects have been a great opportunity to **learn about differences** – different living conditions, different mindsets and thinking about sustainability issues and how to solve problems. We also found that **sharing experiences** in the context of LIRA projects, in particular beyond participants' usual field of action (e.g. in cross-country collaborations), was considered a great achievement. Several stories gathered by the SM survey also indicate that fruitful collaborations and interactions made a real difference to participants. For CSO/NGO representatives, good responses from **communities implementing results** and their willingness to learn and put learning into practice was considered not only a key achievement but also great motivation.

These insights show that transdisciplinary research can enable engagement and mobilize the capacities of research participants in multiple ways – if appropriate approaches are implemented with the right stakeholders, as a workshop participant highlighted. These can help change the idea of research and restore the devastating image of academics as 'data miners'. In a workshop discussion, an informal waste worker made the point:

> *In my sector, the majority of the workers are in retreat and seeing the academia people coming to gather information, to do the presentations to get something that you want […] and you will mine us again. But when I get to LIRA project and I started working with them […], they are coming to work with the informal sector, to make sure that the law makers will implement what informal sectors are also doing. I will be happy to see that fairness and transparency will be strengthened […]. That will help academics get accurate data, being open to understand what they want. Integration will be strong and strengthened for others to benefit out of it.*
> Participant, Workshop I

For **academics** (including PIs and academic partners), key achievements articulated explicitly in the SM survey related to the multiple dimensions of a transdisciplinary research process:

- — Bringing together different stakeholders
- — Learning while working with stakeholders and communities
- — Creating awareness for (transdisciplinary) research
- — Contributions to improve environments and peoples' lives
- — Sharing and networking with colleagues
- — Scientific contributions

For academics, **bringing together different stakeholders** for research collaboration and to build working relationships with people having different needs, interests and perspectives, was very impactful. While forms were very different, these collaborative environments posed a significant opportunity for **learning while working with stakeholders and communities** about how to conduct transdisciplinary research and to co-produce solution-oriented knowledge. Learning from communities and stakeholders was highlighted as a key achievement. Similarly to community members and CSO/NGO representatives who learned how to collaborate with academics, PIs and academic partners also considered learning an achievement as it **created awareness for**

(transdisciplinary) research. The **contributions to improve environments and peoples' lives** that have been mentioned as key achievements are of very different natures. These range from scholarly work like disaggregation of data according to age, sex, disability status and others to supporting urban planning in improving basic services and the security of vulnerable groups, evidence generation for the relationship between climate change and urban health, and very practical outcomes, such as formalizing informal waste collection by the local government, interventions in city planning or the design of urban food gardens to improve food security. LIRA 2030 has enabled outstanding achievements that have also been documented in the final project reports, the report on advancing the Agenda 2030 in African cities (ISC 2020) and in numerous publications, blogs and videos. What makes these articulations from the SM survey – together with several stories shared – particularly interesting is that having been asked openly about key achievements, most respondents relate to the collaborative dimension of LIRA projects between science and society, and many indicate profound engagement, deep learning and emotional involvement. This story even testifies to the hope that has arisen:

> *When we walked into our study community, I was dazed by the conditions the people lived in. I wondered how they could sleep and go about their daily business in such a place. With our frequent visits and interactions, I began to see how they made life work in such conditions. With each community meeting, the people became more animated and involved in improving the environment and improving their lives. It gave me much satisfaction to see that our research brought hope to the community.*
> Academic researcher, SM survey

Key achievements also relate to **sharing and networking with colleagues**. Sharing own knowledge with students and colleagues through mentoring, involving students and young scholars in projects, and having intensive exchanges with scholars, particularly in South–South networks, has been highlighted. Responding to the question of main achievements in the SM survey, only three out of 28 academics called **scientific publications** their main achievements. By no means does this undermine the scientific performance of LIRA projects: it rather mirrors how collaborative research that responds to needs and engages with affected communities makes a real difference for academics and – eventually – leads to a shift in values about what is considered important. The focus of the ISC 2020 report, co-authored by PIs from the LIRA programme, also bears witness to transformations of that kind. In the introduction, the authors present projects profiled in the report to:

> *…inspire hope for early-career African scientists to cross the conventional boundaries between science, policy and society, and to do research that is innovative, engaged, relevant, and that ultimately contributes to social change.*
> ISC 2020, p. 9

In our document review, analysing the **final reports of PIs**, we found main achievements in the following realms:

— Strengthening capacities for collaboration through workshops and training
— Actors' articulation for collaboration and partnership with relevant stakeholders
— Consultation from the beginning and design of the projects
— Sustainability pathways and strategies to work with institutions and policy-makers
— Dissemination of knowledge

Strengthening capacities for collaboration through workshops and training: PIs from the three cohorts acknowledged the importance of being empowered through trainings that were offered by the ISC. The training workshops equipped them for effective collaboration, which contributed towards working with different stakeholders on the projects, such as CSOs/NGOs, communities, private sectors, and government at the local, regional, national and international level.

Actors' articulation for collaboration and partnership with relevant stakeholders: PIs succeeded in having high-level policy-makers working with communities and people from informal settlements and squatter camps to understand the urban city problems from those affected and the groups working together to find solutions. This was also acknowledged in the learning study by Patel et al. (2021), in particular, that Cohort 3 had incorporated groups that were in most cases excluded from engagement. They further elaborated that a diversity of stakeholders was actively involved:

> [I]n the identification of research problems and the shaping of research questions, joint processes for analysing and tackling challenges [which] could be addressed holistically and collaboratively. This encouraged engagement and helped to bridge the gap between institutions.
> Patel et al. 2021, p. 5

Consultation from the beginning of projects and design processes: Involvement of societal actors and communities is critical for the achievement of intended outcomes. Smith et al. (2017) noted that involving the community in the definition of research questions and the development of policies and programmes improved service delivery in a variety of contexts, including in the field of education. The involvement of different stakeholders in problem identification, co-design of knowledge, implementation and analysis turned out to be an important aspect that contributed to the achievement of the LIRA projects. This was also noted in the learning study (Patel et al. 2021).

Sustainability pathways and strategies to work with institutions and policy-makers: Most of the LIRA projects addressed critical areas that affect many cities in Africa, such as energy, health, water supply and sanitation. Community members, policy-makers and scientists came together to first understand the major problems that affected the communities (urban dwellers), jointly created knowledge and found sustainable solutions together. Involving communities and people in the research, instead of carrying out research *about* them – thus imposing externally generated solutions – emphasizes the value of integrating different types of knowledge and ways of knowing.

Dissemination of knowledge: The partnerships established generated knowledge, skills, competencies and awareness of the importance of working together. The knowledge co-produced contributed to the limited literature on sustainable urban development in Africa, in particular on Sustainable Development Goal (SDG) implementation and sustainability research at science–policy and science–society interfaces. In addition, the co-produced knowledge was shared internationally through the publication of articles, seminars and workshops that generated cross-country knowledge translation, databases, community mapping, and official policy and protocol documents (for more details see Section 6.6).

From the final project reports, we could identify several factors that contributed to the intended consequences, which included co-hosting and -funding of events, inclusion of leading experts and Indigenous people, healthy institutional collaboration, positive commitment by government, use of specific tools (such as the Planning, Monitoring, Evaluation and Communication [PMEC] tool), organized record keeping, clearly laid-out and non-deviation of procedures, the use of different communication platforms to facilitate remote collaboration, the teams' rich experiences working in different parts of the continent, the cross-country collaboration opportunities and the mainstreaming of gender issues into the project objectives. There were also unintended factors that led to the achievement of the LIRA objectives, such as the graduation of master's degree students and the co-production of methods that gave birth to the idea of designing a Local Agenda 2030, to name just a few.

6.5　Challenges of LIRA projects and contributing factors

For grantees, an overall challenge has been to meet the multiple objectives of LIRA projects in time. Many claimed that the tight schedule of the projects and limited financial resources were key contributing factors to that. Not surprisingly, the effects of the COVID-19 pandemic significantly increased this difficulty. A significant issue for most PIs was the bureaucracy related to procurement delays at university administrations and project partners (among academics). Although some institutions had policies and procedures in place, they still acted as a source of delays in the processing of project funds and thus the implementation of projects. But also, cross-country project partnership complicated things in some projects and for some, balancing and connecting scholarly work and societal interventions has been a real challenge. Besides these programme- and institution-related issues, **challenges of collaborative research and knowledge co-production** were significant in LIRA projects. We identified the following most important challenges and difficulties:

— Building transdisciplinary teams
— Time availability
— Power dynamics
— Lack of trust between collaborators
— Lack of government engagement
— Language and cultural issues
— Expectation management
— Biased objectives and problem framing
— Lack and inaccessibility of information and data
— Inadequate communication technology and resources

Building transdisciplinary teams: From the perspective of PIs and academic collaborators, the biggest difficulty has been to get stakeholders on board, to build cross-sector partnerships, and to coordinate multi-stakeholder teams across sectors and disciplines with diverse mandates, interests and priorities and to keep all involved motivated and engaged. Also, CSO/NGO collaborators found it difficult in some cases to bring the right people together and to create an understanding for collaborative research tasks. This hampered some of the envisioned transdisciplinary projects in gathering relevant information and data and co-producing knowledge. To forget to involve key stakeholders has been highlighted as particularly problematic.

Time availability: In collaboration, time constraints of all involved played a crucial role. Beyond the diagnosis of a time span of 2 years being too short, a more general problematic is indicated. For many, particularly collaborators from non-academic sectors and communities, such collaborative research activities are conducted on top of their daily obligations. In some cases, this resulted in PIs experiencing difficulties with partners' slow responses to tasks and deadlines and discontinuity of contributions. A CSO/NGO collaborator highlighted this difficulty of 'getting all the several moving parts to deliver on time'. This is, by no means, simply a failure but has a structural dimension that needs to be taken into account, for instance by allocating time and financial resources to collaborating institutions and organizations and incentivizing community members contributing to transdisciplinary research.

Power dynamics: The importance of dealing actively with power dynamics in transdisciplinary research has been increasingly recognized by PIs. In particular, when collaborating with communities, power relations posed a significant challenge (ISC 2020). The communities need to be sure that their intellectual, physical, emotional and/or spiritual dimensions of knowledge in creative and interconnected relationships with people, places and the natural environment are considered and respected. This is to say that community collaborators have to work towards the elimination of oppression and promotion of different worldviews and cultural practices to provide

for their community's openness. PI reports indicate that communities were open to the projects as beneficiaries but within the confines of a process that commits to power symmetry, not power asymmetry. At the same time, scientists and administrators had to ensure the project implementation fidelity and accountability. Therefore, this process presented itself as a power balancing across multiple levels challenge in coordinating between the partners. This situation was exacerbated where there was not enough (published) guidance that could be referred to. The experienced influence of colonial legacies and power imbalances also led to difficulties in liaising with government institutions in some cases.

Lack of trust between collaborators: Trust is gradually built and plays a key role in ensuring a working environment that promotes respectful relationships. It is particularly important in transdisciplinary collaboration and even more so when collaborating with Indigenous communities due to a history of extractivism. In such constellations, applying Indigenous methodologies is key to recovering trust for collaboration. Some PIs indicated that resistance was faced in integrating Indigenous knowledge with science, and some failed to do so. One project, presented in the ISC 2020 report, provides an insightful example of the importance – and at the same time difficulty – of scientists integrating Indigenous knowledge (ISC 2020: 36). While there may be diverse reasons for a lack of trust, in some cases it led to the challenge of lack of transparency and difficulties amongst collaborators, as reported by the PIs of Cohorts 2 and 3. The integration of culturally sensitive and context-specific research features the historical context, cultural experiences, norms, values, beliefs and behaviours of communities into its design and implementation. This meant that there was an issue of trust-building and trust-breaking throughout the implementation of some projects that resulted in a lack of quick agreement on implementation and scepticism between the researchers, policy officials and local community actors. Much as trust is constructed on prior interactions and experiences, the notion that the academics and/or authorities could use the project findings to further their careers or social-economic agendas, with the communities reaping no tangible benefits, posed the possibilities of distrust. This was exacerbated where the reputation of the project member was unknown and/or there was a power differential between the interacting project collaborators.

Two community members participating in the SM survey described the difficulty encountered:

> *During data collection, due to lack of trust between the government and the slum communities, some were not willing to cooperate until we were able to convince them that we were not from government but any information we get from them will be useful.*
> Community member, SM survey

> *[…] some people will reluctantly give you a good response, and some will think your research was based on politics so they will hardly respond to your question.*
> Community member, SM survey

Lack of government engagement: The relationship between academia and governmental institutions has also been described as difficult and lacking trust due to different factors, including different paces of work, with governments in urgent need of results and academics in need of time to produce reliable outcomes. Several project participants from academia, CSO/NGOs and communities complained about the limited or lacking engagement, commitment and openness of government representatives. This has also been mirrored in the results of a Mentimeter poll of PIs. When asked which actors are needed to strengthen transdisciplinary research for Agenda 2030 in African cities, those mentioned most often were local authorities.

Language and cultural issues: Language forms the world one inhabits, which is a vital aspect for the individual to be part of a community or culture in addition to being a means of communication. Language defines the way a group of people understand and relate to one

another and their environment. Considering that the projects were transdisciplinary, there was the challenge of language barriers from an experiential professional and cultural standpoint. One PI highlighted the difficulty in the SM survey, expressing that he would have liked to publish more, 'but co-writing among different languages and including non-academics was challenging' (PI, SM survey). Language of course also played an important role in disseminating results in communities. Not all projects seem to have managed to communicate in local languages, although one project in Ghana did through multilingual audio records.

Expectation management: The constitution of transdisciplinary research teams creates expectations. Often, diverse expectations coexist regarding collaboration and outcomes. These range from simply engaging in collaborative action and the acquisition of information and data to concrete changes in situations or practices. In some cases, the non-delivery of expected contributions from collaborators, and lacking, incomplete or delayed results of research projects for societal institutions or communities, caused disappointment. While deviations from envisioned actions and outcomes are not surprising in highly dynamic research environments, reported disappointment indicates the importance of expectation management from the earliest stages of collaboration.

Biased objectives and problem framing: The failure to fully incorporate Indigenous peoples' participation and ways of doing at the project conceptualization stage brought about biased objectives and problem framing that may have led to the disincentivization of communities. The different knowledge system in the transdisciplinary setting saw the different team members resist integrating Indigenous knowledge with Western science, as reported by a PI of Cohort 2. In turn, the importance of the early involvement of communities and relevant stakeholders for researchers was highlighted by a workshop participant:

> *The grantees had to change either the methodology or the research question because they realized that when they get the outside perspective from people who are not in academia, their dynamics and what is deemed as relevant is totally different from what you thought in the lab.*
> Participant, Workshop II

Lack and inaccessibility of information and data: In some cases, there was a lack of baseline data for referencing that should have been used to inform the project design and implementation. This lack of preliminary information should have provided the bases of understanding regarding the status quo and possible remedial action. Also, accessibility of data has been an issue. Some projects reported difficulties in getting data from governmental institutions, such as a municipality assembly.

Inadequate communication technology and resources: The frequent poor internet connectivity due to inadequate communication technology and resources at most project sites posed a challenge for team members, who should be able to effectively and efficiently communicate with one another. These communication facilities were very useful in overcoming the interaction challenges due to COVID-19 protocols. They prevented learning engagements and led to delays in implementing project activities like data collection, producing outputs and dissemination activities.

6.6 Continued effects and legacy of LIRA projects

Most of the project reports clearly show significant effects of the programme for **grantees' career paths** and on **improving unsustainable situations**. The majority of PIs engaged in international events, presenting their work at international conferences, some of them in high-sustainability policy events held by the United Nations, World Health Organization and Intergovernmental Panel on Climate Change, amongst others. Some created or joined research networks (e.g. on air pollution) or built partnerships with academic and non-academic institutions for future research.

International events were also co-hosted by PIs. Some grantees were offered positions at different research institutions and gained fellowship scholarships.

Scholarly output varies significantly across projects, with up to five research papers published or submitted to international journals. In total, 67 articles were published by the end of the programme and several more are either in review or under development. The average of journal publications is two. Preliminary insights into research results and experiences were shared in various blog posts and at conferences. From many projects, output for communities and policy-makers was provided. Depending on the subject and target groups, these range from policy briefs (approximately 20) and technical books to visual material such as videos and online photo exhibitions. The communication strategy of the programme significantly contributed to creating opportunities and fostering abilities with diverse communication formats. The reasons for the great variety of scholarly output seem to be manifold, with some relating to challenges that have been encountered in transdisciplinary collaboration (see Chapter 6.5).

Regarding **societal effects** and **learning to collaborate across sectors**, participants from CSO/NGOs and communities considered LIRA projects as significant contributions to changing living situations and improving collaboration across sectors, increasing transparency and fairness related to processes and outcomes. Significant positive effects can be observed in creating cross-sector research alliances that enabled dialogue and exchange between groups that have not engaged actively before. The co-production of knowledge and solutions strengthened a sense of shared responsibility in some cases, while in others transdisciplinary collaboration unfolded a mediating function between communities and governmental institutions. In some cases, LIRA projects contributed to a different **image of academia**, one that opposes data mining and promotes the value of communities' contributions to transformative research, as the quote from the informal sector worker in Chapter 6.4 impressively showed. Projects that were designed with healthy, social social-ecological outcomes and SDGs in mind were relevant to the **well-being of the people and the environment** within the context of the projects. Some projects were able to work with the communities in finding ways of changing practices and improving living or working conditions, for example by reducing air pollution in the informal sectors or developing policies that would help mitigate air and water pollution. One other project designed a solar-powered chimney that improved indoor air quality and thus improved the health of the community. Most projects gathered relevant data to address community problems and ways of improving the livelihood of (informal) communities. Some projects also left behind a manifest legacy beyond the actual scope of the project, like a prototype unit for alternative multi-storey housing, in order to translate the ideas into reality. The Durban municipality was to use this prototype multi-storey idea to construct 150 alternative housing units in early 2021 to facilitate a more comprehensive spatial reconfiguration of three informal settlements. In one case, the downscaling and contextualizing of SDGs at the local level was taken up in a national development plan, and in another case, a web-based interactive map was created to monitor and track progress in implementing SDGs at the city and community level.

These are examples of LIRA project legacies within the context of projects, and beyond those, where results have been scaled up or transferred to other cases. The analysis of outcomes of this kind of integrated, solution-oriented transdisciplinary research approach could in some cases immediately change unsustainable situations or provide guidelines for future urban development. Some projects have also secured **additional funds** from other funders to extend activities during the project or continue with the projects. We identified six projects with follow-up research funded and several others where co-funding was gathered for the implementation of solutions. Other co-funding and in-kind contributions of host institutions were provided for conference participation and publication fees for PIs.

6.7 Learning for collaborative research and knowledge co-production

There are many dimensions and detail levels to learn from LIRA project experiences and what contributed to achievements and challenges. From the publication *Advancing the Agenda 2030 in Africa* (ISC 2020) we can gain first-hand insights from grantees authoring the report into what has been learned by experimenting with interactions between science, policy and society in African cities in LIRA projects. As key learnings, a learning attitude, active listening and the need to deal sensitively with expectations and power dynamics – including researchers' own power and dynamics in the social fabric – are highlighted. Challenges identified in this evaluation confirm the need to place an emphasis on the reflexivity and sensitivity of researchers in transdisciplinary research.

The authors of the report (ISC 2020) emphasize the need to be realistic and strategic about engagement and consider process as an important outcome. In the SM survey we asked participants from diverse sectors and communities **how working together was experienced** (see **Figure 3**). In a polar question, we asked for allocating the experience 'Working with other societal sectors was…' between 'too difficult (we simply didn't cope)' and 'very easy (working with others didn't pose any problems)'. The overall result shows that collaboration between people from different sectors has not been straightforward, but not impossible either. Looking into different perspectives, it appears that responses from PIs are the most diverse, with several tending towards the 'too difficult' pole, are significantly more positive from academic partners, and most positive (based on low numbers, however) from CSO/NGOs and community members, which indicates that the level of cooperation required of them during LIRA projects was not too difficult or burdensome. Having in mind the multi-dimensionality of LIRA projects and according responsibilities of PIs, this comes as no surprise but indicates how important is it to provide excellent conditions for ECRs conducting research at the science–society interface.
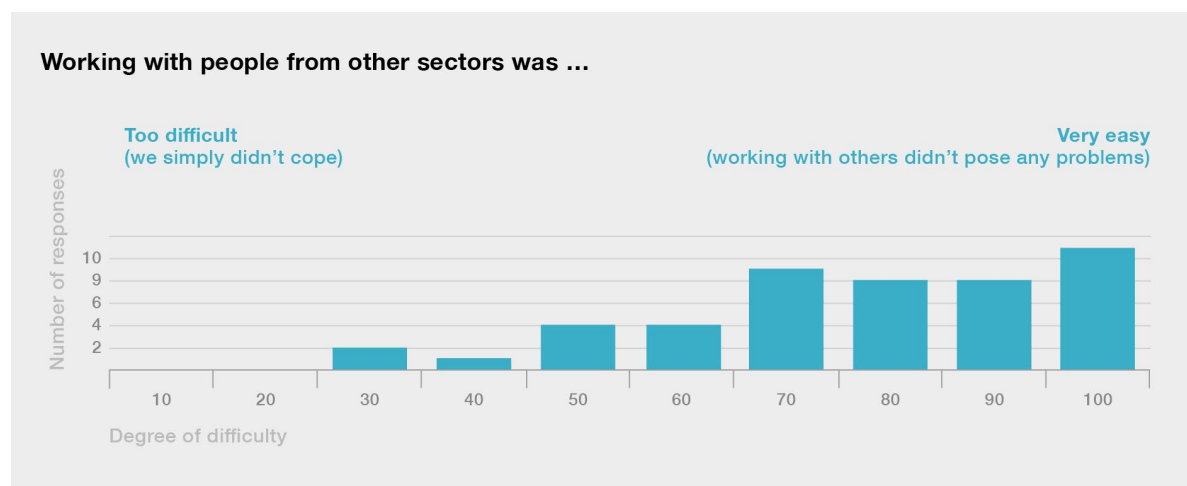
Figure 3: Experiencing working with people from other sectors (source: SM survey)

We specified and deepened that question by asking: '**Looking at sustainability challenges through others' lenses** was… straightforward (very easy, no problem looking through others' lenses)' to 'impossible (just too difficult through our own and other's lenses)' (see **Figure 4**). This had the most widely spread results, covering all options. In this question, the challenge of perspectivism (looking through others' lenses) has been posed in relation to sustainability challenges, which is, or could be, a complex challenge in and of itself (depending on the actual contextual issues at hand). It is, therefore, not all that surprising to see the varied responses to this question, ranging from impossible to straightforward. Notably, once more the responses from CSO/NGO and community members are the most positive, with a majority indicating that this was

30

(close to) straightforward. This certainly warrants some further investigation to better understand what kind of sustainability challenges were more difficult (or even impossible) to look at through others' lenses versus those in which this was not a problem at all.

Having to look at our sustainability challenges through others' lenses was …

Impossible
(just too difficult to look through others' lenses)

Straightforward
(very easy; no problems looking through others' lenses)
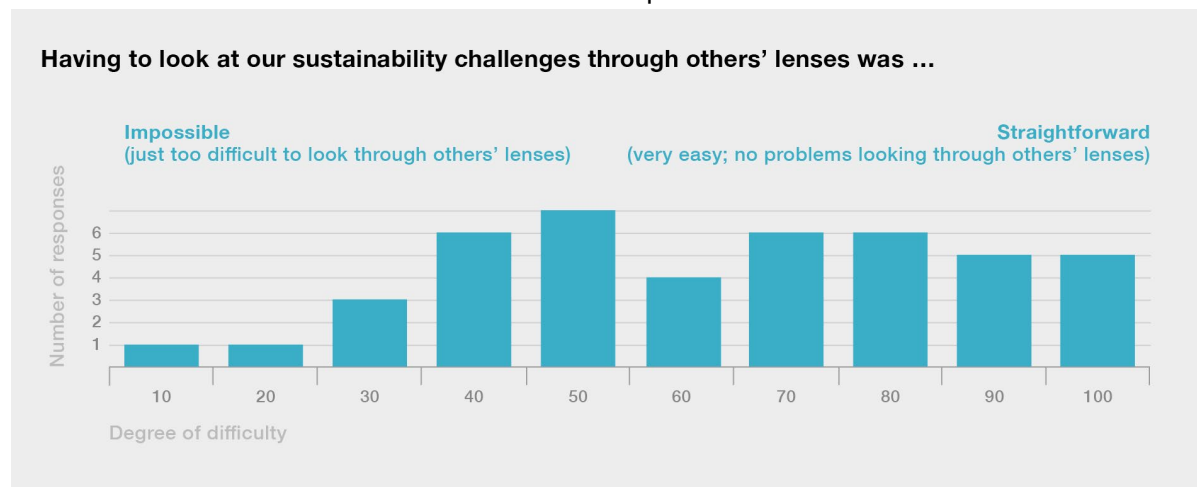
Figure 4: Changing perspectives on sustainability challenges (source: SM survey)

More future oriented, we asked participants **how science and society can work better together** to support sustainable development in Africa, creating a field between the attitude of 'recognizing all knowledge as important', to 'developing research questions together' and to 'jointly developing and implementing solutions'. Here, results show relative similar importance appointed to the three potential areas of improvement, with a slight tendency towards the practical side of collaboration (see **Figure 5**).

**How can science and society work better together
to support sustainable development in Africa?**

By developing research questions together

**By jointly developing and
implementing solutions**

**By recognizing all knowledge
as important**

Figure 5: Potential areas of improvement of science–society collaboration (source: SM survey)

For further results see the workshop report: Strengthening and up-scaling collaborative research and knowledge co-production (see Annex 6).

6.8   Learning for improving institutional conditions

Institutional barriers and biases in the academic system towards traditional types of research have been reported from many participants and in former studies (Schneider et al. 2021; ISC 2020). While **administrative and bureaucratic hurdles** cause difficulties and delays for grantees in conducting their research, more **profound and structural hurdles** were encountered due to the very fragmented institutional landscape, with limited connections between academic and societal institutions. The traditional, hierarchical and static structures of institutions make it difficult to respond appropriately to rapidly changing environments and to find support for collaborative research at the science–society interface. Moreover, African academic institutions are embedded in a broader, global academic value system with hegemonic power of classical modern science that provides few incentives for the type of research that has been conducted and promoted by the LIRA programme. Grantees also experienced those difficulties at the global level when publishing transdisciplinary research internationally. While exploring possibilities to strengthen institutional conditions for transdisciplinary sustainability science, a workshop participant involved in science policy brought it to the point:

> *Institutions are machines whether it is the universities, funding institutions, or implementing institutions […]. These are machines that have been established and are running under a particular mindset that is very difficult to change in a short time period. These machines, coming back to universities, would take a lot of time to embrace the kind of science that we are talking about generated by transdisciplinary research as opposed to the long-standing disciplinary topic-focused and perhaps method-driven science.*
> Participant, Workshop II

When LIRA grantees call for more institutional and financial support to conduct research that makes a difference, they not only refer to improvements in peoples' living conditions and urban environments in Africa, but also to **transforming academic cultures**. Interestingly – and an indication of the importance of personal engagement and relationships – results from the SM survey show that LIRA PIs and academic collaborators don't lack opportunities for cross-sectorial collaboration. In comparison, CSO/NGO and community collaborators do, and indicated a need for increasing such opportunities and ensuring that collaboration structures do not end with a project's formal termination – a problematic that has been articulated by PIs and various actors involved in LIRA projects. Thinking of future programmes, this indicates the need to **de-centralize institutional constructs** of projects or programmes, with strong embedding in diverse, not only academic, institutions. With the LIRA experience in mind that shows how much effort was needed to enable LIRA projects within African universities, this might be considered as overshooting the mark. But if transdisciplinary sustainability research is considered a new paradigm of research for sustainability, one that is located between institutions traditionally organized in modern nations, it does not do to avoid tackling transformations of the institutional landscape.

Workshop participants also reported problems related to the **cultural characteristics of academic institutions** that are incorporated into everyday practices, many of them mirroring competition rather than collaboration, with effects on data sharing and openness for collaboration and indicating the need to promote and foster collaborative forms of research in higher education. In a similar vein, resistance to innovation and creativity has been reported. While this seems to be the overall situation (and not at all specific for African academic institutions), there are encouraging experiences (stories from the SM survey, amongst others) with sharing and disseminating learnings from LIRA 2030 trainings with students and colleagues. These indicate how programmes like LIRA can promote change and emphasize the potential of systematically strengthening this dimension of multiplying learning in future programmes.

For further results see the workshop report: Institutional conditions for collaborative sustainability research in Africa (see Annex 7).

6.9 Learning for future training programmes

The LIRA training activities have been the backbone of LIRA 2030 and were key to enable transdisciplinary sustainability research. The PIs co-authoring the ISC 2020 report highlight:

> *Investment in transdisciplinary research and training is crucial to equip the next generation of scholars with the mind-sets and tools needed to ensure that urban science is geared towards transformative and systemic change in African cities.*
> ISC 2020, p. 9

Evaluation results of the different training components for PIs and Co-PIs have been extremely positive. Critical feedback helped improve the programme from cohort to cohort and led to adaptations of the training programme, including the acquisition of new, and re-allocations of existing, funds. Continuously learning from participants' needs (for knowledge, skills and exchange of experiences) that only came to the fore to a large extent while conducting transdisciplinary research helped create a supportive environment to realize successful collaborative, transdisciplinary projects.

Regarding the **training formats**, the implementation of on-site core training for ECRs whose pre-proposal had been selected in the two-stage selection procedure of each cohort was evaluated very positively, by participants, programme representatives and trainers. The format and temporal allocation allowed for combining the improvement of quality of submitted proposals with network building of peers across Africa and extending the number of participants involved in training programmes. Additional trainings for Co-PIs were of great importance for the projects, as have been the coaching workshops for PIs and Co-PIs that offered opportunities to immerse themselves more profoundly in the diverse aspects of transdisciplinary research. Trainers also emphasized the importance of embedding and combining transdisciplinary methodology training with sustainability-related issues. Overall, the staged training programme that was conducted throughout the programme to accompany grantees in the course of their projects was very apt to respond to grantees' needs at different stages. Other programme-level events, such as research fora, site visits and additional (peer) learning opportunities additionally strengthened advancements.

ECRs participating in the LIRA training programme came from highly diverse backgrounds, including of scientific practices and (academic) cultures. The diversity of recommendations for improvement that trainees provided (incorporated in Chapter 8.6) mirrors the **diverse needs of participants** and indicates the need to put participants and their experiences centre stage in trainings. Additionally, we learned from the SM survey and Workshop I that collaborators from other sectors and communities also require learning opportunities and guidance to conduct transdisciplinary research. Some LIRA project grantees offered different trainings for collaborators to enable knowledge co-production and, to a certain degree, became multipliers of the LIRA training programme. This is an important dimension to learn from for future programmes.

For further results see the workshop report: Training early career researchers conducting transdisciplinary projects (see Annex 8).

7 Conclusions

There is no single way to evaluate transdisciplinary research in Africa due to the different historical-political and social-cultural conditions across regions and nations and the multiplicity of Indigenous peoples across the continent. However, any evaluation of research in Africa should take into account the presence of relational ontologies and epistemologies, and the colonial heritage that shapes social fabrics to date, and deploy a relational methodology, accordingly.

> *Africa is a multilingual continent made up of multiple countries that contain diverse indigenous communities within those countries. Traditionally, African people have been evaluated through Western frameworks and understandings, not via African ways of producing knowledge.* Made in Africa *evaluation is an approach to developing and conducting evaluation through an African worldview that focuses on African values, belief systems, customs, ways of knowing, and ways of constructing knowledge.*
> Gaotlhobogwe et al. 2018

In this evaluation, an intercultural team of evaluators made the attempt to integrate standard Western evaluation methodologies with contextually relevant, indigenizing and decolonializing approaches. On the surface, these may appear similar in form. Their difference plays out in the types of questions being asked, the perspective on the material and, last but not least, the relationship between those evaluating and those being evaluated. This evaluation intended to respond to the African Union Agenda 2063 that pledges to mobilize people and their ownership of continental programmes and associated monitoring and evaluation frameworks (Watera 2019). Therefore, we opted for a dialogical and formative evaluation approach to learn from and with those involved in LIRA 2030 and to jointly develop recommendations that are anchored in lived experiences. With a sequential mixed methods evaluation design, we combined the analysis of documents produced by grantees and programme managers with an SM survey that gathered the stories and experiences of different actor groups involved in LIRA projects and a series of workshops that emphasized key dimensions of LIRA 2030. We attempted to take all forms and ways of knowing into consideration in equal manner to conduct an integrative evaluation that created reflection and learning opportunities for all involved.

7.1 Overall appraisal

What we encountered in this evaluation can be considered an impressive attempt at a complex response to complex problems. The programme pursued multiple objectives to tackle transformations of research and unsustainable situations, combining epistemic and transformative objectives and acknowledging the entanglement of producing knowledge and shaping the world (Jasanoff 2004). The overall architecture of the programme, enabling capacity building embedded in integrative, transdisciplinary sustainability research, has proven very successful (LIRA 1). Where grantees and collaborators where challenged, sometimes even overwhelmed, by the different tasks and partially competing goals that had to be achieved, an immense source of learning unfolded. Besides practising leadership in the role of PI of projects, the programme's career development opportunities significantly supported grantees in gaining leadership qualities. In achieving different goals simultaneously, a gap between conditions provided by the programme in terms of temporal and financial means opened up (LIRA 4). The 2-year time frame was far too short to build transdisciplinary research environments, co-produce solution-oriented applicable knowledge for sustainable development and to publish scientific papers in international journals. In particular, publishing results from transdisciplinary research posed a significant challenge for LIRA grantees. While the former weakness of the programme can be taken into consideration by future programmes in a relatively straightforward way, the

latter represents a global and long-term transformation challenge. The multiple networking opportunities – mainly in annual forums, trainings and cross-country collaboration – seem to have contributed significantly to strengthen a sense of belonging to an emerging community and with that of professional identity. This can be considered a huge achievement of the programme, including tangible effects such as forming networks for transdisciplinarity in Africa and several grantees leading international research projects that build on these networks (LIRA 3). LIRA 2030 made an outstanding contribution to developing and building transdisciplinary research capacity, and not only increased relevant knowledge for sustainable development in urban Africa but enabled spaces for experimentation on how knowledge production can best be solution- and implementation-oriented through collaboration with societal sectors and communities (LIRA 2 & 5). The majority of projects created outcomes that were at the same time evidence-based and context-sensitive to advance research on sustainable development in urban Africa and to inform decision-makers, by encountering situated problems with situated approaches. This comes at a time when research communities are challenged to overcome the historically rooted, prevailing inequalities and power imbalances in conducting research. Watera (2019) noted that 'the global agenda of the Sustainable Development Goals calls for "Leave no one behind" while the African Union Agenda 2063 pledges to mobilize people and their ownership of continental programs.'

The engaged and open attitude of all those involved, including a funder open to experiment with a new funding mechanism that fosters the autonomy of African scholars in international collaboration, was a key requisite for success for such an experimental endeavour as LIRA 2030. The degree of reflexivity and willingness to learn from the programme experiences is outstanding. The programme has been a real learning journey with impactful decisions of the SAC and management team (and a funder, open to accept these) to adapt the programme continuously and to lever reflexivity by conducting systematic learning studies at the programme and project levels.

What surprises from reports and discussions is that little attention was paid to the broader embedding of institutions, in particular universities, and research practices (including transdisciplinary approaches) in colonial and Western mindsets, value systems and historical trajectories. When tackling and re-thinking sciences' and universities' role in society, as well as research and higher education practices in Africa, it must not be overlooked that the institution of the university is *as such* the heritage of cultural domination. The way history has shaped the institutional model of the university globally is entangled with a colonial history that is not only contextual, but inscribed in structure, practices, values and habits. In this evaluation, only one participant touched upon this problematic during a workshop by pointing to the importance of:

> *[t]he recognition of the significance and the difference, in terms of the native African scholarship, in a political economy around knowledge production which is so hegemonically Northern, which has particular assumptions about knowledge production and Africa gets marginalized within those realms.*
> Participant, Workshop II

When conducting transdisciplinary research with communities, it turns out to be of uttermost importance to deal proactively with cultural hegemonies. This is particularly the case when researching with Indigenous communities. Current indigenous communities' leadership are cognizant of the historical act of Eurocentric research project misuse and harassment, where collected information on Indigenous communities was used to manipulate and control them. This has fundamentally informed the distrust of research relationships within many Indigenous communities (Held 2019). These historic events, which were chronic, pervasive and intergenerational experiences of oppression, have been imposed on and normalized in the lives of Indigenous communities (Burnette & Figley 2017).

A programme environment such as LIRA 2030 that is anchored in praxis (Freire 1996), which nurtures action from reflection and theory from practice by mobilizing transdisciplinary research, and that enables people from different life-worlds – including international African scholars, informal waste workers and religious community leaders – to expose themselves to each other, seems very promising to tackle the task of decolonizing research and higher education. In his seminal paper addressing the question 'What is the university for?', Premesh Lalu (2019) opens a perspective from the South on the reinvention of the university. Against the background of a history of inadequate attempts at renewal, Lalu concludes:

> *The question of our time demands that we ask how to reinvent not only the idea of the university, but the idea of university discourse. We need to think once again about approaches to technology, the state, and the public sphere, and how each gives a view of the desire that now remains repressed in our perspective of knowledge projects. We need to recuperate the sense of attention and play, and of the creative acts as opposed to the banality of neoliberal creativity aimed at mere entrepreneurial activities and false promises. The university committed to the task of realigning technology, mnemonics, and an ethics of the self will provide indispensable for naming our present and finding our way out of those predicaments that threaten to undermine the best of our knowledge upon which the future of our students, faculty, its workers, and the institution of the university rest.*
> Lalu 2019, p. 54

With the abundant experiences gained in LIRA 2030, doors have opened up to tackle this epochal mission. Promoting research *of* people and *for* people and the environment is a way to recover what remains repressed and to mobilize creativity and the power to intervene to create more sustainable futures.

7.2   Balancing acts

What has been learned in assessing the LIRA 2030 programme and projects is that complex problems require complex responses that induce change in multiple directions simultaneously. This is not an easy effort. Many achievements encountered in this evaluation constituted significant challenges at the same time, and factors enabling certain achievements have hampered reaching others. In concluding this evaluation, we therefore propose to look at the different features and dimensions of programmes that tackle such complex endeavours as balancing acts that require attentive navigation, continuous critical reflection, flexibility and adaptability, and a responsive implementation practice to provide conditions that serve the needs of all involved. In what follows, we present a selection of those realms where no unambiguous recommendations can be expected.

Between complexity and practicability

This evaluation indicates that it is possible to successfully implement a programme pursuing a multiplicity of objectives simultaneously. We learned that it is of crucial importance to intertwine these effectively, for instance by combining trainings and presentations of research results to international audiences with networking, career advancements and enhancements of dissemination abilities of research outcomes. At the same time, this meant grantees could sometimes feel overloaded with demands and conditions (timespan, financial resources, accompaniment). To best balance complexity and practicability, a dynamic funding structure and programme environment can contribute significantly, for example by creating additional funding opportunities for cross-project activities or comparative studies without demanding these from the outset.

Between transformation of academic and urban environments

LIRA 2030 has demonstrated how a programme can change urban environments by changing academic practices. We learned that there is huge potential for grantees to serve as multipliers and induce transformation in their academic environment (sharing, debating, teaching, collaborating) while at the same time intervening and contributing to transformations of unsustainable urban situations, practices and structures. Efforts that have been made at the programme level by engaging academic and science policy-makers on the one hand, and political decision-makers locally and internationally, show that this can also be tackled as an explicit purpose. Making this bi-directionality visible and explicit may enhance success and mitigate overload.

Between liberty and guidance, openness and control

We have learned in this evaluation that there is huge potential in close guidance and support (e.g. through trainings, coaching, reflection guidelines) and a necessity to grant liberty and openness to adapt to ideographic research environments. This concerns both the interpretation of the transdisciplinary research paradigm and basic tasks such as reporting. Thoroughly structured, ideal types of transdisciplinary approaches proposed by Western scholars may provide orientation in conducting research in 'messy' environments, or 'in vivo' (Nicolescu 2002), while at the same time restricting the emergence of culturally sensitive, original African approaches. Close-meshed (form-like) documentation and reflection guidelines facilitate reporting and reflection and enable comparability while at the same time narrowing down freedom of expression and limiting culturally diverse practices, and they may not be fully compatible with users' life-worlds.

Between standard Western and Indigenous approaches

Promoting transdisciplinarity around the globe bears the possibility of imposing a new hegemonic concept, shadowing the situated African, indigenizing, decolonizing research approaches of engaged research and repeating historical experience with best motifs. Achieving a balance between Western and Indigenous approaches by mobilizing the potential of both seems to be apt in trainings, but also in the assessment of grant proposals and evaluation of research. This includes openness to acknowledge different value systems regarding accountability, robustness, traceability and approaches to collaboration. The integration of Indigenous and Western approaches is key in decolonizing science and may require putting the worldviews of the colonized Other centre stage (McKay 2022).

Between (research) action and reflection

The example of LIRA 2030 indicates that learning studies and the systematization of experiences (such as the ISC 2020 report), as well as the many evaluation and reflection activities of trainings and project experiences, are of huge value for the improvement of ongoing and future programmes. Such activities are very appropriate and necessary for innovative and experimental programmes for novel forms of research at the science–society interface that are not yet consolidated and widely accepted as research approaches. The LIRA 2030 experience allows us to learn that the appropriate incorporation of such reflection and (self-)evaluation exercises requires thorough planning and that these need to be adequately incorporated into a programme (including allocation of time and financial resources) and communicated from the beginning. Properly embedded in a programme, iterations of (research) action and reflection can make a huge difference to the chances of success and enable learning for wider audiences.

Between success and failure

Science is open-ended. Transdisciplinary research is solution-oriented. Success and failure thus imply different consequences. The suggestion to balance between success and failure addresses

expectations, first and foremost. The multiplicity of objectives, pursued with transdisciplinary research approaches, invites the illumination of the broad spectrum of (possible) achievements when it comes to assessing success. It requires laying bare, negotiating and agreeing on criteria of success and failure, including the different worldviews, value systems and objectives of all those contributing to the research. With an attitude of mutual responsibility, a sense of success may even be achieved even if one's own goal is not met. Learning to collaborate while collaborating, and building trust and functioning cooperation environments between sectors and communities, can be a successful outcome even if the municipalities' waste management is not yet improved or the scientific paper has not yet been published. Failing can equal successful learning.

8   Recommendations

From the insights gained during the different stages of the final evaluation we drew the conclusion that the LIRA 2030 programme has been highly experimental and successful in many ways. It is an abundant source of learning for future programmes on research for sustainable development in urban Africa and beyond. Having been dialogical and formative, recommendations generated in the course of the final evaluation are an outcome of the evaluators' outsider perspective and experience-based contributions from grantees, project collaborators and those in charge of the programme. When asked: 'Who else should hear your story' in the SM survey, a majority checked 'science policy-maker' and 'funders', followed by 'my fellow early career researchers', 'the minister of higher education', 'ISC representatives', 'my supervisor' and 'faculty'. The broad spread of answers is another indication of the complexity of integrated, solution-oriented transdisciplinary sustainability research and the need to engage a broad range of actors in different roles to make it successful. Recommendations are therefore targeted to different audiences to be considered in implementing future transdisciplinary research funding programmes and in providing adequate institutional environments. They are derived from what worked well in LIRA 2030 and from areas of potential improvement.

8.1   For funders

Fund programmes and research that pursue multiple objectives

Fund programmes that combine the research (of ECRs) for transdisciplinary sustainability with capacity, leadership and network building. It is an efficient way to enhance scientific capacity and sustainability transformations while strengthening the growing community of transdisciplinary researchers. Provide sufficient funds for implementing and managing complex programmes that include trainings, accompaniment, networking events and mentoring of ECRs.

Strive for autonomy of scholars and institutions from the Global South

Fund programmes that enable scholars and institutions from the Global South to conduct independent and context-driven research for sustainability. Adapting international funding schemes is a key component of decolonizing science and will support the advancement of integrated approaches that build on standard Western and context-specific methodologies.

Fund transdisciplinary consortia

Support transformations of the landscape of institutions through funding schemes that encourage or require co-applications of institutions and organizations from civil society, government, economic sectors and the media. This would support universities in strengthening ties with society and enhance commitment on all sides. Demand collaboration plans include the tentative allocations of tasks and responsibilities, and incentivize the contributions of all involved, including financial resources and capacity building.

Conduct staged and multi-component calls for long term funding of transdisciplinary consortia

Conduct two-staged calls for pre- and full proposals to create space for capacity and consortium building. Allocate sufficient time and seed funding for full proposal submission (for team building and problem-framing). Funding periods should be a minimum of 3 years, and if including PhDs, 4 years. Offer multi-component application opportunities for granted teams to extend successful transdisciplinary consortia. Fund collaborations for the implementation of results through transformative action and for cross-project collaborative or comparative research.

Focus on strengthening and transforming academic institutions

Fund programmes and research that contribute to transformations of academic institutions. Encourage interventions to foster long-lasting enabling conditions of inter- and transdisciplinary sustainability research. Allocate funds for the dissemination of learnings and experiences in events, teaching and supervision. Demand the commitment of leaders of academic institutions and administrative staff to granting applications and allocating funding for events at the leadership level, academic communities of universities and staff administrating projects.

Do justice to multilingualism and interculturality

Develop multilingual calls with equal opportunities for researchers from different linguistic communities. Allocate funds for intercultural conceptual work, translators and publication support to strengthen dissemination of results in diverse formats, technical and local/national languages.

Fund continuous formative evaluation and accompanying research

Provide funding opportunities for formative evaluation and accompanying research to promote continuous (self-)assessment and support for transdisciplinary research consortia. Collaborative design between funders and programme-implementing institution from the outset will not only enhance quality and contribute to advancing transdisciplinary sustainability research but also enable learning for funding and implementing institutions on how to best finance, implement and manage transdisciplinary sustainability research.

Allow for dynamic and adaptive implementation

Allow for adaptations of methodologies and process design, allocation and distribution of funds within consortia, and accompanying activities related to institutional interventions and capacity building. Transdisciplinary research environments are highly dynamic and require recursive and adaptive research strategies, including team compositions.

Fund research on institutional transformations

Finance research on how to transform institutional environments towards inter- and transdisciplinarity in research and higher education. More knowledge is needed on how to best conduct transformations of the academic system to adapt and incorporate inter- and transdisciplinary research, including Indigenous approaches to research and higher education. This can be conducted as formative accompanying research of programmes, learning from processes in situ or independent research.

Encourage transdisciplinary research with informal sectors and communities

Call for transdisciplinary sustainability research in the emerging context of informal urbanization. Involving informal sectors and communities can prevent the reproduction of path-dependent tracks in research for sustainability solutions, open up new perspectives, and support improving the conditions of informal workers and dwellers. Take into consideration the particular effort involved in constituting such transdisciplinary research consortia in allocating funds.

8.2 For programme managers and implementers

Ensure representation of all involved in the programme governance

Build intercultural management and trainer teams, and compose advisory boards of programmes that represent funded consortia so that they include representatives of societal sectors and communities, to ensure the culturally sensitive and responsive implementation and management of programmes. Engage advisors as promoters and use their networks. Intercultural trainer teams can enhance trainings that are context-sensitive and allow for intercultural learning. Build on existing expertise in the region where trainings are conducted. Enable trainers to work as a team across the duration of a programme, which will enable continuous adaptation based on feedback and trainers' observations.

Pursue multiple objectives in an interwoven way

Pursue and interweave the diverse objectives necessary for advancing transdisciplinary sustainability research. Create research and learning environments that support grantees navigating the multiple goals by raising awareness, conducting trainings in research management and (self-)assessment, and support adjustments of research strategies. Plan and communicate programme-level activities in as much detail as possible and respond to emerging demands and changing conditions with adjustments.

Enable networking opportunities for all involved

Create network opportunities for scholars conducting transdisciplinary sustainability research to enhance career paths and future research collaborations. This can strengthen self-confidence in this novel and still contested research paradigm. Research participants from other sectors and communities can benefit from networking opportunities in programme activities and in their field to learn from best practice and to form communities of practices. It can enhance peoples' self-understanding as researchers, as well as citizen science and civil society-based research.

Avoid homogenization and cultural attribution

Appreciate differences between (African) countries regarding research contexts and resources. While linguistic expressions may require summations, avoid inappropriate homogenizations and cultural attributions, such as 'African approaches' or 'marginal groups'.

Engage closely with projects and collaborators

Create opportunities for programme managers and implementers to gain first-hand insights into projects' activities and needs through site visits, and create space for mentoring and exchange between grantees and international programme advisors. This allows for greater recognition and valuing of peoples' work, being heard and seen personally.

Conduct formative evaluation and accompanying research

Plan formative evaluation and accompanying research processes for the entire duration of a programme. Develop quality criteria for (self-)assessment with all involved in research to support the navigation of multiple objectives and quality improvement. Embed site visits as project audits in such activities. Allocate personnel for formative evaluation and accompanying research. This may also support collaboration and comparative research across projects.

Offer multi-staged trainings

Conduct comprehensive trainings that cover a large variety of topics. Implement intensive training at an early stage (in two-staged funding schemes, before submission of full proposals) and conduct multi-staged trainings to gradually deepen understanding and build capacity while implementing projects to achieve deep learning. Prevent overload and enable appropriate incorporation of learnings into trainees' research practices.

Offer training opportunities for all involved in transdisciplinary research

Offer training opportunities for all involved in transdiciplinary research. As novel forms of collaborative research across sectors, not only academics require training in research collaboration and knowledge co-production. Particularly partners unfamiliar with systematic approaches to knowledge production and collaboration across sectors require support. Emphasize multiplier effects through meta-level reflections and sharing of training material with grantees and beyond to enable the support of project partners.

Combine multiple training methodologies and components

Conduct different types of trainings and combine different modes of implementation, including the integration of training components into activities with other principal purposes (e.g. conferences, site visits). While certain training objectives can be achieved online, others will need on-site engagement for groups, learning from cases (e.g. via field trips). Think of training approaches with a strong dissemination effect in project contexts or host institutions.

Design situated, context-sensitive training programmes

Consider context when designing training programmes. Transdisciplinary approaches need to be situated in the research traditions and institutional realities of participants. Context sensitivity is produced at the level of content and form. Content may include community-based research approaches or Indigenous and decolonizing research methodologies, context-related examples and literature. Above all, it requires catering for the multiple worldviews of people and paradigms that inform assumptions about the nature of reality, knowledge and values. Enable discussions and foster mutual learning attitudes in exploring differences between different research approaches.

Offer comprehensive and responsive trainings

Design trainings that cover the diverse dimensions of a transdisciplinary research process and that are dynamic enough to respond to participants' specific needs and to adapt flexibly to contextual changes. Besides theory and methods, trainings should cover project management, publishing strategies, and approaches to assessing the outcomes and impact of transdisciplinary research. Importantly, trainees should also be accompanied in reflecting researchers' roles, and in deepening reflexivity, mitigating power imbalances and on building trust in heterogeneous teams.

8.3 For university leaders and administrators

Promote transdisciplinarity in research and higher education

Contribute to enable and normalize transdisciplinarity in research and higher education. Transdisciplinarity is increasingly promoted by international science policy-makers as a research paradigm with powerful impacts on transformations towards sustainability. Incorporate transdisciplinarity in mission statements and action plans, establish support structures for cross-sector collaboration, adapt regulative and administrative structures, and promote dialogue and debate among faculty to foster a culture of collaboration and creativity and to engage critically with the colonial heritage of the university.

Strengthen ties with societal institutions and organizations

Strengthen the embedding of universities in the local and regional environment by building partnerships and institutionalized relations that facilitate continued collaboration for joint efforts for sustainability transformations, data sharing and joint repositories, and the involvement of practitioners in higher education. Set up support units to facilitate and coordinate cross-sector collaboration in research and teaching.

Create capacity-building opportunities

Create opportunities for researchers and educators to build capacity to transform research practices, curricula, teaching and learning towards inter- and transdisciplinarity. These may include trainings for engaged and decolonial research methodologies and didactical approaches, management and administration of cross-sector projects and self-evaluation, as well as trainings in research ethics and interculturality.

Support transdisciplinary research projects

Provide support for granted transdisciplinary research projects. Universities must facilitate spaces, timings, materials and infrastructure resources, and incentivize collaboration efforts in their reputation system. Network building with local societal institutions, organizations and communities should be backed up by possibilities of institutionalizing such relationships, administrative and coordination support structures, and open science policies.

Seize the opportunity to learn from projects implemented in your university

Use examples of transdisciplinary research and other engaged, collaborative research approaches conducted at your university to promote dialogue and debate about the potential of cross-sector collaboration in research for sustainability, in particular with Indigenous communities, about universities' roles in society, and the need to overcome the colonial heritage inscribed in institutional structures and practices.

8.4 For collaborators of societal institutions and communities

Engage in transdisciplinary research at all stages of the process

Contribute to the identification of social and environmental needs and knowledge gaps. Engage in the formulation of research questions and articulate your needs as precisely as possible to obtain useful results. Bring your experiences, knowledge, contacts and data to collaborative research and the co-production of knowledge. Reach out to potential collaborators and strategic actors and share openly with academics who research for sustainability and the common good.

Reflect on your roles in and contributions to transdisciplinary research

Explore what you can contribute to transdisciplinary research that academic researchers cannot. Reflect on your role in the social fabric and decision-making processes and your possible contributions to research into a problem at stake. Consider that every collaborator has something unique to contribute, that all knowledge is valuable and that solving sustainability problems requires different perspectives on, and understandings of, a problematic that enhance the possibility of achieving positive results.

Articulate your needs to contribute effectively to transdisciplinary research

Explore in detail what conditions enable you to successfully contribute to transdisciplinary research. Besides financial resources that allow you to allocate time for collaboration, you may require training that improves your capacities to research your own environment or monitor situational changes.

Take leadership in the implementation of results

Use your experiences, relationships and strategic positions to successfully implement research outcomes. Make results reach broadly and take a leading role through transformative action in implementing co-created solutions beneficial for people and the environment.

8.5 For early career researchers

Develop strategies to navigate multiple objectives

Be strategic and realistic in pursuing multiple objectives simultaneously. Track advancements carefully and extend collaboration where necessary and possible to achieve envisioned goals. Consider the process itself as an important outcome in transdisciplinary research and be open to adaptations of methodology, transdisciplinary process design and shifting outcomes.

Conduct culturally sensitive methodologies

Apply culturally sensitive methodologies and mobilize the skills and creativity of diverse collaborators through transdisciplinary research, rather than pursuing validating strategies from the Global North. Deal with differences in language, worldviews, power, attitudes and attributes, and recognize how decisions are influenced by power relations.

Engage with a learning attitude in transdisciplinary collaboration

Value the contributions of all equally to enable mutual learning and unfold the potential of transdisciplinary research consortia. A learning attitude and attentive listening is required throughout the process to learn from stakeholders' and communities' knowledges, perceptions, practices and needs. This attitude will help identify relevant actors, frame problems adequately, formulate the right research questions, meet diverse needs and manage expectations.

Build trust for beneficial collaboration

Consider that transdisciplinary research brings together people inhabiting different life-worlds and acting within different institutional logics with different roles and responsibilities, (technical) languages and experiences. This requires attention to trust-building, particularly working across communities that are embedded in and affected by cultural hegemony and colonial heritage. Openness and transparency are prerequisites to build trust.

Be fair and transparent engaging with communities

Be responsible, fair and transparent in collaborating with research partners from societal sectors and communities. Collaboratively set goals and negotiate roles and responsibilities. Transdisciplinary research collaborations are opportunities to enhance the self-valuation of research contributions of stakeholders and communities and to improve their situation or practices. Co-produce and co-disseminate knowledge amongst all involved (and beyond).

Be responsive to the conditions and needs of collaborators

Be sensitive to the specific conditions, abilities and needs of all involved to enable their contributions to be valued equally in transdisciplinary research. These include temporal realities, familiarities with places and practices, customs, traditions and language abilities. Develop an open culture for articulation, critique and mutual learning.

Share power in conducting transdisciplinary research

Start collaboration from the early stage of a research project. Engage with relevant actors while framing problems, developing research questions and identifying societal needs. This will help decentralize power and allow for decisions and practices to be shared. Collaboratively explore and negotiate the potential contribution and roles of collaborators. Promote communities' ownership and leadership

Produce (intermediary) results useful for policy-makers and communities

Overcome gaps in temporal regimes between transdisciplinary knowledge production and decision-makers' and communities' needs for quick results on urgent matters by producing helpful intermediary results. Besides concrete effects on unsustainable situations, this can promote the potential of the research collaboration and encourage continuous participation.

Consider engaging with informal sectors

Pay attention to informal sectors and communities, where appropriate. While institutions and organizations have legitimate representatives that can be approached for transdisciplinary collaboration, the involvement of informal sectors and communities requires specific efforts in building transdisciplinary research teams. Strategies to tackle this challenge include applying specific methodologies, working with gatekeepers and traditional leaders, and using appropriate media for outreach and communication.

8.6 For trainers of future programmes

Form a trainer team

Consider a training programme to be a learning journey that a team of trainers conducts together with trainees. Collaborate continuously as a trainer team, involving additional trainers with specific expertise related to on-site cases and specific thematic focuses where necessary and possible. Joint learning from experiences will help to continuously improve a programme.

Put trainees' experiences centre stage

Depart from trainees' experiences in collaborative and engaged research. While training participants may be newcomers to the discourse and methodologies of transdisciplinarity, they may have much experience in cross-sector and community-based research, using different language for related practices and principles. Departing from trainees' realities and designing question-driven trainings may allow for embedding different practices into trainings on transdisciplinarity and provide an opportunity to bring different research traditions into dialogue.

Emphasize the multiplicity of objectives of transdisciplinary research

Guide trainees in pursuing multiple objectives of transdisciplinary research at the same time. Learning to conduct transdisciplinary research as an ECR while implementing research projects can lead to overload. To prevent difficulties and disappointment, introduce suitable tools to navigate multiple objectives simultaneously. These include self-defined goals and success factors, defined outcome spaces and time management. Multi-staged training programmes offer the opportunity to revisit, discuss and revise these continuously in teams of peers.

Conduct context- and power-sensitive training

Consider both training activities and transdisciplinary research as being embedded in power dynamics and imbalances due to cultural hegemony and colonial heritage. Enable trainees to gain a profound understanding of their own situatedness and positionality. Provide guidance and tools for navigating power and decolonizing relationships in transdisciplinary research teams while exploring, mobilizing and integrating different ways of knowing, acting and being.

Pay attention to language

Raise awareness of the importance of language when working across linguistic communities in international trainings. Participants may have inhibitions about actively engaging in trainings that are not conducted in their mother tongue. Consider the importance of multilingualism in transdisciplinarity, where not only national or community language may hamper research collaboration and knowledge co-production but also the technical languages of those involved. Equip transdisciplinary researchers with linguistic abilities and tools for conceptual work to communicate and collaborate with diverse research participants.

Continuously evaluate training activities

Assess training activities to enable continuous quality improvement and adaptations that respond to trainees' needs. Define evaluation criteria developed by trainers and in dialogue with participants. Use multiple evaluation techniques, combining self-evaluation of trainers with individual and collective participants' evaluation, and involve outside evaluators. By combining different perspectives, formative evaluation can best be brought to fruition over the course of a training programme while at the same time sharing results to learn from training programmes.

9 Literature

Burnette., C.R. & Figley, C.R. 2017. Historical Oppression, Resilience, and Transcendence: Can a Holistic Framework Help Explain Violence Experienced by Indigenous People? *Social Work*, 62(1), 37–44.

Buyana, K., McClure, A., Walubwa, J., Koranteng, K., Mukwaya, P.I. & Taylor, A. 2022. Power dynamics in transdisciplinary research for sustainable urban transitions. *Environmental Science & Policy*, 131, 135–142.

Chilisa, B. 2020. *Indigenous Research Methodologies* (2nd Edition), Los Angeles: Sage.

Chilisa, B. 2012. *Indigenous Research Methodologies*, Los Angeles: Sage.

Chilisa, B., Major T.E., Gaotlhobogwe, M. & Mokgolodi, H. 2016. Decolonizing and indigenizing evaluation practice in Africa: toward African relational evaluation approaches. *The Canadian Journal of Program Evaluation*, 30(3), 312–328.

Fetters, M.D., Curry L.A. & Creswell, J.W. 2013. Achieving integration in mixed methods designs—principles and practices. *Health Services Research*, 48(6), 2134–2156.

Flick, U. 2010. Triangulation in der qualitativen Forschung. In: Flick, U., Kardorff, E. v. & Steineke I. (eds). *Qualitative Forschung: Ein Handbuch*. Reinbek b. Hamburg: Rowohlt, 309–318.

Freire, P. 1996. *Pedagogy of the Oppressed*. London: Penguin Books.

Gaotlhobogwe, M., Major, T.E., Koloi-Keaikitse, S. & Chilisa, B. 2018. Conceptualizing evaluation in African contexts. In: Cram, F., Tibbetts, K.A. & LaFrance J. (eds.). *Indigenous Evaluation. New Directions for Evaluation*, 159, 47–62.

Held, M.B.E. 2019. Decolonizing Research Paradigms in the Context of Settler Colonialism: An Unsettling, Mutual, and Collaborative Effort. *International Journal of Qualitative Methods*, 18.

Hood, S, Rodney Hopson, R. & Kirkhart, K. 2015. Culturally Responsive Evaluation. In: Newcomer, K.E., Hatry, H.P. & Wholey, J.S. (eds.). *Handbook of Practical Program Evaluation*. Hoboken: John Wiley & Sons, Inc., 281–317.

International Science Council (ISC). 2022. Women Leading on Equitable and Inclusive Solutions to address the Climate Emergency: Webinar. Available at: https://council.science/current/blog/women-leading-on-equitable-and-inclusive-solutions-to-address-the-climate-emergency-webinar (accessed 10 April, 2023)

ISC. 2021. *Science and Society in Transition. ISC Action Plan 2022–2024*. International Science Council: Paris.

ISC. 2020. *Advancing the 2030 Agenda in African Cities Through Knowledge Co-production: Urban Experiments led by Early-career African Scientists.* International Science Council: Paris.

Jasanoff, S. 2004. *States of Knowledge: the Co-production of Science and Social Order*. Routledge: London.

Jeng, A. 2012. Rebirth, restoration and reclamation: The potential for African centred evaluation and development models. Paper presented at African Thought Leaders Forum on Evaluation and Development: Expanding Thought Leadership in Africa, Bellagio, Italy.

Kawakami, A.J., Aton, K., Cram, F., Lai, M. & Porima, L. 2007. Improving the Practice of Evaluation Through Indigenous Values and Methods: Decolonizing Evaluation Practice—Returning the Gaze From Hawaiÿi and Aotearoa. *Hülili: Multidisciplinary Research on Hawaiian Well-Being*, 4(1), 319–348.

Lalu, P. 2019. What is the university for. *Critical Times*, 2(1), 39–58.

Mbava, N.P. & Chapman, S. 2020. Adapting realist evaluation for Made in Africa evaluation criteria. *African Evaluation Journal*, 8(1), a508

McKay, M. 2022. Evaluations that 'leave no one behind': Decolonizing Canada's international assistance evaluations in Africa. Masters Thesis, Simon Fraser University, available at: https://summit.sfu.ca/_flysystem/fedora/2022-08/input_data/22385/etd21854.pdf

Mertens, D.M., Cram, F. & Chilisa, B. (eds.) 2016. *Indigenous Pathways Into Social Research: Voices of a New Generation*. Walnut Creek, CA: Left Coast Press.

Nicolescu, B. 2008. In Vitro and In Vivo Knowledge. In: Nicolescu, B. (ed.): *Transdisciplinarity. Theory and Practice*. Cresskill: Hampton Press, 1-22.

Odume, O.N., Amaka-Otchere, A., Onyima, B., Aziz, F., Kushitor, S. & Thiam, S. 2021. Pathways, contextual and cross-scale dynamics of science-policy-society interactions in transdisciplinary research in African cities. *Environmental Science & Policy*, 125, 116–125.

Patel, Z., Schneider, F. & Paulavets, K. 2021. *Leading Integrated Research for Agenda 2030 in Africa: Synthesis Report*, unpublished.

Patel, Z., Schneider, F. & Paulavets, K. 2022. Linking local projects with global processes: learning from transdisciplinary collaborations in African cities. *Frontiers in Sustainable Cities*, 4.

Schneider, F., Patel, Z. & Paulavets, K. 2021. *Programme Level Study: The Role of the LIRA Programme in Influencing the Projects' Capacities of Engaging in Transdsciplinary Research*. Report, unpublished.

Schneider, F., Tribaldos, T., Adler, C., Biggs, R.O., de Bremond, A., Buser, T., ... & Zondervan, R. 2021b. Co-production of knowledge and sustainability transformations: a strategic compass for global research networks. *COSUST*, 40, 127–142.

Schäfer, M., Bergmann, M. & Theiler, L. 2021. Systematizing societal effects of transdisciplinary research. *Research Evaluation*, 30(4), 484–499.

Smith, J.A., Larkin, S., Yibarbuk, D. & Guenther, J. 2017. What do we know about community engagement in Indigenous education contexts and how might this impact on pathways into higher education? In: Frawley, J., Larkin, S. & Smith, J. (eds): *Indigenous Pathways, Transitions and Participation in Higher Education.* Springer: Singapore.

Smith L.T. 2012. *Decolonizing Methodologies: Research and Indigenous Peoples* (2nd ed.). London: Zed Books.

Stainbrook, K., Penney, D. & Elwyn, L. 2015. The opportunities and challenges of multi-site evaluations: Lessons from the jail diversion and trauma recovery national cross-site evaluation. *Evaluation and Program Planning*, 50, 26–35.

Thiam, S., Aziz, F., Kushitor, S.B., Amaka-Otchere, A.B.K., Onyima, B.N. & Odume, O.N. 2021. Analyzing the contributions of transdisciplinary research to the global sustainability agenda in African cities. *Sustainability Science*, 16, 1923–1944.

Thondhlana, G., Mubaya, C.P., McClure, A., Amaka-Otchere, A.B.K. & Ruwanza, S. 2021. Facilitating urban sustainability through transdisciplinary research: lessons from Ghana, South Africa, and Zimbabwe. *Sustainability*, 13, 6205.

Tirivanhu, P. (2022). Whither Made in Africa Evaluation: Exploring the future trajectory and implications for evaluation practice. *African Evaluation Journal*, 10(1), a614.

Villanueva, E. (2021). *Decolonizing Wealth: Indigenous Wisdom to Heal Divides and Restore Balance.* Berrett-Koehler: Alameda.

Wach, E., Ward, R. & Jacimovic, R. 2013. Learning about qualitative document analysis. *IDS Practice Paper in Brief*, 13*.*

Watera, J. 2019. Indigenizing Citizen-Based M&E Mechanisms in Africa: Lessons from Uganda's Barazas. *eVALUation Matters: A Quarterly Knowledge Publication on Development Evaluation,* Fourth Quarter 2019, 8–21.

Wolff, S. 2010. Dokument- und Aktenanalyse. In: Flick, U., Kardorff, E. v. & Steineke I. (eds). *Qualitative Forschung: Ein Handbuch*. Reinbek b. Hamburg: Rowohlt, 502–551.

10 Annexes

Annex 1: Evaluation matrix

Annex 2: Evaluation participants

Annex 3: Methods in detail

Annex 4: SenseMaker survey

questionnaire

Annex 5: Summary introductory events

Annex 6: Results Workshop I

Annex 7: Results Workshop II

Annex 8: Results Workshop III

Annex 1

Evaluation matrix of sequential mixed methods evaluation design

Phase	Method	Purpose of the method	Participants	Questions asked in each phase related to LIRA and ISC objectives	Data collected	Analysis	LIRA/ ISC objectives
Preparatory Phase	**Introductory Event** Presentation of evaluation process, methodology, objectives Menti-metre (2) Discussion	Build trust, encourage engagement of PIs Introduce evaluation process First round of data collection Identify expectations and potential evaluation challenges	PIs	Mentimeter (1): — Please share a positive impact of your project. — What three main factors contributed to that positive impact the most? Mentimeter (2): — Please share up to three obstacles that you encountered in your LIRA project. — Which actors are needed to strenthen transdisciplinary research for the Agenda 2023 in African cities? Discussion Expectations of the evaluation and evaluation challenges.	Mentimetre key words Themes emerging from the (breakout room) discussion groups	Thematic analysis	ISC 1, 3
Phase 1	**Document Review**	Analyse existing documentation to gain insight into how to design future programmes. Main documents for analysis: Programme & project level final reports; Complementary studies: Learning study; LIRA 2023 Report Baseline documents: ISC proposal; Calls for proposal, annual work plans	N/A	Preparatory review of documentation: — What evaluation has already been conducted? — What lessons have already been learned & evaluated? — Who has already been involved in evaluation of the projects/learning to date? Document review matrix of questions include: — Key achievements of projects/programme? — Key challenges of projects/programme? — Factors contributing to intended/unintended consequences? — Evidence of project legacy and up-scaling of projects? Focus decolonial angle: — What were the impacts of LIRA projects on the community? — Where expected outcomes of projects defined by funders at the expense of the beneficiaries/communities involved?	Themes emerging from preparatory review and document review	Relational content analysis	ISC 1-3 LIRA 1,3,5
	SenseMaker Survey	Gain lived experience of participants in LIRA 2030	All project participants	• See annex 6	Qualitative and quantative data	Thematic analysis	ISC 1,3 LIRA 1-5
Phase 2	**Workshop I** 2 parallel sessions à 90 min, including 2 focus groups à 30-40 min.	Present and discuss results from phase I and identify key actions and recommendations in focus group discussions Gain insight from a diverse range of project participants	Project participants	Theme: Collaborative research and knowledge co-production for sustainability in urban Africa Objective: Based on experiences in LIRA projects, learn about what can strengthen and upscale research collaboration between academics and other sector representative for sustainable Cities in Africa. Guiding questions for focus group discussion: — How can knowledge co-production be strengthened within cross-sector teams? — How can engagement with diverse people and institutions be strengthened?	Recorded workshop data, miro-board notes	Thematic analysis	LIRA 2,3 ISC 3 (1-2)
	Workshop II 1 session à 90min with focus group discussions à 40min	Present and discuss results from phase I and and identify key actions and recommendations in focus group discussion Gain insight from a diverse range of programme participants, PIs and university administrators	Programme representatives (ISC, NASAC, SAC), PIs, university administrators	Theme: Institutional conditions for collaborative sustainability research in Africa Objective: Based on experiences in/with LIRA projects, learn collectively learn about how institutions can support inter- and transdisciplinary sustainability research in Africa Guiding questions for focus group discussion: — How can institutions support inter- and transdisciplinary sustainability research in Africa? — How can future programmes strengthen institutional conditions (universities, governmental and other societal organizations) for inter- and transdisciplinary sustainability research in Africa?	Recorded workshop data	Thematic analysis	ISC 3 (1-2) LIRA 4
	Workshop III 1 session à 90min with group discussion à 60min	Present and discuss results from phase I and identify positive experiences and recommendations in a group discussion	Trainers of the LIRA programme	Theme: Training ECRs conducting transdisciplinary projcets Objective: Based on experiences with the LIRA training programme, develop recommendations for future programmes Guiding questions for group discussion: — What are key features that enable learning and capacity building in a programme on transdisciplinary sustainability research in Africa? — How can training programmes strengthen and promote transdisciplinary research that take into consideration African Indigenous methodologies, context conditions and needs?	Recorded workshop data	Thematic analysis	ISC 3 LIRA 1-3
Phase 3	**Present results** Feedback	Deliver and present final report Provide opportunity for final feedback Share/discuss final results with participants	All participants	Final feedback on the evaluation results	N/A	N/A	N/A

Annex 2

Participants, recruitment and communication strategy, and contributions

Participants

The evaluation aimed at actively engaging with all stakeholder groups involved in initiating, managing and implementing the LIRA programme and the 28 projects. These include the ISC/NASAC management and trainer team, representatives of the Scientific Advisory Committee (SAC), principal investigators (PIs), academic partners (APs), representatives of civil society and non-governmental organizations (CSO/NGOs), community members (CMs) and community leaders (CLs), university administrators (UAs), private sector (PS) representatives, service providers (SPs), media (M) and the public sector/government at municipality, province/country and national levels (GOV-m, -p, -n). (Co-)funders of the programme were not included. Due to the high-level activities conducted at the programme level and the diversity of co-funders at the project level including them became unfeasible in the evaluation process. Adjustments had to be made to the inception report (IR) regarding the involvement of different groups in evaluation activities. The introductory event was targeted to PIs only and the SenseMaker (SM) survey to all involved at the project level, but not the programme level. Workshop II was conducted only once. In return, trainers were involved in an additional Workshop III with a group discussion.

Recruitment and communication strategy

In the preparatory phase, we introduced the final evaluation and invited 28 PIs individually by email to collaborate by joining an introductory event and sharing the contact data of their project collaborators. We provided an Excel sheet to allocate names and contact data to sector categories. Relevant categories were adapted from final project reports. We received contact data from almost 180 persons from 11 projects: 14 from one project of Cohort 1; 54 from four projects of Cohort 2 and 109 from six projects of Cohort 3. All together, we gathered 205 contact data from persons involved in LIRA projects. From the contacts provided by PIs, approximately 45% were from academia (including Co-PIs and team members), 15% CMs, 10% from CSO/NGOs, 10% from government institutions and the remaining 5% were UAs and representatives from the media, private sector and other (not identifiable). The effort to involve collaborators from academia and other societal realms was made to complement the perspective of PIs, which is incorporated in the final project reports and complementary studies.

In total, 190 out of 205 persons collaborating in LIRA projects (including PIs) could be contacted. We sent an invitation email per project to contribute to the SM survey and requested follow-up communication from PIs with their project collaborators to encourage participation. We sent a similar invitation to participate in Workshop I. Personalized letters were sent to collaborators in formal institutions (27 from the three levels of government) and 12 CL and other authorities. Contact was made via email (156 emails) and mobile messaging/WhatsApp (19 phone numbers). Forty-seven persons were invited via both media. For Workshop II we approached selected persons from the ISC, NASAC, the SAC and authors of the learning studies. We also invited all PIs and sent formal invitations to UAs. For Workshop III we invited the core trainer team and others that contributed to more than one training in LIRA 2030 (more details are provided in Annex 4).

Contributions of project participants

In total, we managed to engage 50 persons involved in LIRA projects in the SM survey and interact with 32 in online events (introductory event, Workshops I and II). From Cohort 1, five projects were represented, eight from Cohort 2 and seven from Cohort 3 (for details see Annex 4). In the SM survey, 11 PIs, 23 APs, 3 CMs, 7 CSO/NGO representatives, one each GOV and PS, and 4 others that could not be identified responded. In Workshop I, targeted to project participants from different sectors, 3 PIs, 9 APs, 3 CMs, 2 representatives of CSO/NGOs and 1 GOV engaged (see below).

Table 1: Participation in evaluation activities per project

	Project	# persons identified	# persons contacted by email and/or phone	# in IE	# in SM survey	# in WS I	# in WS II
1	Assessment and characterization of volcanic and flood hazards and their health implications in the cities of Goma (Democratic Republic of Congo), Buea and Limbe (Cameroon)	1	1	1			
1	Biogas-supported decentralized water treatment system for communities in Diepsloot (South Africa) and Chambishi (Zambia) townships	1	1	1			
1	Co-designing energy communities with energy-poor women in urban areas (Kenya, Uganda and South Africa)	1	1				
1	Delivery of clean air strategies for mitigating household air pollution and associated respiratory illnesses in urban informal settlements in Dar es Salaam (Tanzania) and Lilongwe (Malawi)	1	1				
1	Health effects of indoor air pollution from cooking stoves in Kigali (Rwanda) and Dar es Salaam (Tanzania)	1	1	1			
1	Mitigating risks of flood-related waterborne diseases in Abidjan and Kampala (replaced by Lomé)	15	13	1	2	1	
1	Reducing human exposure to combustion-derived pollutants in selected urban communities of Kampala (Uganda) and Mwanza (Tanzania)	1	1			1	
1	Towards healthy communities: citizen science for improved air quality in Nairobi (Kenya) and Addis Ababa (Ethiopia)	1	1				
2	Bridging decentralized energy planning with neighbourhood-level innovations in cities of Africa: case studies from Ghana and South Africa	1	1				
2	Co-creating an urban framework for localized norms on sustainable energy	1	1	1	1		
2	Community-led upgrading of informal settlements	1	1	1			
2	Co-producing urban knowledge in Angola and Mozambique through community-led data collection: towards meeting SDG 11	10	9	1	6	2	
2	Green spaces and repurposing waste: Building capacities for resilience in urban and peri-urban West Africa	1	1				
2	Integrating sustainable water and sanitation solutions to create safer,	1	1				

	more inclusive and climate-resilient cities in Tanzania and South Africa						
2	Integration of housing and health policies for inclusive, sustainable African cities	1	1				
2	Management of shared sanitation facilities in informal settlements of Kisumu, Kenya and Kumasi, Ghana	1	1		1		
2	Realizing the potential of urban density to create more prosperous and liveable informal settlements in Africa	14	14	1	2	1	
2	Standardising city-level data-gathering towards achieving Sustainable Development Goal 11 in Africa (SCiLeD)	18	15	1	10	1	
2	Transforming southern African cities in a changing climate	16	16	1	5		
3	Cleaning from the bottom up: Inclusive stakeholder participation for integrated waste management in Accra and Lagos	33	31	1	7	5	1
3	Contributing to the achievement of Sustainable Development Goals: Knowledge on water, sanitation and health risk in Cotonou and Lomé cities	1	1		1		
3	Decentralization of urban water supply services and access to water under urbanization in West Africa, Wa, (Ghana) and Niamey, (Niger)	1	1				
3	Enhancing sustainability and resilience of African cities through a water–energy–food (WEF) nexus approach	6	6	1	2	1	1
3	Enhancing urban wetland and river ecosystem health	18	16	1	2	1	
3	Household energy use practices and potential interventions for sustainable consumption in Makhanda-Grahamstown, South Africa and Kumasi, Ghana	25	24		3	2	
3	Inclusive metabolism: Using co-produced theory of informal decentralized urban infrastructures to transform the delivery of urban food, water and energy services in Ghana and South Africa	26	22		3	2	
3	Reducing diarrhoea burden under climate change in urban contexts: An integrated approach for sustainability in West African medium-sized cities	7	7		1	1	1
3	Urban water futures: Bridging supply–demand gaps in Accra and Johannesburg through reuse	1	1				
	Other, not identified				1	4	
Total		**205**	**190**	**14**	**50**	**18**	**3**

Abbreviations: Introductory event (IE); SenseMaker (SM); Workshop (W).

Table 2: Number of participants in evaluation activities per type of collaborator from project level

Type of collaborator	# in SM survey	# in IE	# in WS I	# in WS II	Total # events (IE, WS I & II)
PIs	11	13	3	2	18
APs	23	1	9		10
CMs	3		3		3
CSO/ NGOs	7		2		2
GOV	1		1		1
UAs				1	1
PS	1				
Other	4				
Total	**50**	**14**	**18**	**3**	**32**

Abbreviations: Introductory event (IE); Workshop (WS); Principal Investigators (PIs); Academic Partners/team members (APs); representatives of Civil Society Organizations/ NGOs (CSO/NGOs); Community Members (CMs); University Administrators (UAs); Private Sector (PS); and public sector/Government (GOV).

Annex 3

Methods in Detail

Preparatory phase

Introductory events

The introductory event aimed at informing about the final evaluation process, clarifying its purposes, building trust and creating co-responsibility for the process amongst PIs to contribute to the final evaluation. Further, it provided an opportunity to identify key topics to be taken into consideration in Phase I of the evaluation. All PIs were invited to participate in one of the two parallel introductory events that were held on September 12 and 16, 2022, with a duration of 90 minutes each. Fourteen PIs participated in the introductory events and eight expressed interest in participating but could not attend. Initial data on PIs' experiences of the LIRA project and programme were gathered through Mentimeter mini-surveys and discussions on the following questions and tasks:

— Please share a significant positive impact of your project
— What factors contributed to that positive impact?
— Please share up to three obstacles that you encountered in your LIRA project
— Which actors are needed to strengthen transdisciplinary research for Agenda 2030 in African cities?
— What are your expectations for this evaluation process?

Introductory events were recorded and systematized, including the outcomes from the Mentimeter mini-surveys. A summary of the introductory event with information on the evaluation process, methodology and objectives, as well as insights gained from mini-surveys and discussion, has been sent out to all PIs (Annex 7). Results were taken into consideration in the SM survey and workshop design.

Phase I: Learning from...

Document Analysis

In order to extract meaning, gain insight and develop empirical knowledge, document analysis necessitates the examination and interpretation of data. In this evaluation, document analysis was meant to unearth achievements, challenges, factors that contributed to intended and unintended consequences, the legacy of the projects, and recommendations on how to foster inter- and transdisciplinary research collaboration in Africa. Furthermore, the analysis was to reveal the extent to which LIRA projects supported the implementation of SDGs in Africa. The qualitative analysis followed five steps: setting inclusion criteria for documents, collecting documents, articulating key areas of analysis, document coding and analysis (Wach et al. 2013).
An overview of documents that have been used in this evaluation are listed and characterized according to type, author(s) and use in this evaluation in **Table 1**.

Content analysis of the documents was used for organizing information into categories related to the central questions of the evaluation, and emerging themes were then identified. In a relational content analysis, the evaluator should take into consideration the socially organized practices of the production and reception of documents (Wolff 2010), reflect on their own bias, operationalize the variables, develop a coding scheme and lastly code and analyse the data

(Chilisa 2020). At the project level, the analysis was conducted by and across the cohorts of the LIRA projects, with a focus on the relevance of the projects for the communities involved (ISC 1). To analyse continuous societal effects and project legacy (ISC 2) for sustainable development in urban Africa, we distinguished between PIs' career paths, scientific advancements from projects and research project continuation/extension through additional funding. Regarding societal effects, we distinguished between the project context (learning, capacity building and awareness raising; networking; improvement of situation; continuation of activities; and additional funding) and effects beyond the project context (influence on public discourse; influence on laws and regulations; further structural effects) (Schäfer et al. 2021, adapted). To analyse the relevance of the programme for the communities involved, the following questions were asked:

— Was the community involved in the initiation of the programme and projects?
— Was the programme culturally and contextually appropriate?
— Was the programme relevant to the peoples' well-being?
— Has the community been affected in a positive way as a result of the projects? (adapted from Chilisa 2020).

The document analysis assisted the evaluators in better understanding the programme structure and organization, to generate questions for the SM survey, and to identify thematic foci for workshops and focus group discussions. Results of the document analysis served as a baseline to verify other findings and corroborate evidence from other sources.

Table 1: Documents and use in the evaluation

No.	Name	Type of document	Author(s)*	Use in evaluation
1	LIRA grant proposal	Application	ISC	Background/baseline
2	Calls for proposals (3 cohorts)	Call	ISC	Background/baseline
3	Final Project Reports	Documentation based on pre-structured template	PIs	Relational content analysis
4	Integrated Progress Report	Documentation	ISC	Relational content analysis
5	Annual Progress Reports (2016–2021)	Documentation	ISC	Support material for analysis
6	Annual Work Plan (2016–2021)	Plan	ISC	Support material for analysis
7	Programme-Level Learning Study	Unpublished report	Schneider, Patel, Paulavets	Complementary material
8	Synthesis Report: Project-Level Learning Study	Unpublished report	Patel, Schneider, Paulavets	Complementary material
9	Advancing the 2030 Agenda in African cities through knowledge co-production	Published report	8 PIs, Paulavets	Complementary material
10	LIRA web page	Information, documentation	ISC	Support material for analysis

*Full citations of co-authored texts are provided in the literature section

SenseMaker Survey

The overall objective of the SM survey was to gather lived experiences from multiple perspectives of LIRA project participants. The SM tool allows the powerful combination of vast amounts of data, with the rich context of narrative, based on the anecdotes of real people going about their real lives, producing sophisticated visualizations of patterns, ideas, outliers, tendencies, threats or opportunities that are intuitively readable to anyone. It provides rich, insightful data, directly from the heads, hearts and personal experiences of the people that matter. Besides stories, we asked participants to indicate the key achievements and challenges experienced in LIRA projects, a series of pre-crafted estimations regarding goal achievement, particular challenges and potentials for improvement, and for recommendations for future projects. For further details, the SM questionnaire is attached in Annex 6. We conducted a pre-test with three persons involved in LIRA 2030, two from projects and two from the programme level.

PIs and project collaborators whose contact data were shared by PIs (see Annex 5) were invited to respond to the SM survey; 109 persons (including PIs) were invited to participate. In total, 50 stories were received and all other questions were well answered with an average response rate of about 80% per question. Contributions from Cohorts 2 and 3 significantly dominate those of Cohort 1. The majority of respondents fall in the 26–35 and 36–45 age groups, with a fairly even gender spread (slight female bias). The geographical bias was strong, with nearly two thirds coming from Ghana, Nigeria and South Africa; the remaining responses were received from Mozambique, Ivory Coast, Benin, Senegal, Uganda and Zimbabwe.

SM survey data were analysed according to actor perspectives. In a first step, stories were coded and results relating to Workshop I and II themes were analysed in detail. In a second step, key achievements, challenges and recommendations were systematized and dyads and triads were interpreted in the evaluation team with selected visual results being interpreted with participants from Workshop I. Preliminary results of the SM survey informed decisions on thematic foci of workshops, and results from PIs' perspectives gained from the second step of analysis were merged with results from the document analysis and complemented with results from academic partners (AP), CSO/ NGOs and community members (CM).

Phase II: Learning with…

Workshops with focus group discussion

We designed the workshops to enable collective reflection, discussion and learning. Themes for workshops were selected based on results from Phase I of the evaluation and the introductory events. Our overall guiding question for the workshop design was: What is important to understand in order to make a change? We decided to focus on fields of action to collectively formulate recommendations and identify actions that can be taken by different actors by building on/taking into account key achievements, challenges, legacy of LIRA projects and the programme. The workshops were composed of two parts: a presentation of preliminary results from Phase I of the evaluation and focus group discussions on selected themes/questions.

Workshop I: Collaborative research and knowledge co-production for sustainability in urban Africa

The overall objective of Workshop I was to learn about what can strengthen and upscale research collaboration between academics and other sector representatives for sustainable cities in Africa based on experiences in LIRA projects. We invited every LIRA project participant for whom contact details were given to participate in one of the two parallel sessions of Workshop I that were held on November 30 and December 5, 2022, with a duration of 90

minutes each. Eighteen persons participated in Workshop I and another 18 expressed interest/registered but could not attend (for more details see Annex 5). The number of participants was significantly lower than expected, so focus groups were conducted –once in the plenary and once in two break-out rooms.

Selected preliminary results from Phase I were exposed for joint interpretation and discussion. In a 30–40-minute focus group discussion, the following questions were discussed:

— How can knowledge co-production be strengthened within cross-sector teams?
— How can engagement with diverse people and institutions be strengthened?

Focus group discussions of the two workshop events were recorded, transcribed and categorized. Similar entries were grouped while clusters of meaning were built inductively. Some categories overlap and some are on different levels of aggregation to maintain visibility for important issues, such as language, that remained separate from communication (see Annex 8).

Workshop II: Institutional conditions for collaborative sustainability research in Africa

The overall objective of Workshop II was to collectively learn about how institutions can support inter- and transdisciplinary sustainability research in Africa based on experiences in LIRA projects. We invited all PIs and university administrators we could identify through PIs and two representatives of the ISC/NASAC team as well as selected representatives of ISC, NASAC and the SAC. Workshop II was held on December 13, 2022, with a duration of 90 minutes. Seven people participated in Workshop II from a total of 12 that registered (for more details see Annex 5). Also here, the number of participants was significantly lower than expected. Despite previous personalized communication, we could only have one university administrator on board. The focus group in Workshop II was also conducted in the plenary. Selected preliminary results from Phase I were exposed for joint interpretation and discussion. In a 30–40-minute focus group discussion, the following questions were discussed:

— How can institutions support inter- and transdisciplinary sustainability research in Africa?
— How can future programmes strengthen institutional (universities, governmental and other societal organizations) conditions for inter- and transdisciplinary sustainability research in Africa?

Focus group discussions were transcribed and analysed thematically. Based on challenges to fields of action we developed recommendations for future programmes (see Annex 9).

Workshop III: Training workshop

The overall objective of Workshop III was to elaborate on recommendations for future trainings for ECRs to lead and conduct transdisciplinary sustainability research projects in Africa. We invited trainers who participated more than once in the training programme of LIRA 2030 to reflect on their experiences gained throughout the training activities. Workshop III was held on February 2, 2023, with a duration of 90 minutes. Five persons participated in Workshop III. In a 60-minute group discussion, the following questions were discussed and results mapped on a Miro board:

— What are the key features that enable learning and capacity building in a programme on transdisciplinary sustainability research in Africa?
— How can training programmes strengthen and promote transdisciplinary research that takes into consideration African Indigenous methodologies, context conditions and needs?

The group discussion was transcribed and analysed thematically. Here, we linked positive experiences to recommendations for future programmes (see Annex 10).

Complementary sources

The training activities of the LIRA programme were continuously evaluated (documented in Annual Progress Reports). A team of PIs, supported by international scholars, delivered an analysis of achievements and learnings to advance Agenda 2030 in Africa based on eight LIRA projects (ISC 2020), and in a series of publications LIRA grantees had already shared their experiences and learnings with international audiences. The ISC 2020 report provides insights into the co-production of transdisciplinary knowledge on sustainable urban developments and elaborates on how collaboration between scientists, policy-makers, urban practitioners, the private sector and communities can support the implementation of SDGs. The accompanying Learning Studies (Patel et al. 2021; Schneider et al. 2021) systematically analysed multiple dimensions of the programme and projects and delivered clear recommendations for future programmes. These were conducted by evaluators with different roles in LIRA (PIs, ISC management team, trainers), which allowed for triangulation of experiences and perspectives. The programme- and project-level learning studies addressed evaluation objectives that are central to this final evaluation. They assessed the projects per cohort in detail, the programme features and evolving adaptations, and its potential and limitations for enabling transdisciplinarity and capacity building for ECRs. It further analysed multiple dimensions of transdisciplinary research (diverse understandings, learning processes in projects and the programme, enablers and challenges, achievement of objectives). The methods applied in the Learning Study comprise document analysis of annual and final project reports, programme documents (calls, meeting reports, workshop agendas, reports to Sida), documentation of two self-reflection workshops per project, course evaluations and a survey with all PIs, conducted at the end of the programme, as well as interviews with five representatives of the ISC management team and members of the SAC. The involvement of the authors of the Learning Study in various activities of the programme allowed for adding lived experiences and participant observations to events.

These previous reflective and (self-)evaluation activities were taken into consideration in the design of this final evaluation to avoid repetition while at the same time deepening insights based on results from previous analyses. They also impacted the selection of thematic foci that had to be made at various steps of the final evaluation due to constraints related to the limited time and availability of participants. Complementarity is, overall, clearly given between the insider and outsider perspective to the LIRA programme.

Triangulation, integration, complementation

In this evaluation, the following types of triangulation and integration were conducted:

(1) Design: Integration through an exploratory, multi-staged, sequential mixed methods research design
(2) Data collection: Integration of data through building between evaluation phases and methods
(3) Participant roles: Triangulation and integration of data according to the perspectives of contributors to LIRA 2030
(4) Data interpretation: Evaluator triangulation weaving/merging different sources of data into the interpretation.

From the outset, this evaluation was designed as an exploratory, multi-staged, sequential mixed methods design (Fetters et al. 2013). The primary reason for this decision was the complexity of the programme, the multiplicity of objectives of LIRA and perspectives involved in LIRA, and the significant previous reflection, systematization and self-evaluation activities. With this design, a gradual deepening of understanding was reached while creating diverse opportunities for reflection and mutual learning through dialogue and gathering different datasets to ensure robust results. The preparatory phase served to provide an overview of key topics for this evaluation. Data gathered from the introductory events and an overview of the Learning Studies and the 'Advancing the 2030 Agenda in African cities' report supported the design of the SM questionnaire and identification of possible thematic foci for workshops (integration through building; *Ibid*.). At the end of Phase I, preliminary results gained from the document analysis and SM survey informed the selection of thematic areas for focus groups (*Ibid*.). While project-level document analysis represents the PI perspective, with the SM survey multiple perspectives of project collaborators could be gathered. We analysed the SM survey data according to actor perspectives, triangulated different actor perspectives for selected aspects and merged data of PIs from both sources. For selected questions we elaborated bipolar results distinguishing between academics and other societal actors. Where thematic overlaps allowed, results were linked to and complemented by insights from the previous studies. The heterogeneity of perspectives, expertise and lived experiences of the evaluation team allowed and required investigator triangulation in the interpretation process (Flick 2010). Overall results and recommendations were gathered by merging and weaving the different insights gained during this dialogical and formative evaluation process, incorporating the previous experiences and research expertise of the team.

References are provided in the main document.

Annex 4

SenseMaker Survey Questions

An online form was used for the survey. The format of the questions presented below does not display the original online format. The purpose of each question is indicated in a comment below the question.

Introduction
Welcome!
With this survey we want to strengthen impactful research for sustainable development in Africa. It is part of the final evaluation of the LIRA programme (2016–2021) in which you participated. We would, therefore, love to hear more about your experiences. Sharing your stories will help us to improve future collaboration between science and society.
The questions are directed to you and collaborators from different sectors. If a question does not correspond with your experiences, please click the N/A (not applicable) box.
The process is simple: we will ask you for a significant experience you have had with LIRA. We then ask some follow-up questions about that experience. We hope this can help you to share your unique story.
This will take about 15–20 minutes of your time. If you have any questions, please feel free to contact: lira_evaluation@responsiveresearch.org.

Informed Consent
Your participation in this survey is entirely voluntary and all the data in any reporting on the evaluation study will be anonymized so that you cannot be identified. You may decide not to answer any of the questions that are asked, and you can withdraw from the survey at any time. The data will be stored securely and will be available only for research purposes. The results will be used to inform decision-makers on how to improve future research programmes.
Question 1: *Please share with us an experience of yours, or someone you know, which made you feel satisfied or unsatisfied about the LIRA project you participated in. In other words, you can share a positive or negative story...*
Comment: Open text. Indirect prompting question for eliciting participants' experiences/stories (positive and/or negative) of the LIRA projects they participated in.
Question 2: *Please give your story an appropriate title and/or #hashtag:*
Comment: Open text. Allowing respondents to enter some appropriate titles/#hashtags (succinct summaries) of their shared stories/experiences.
Question 3: *How common is your experience*?
- o Everyone would say the same
- o A lot of people would say the same
- o Some people would say the same
- o Hardly anyone would say the same
- o No-one would say the same
- o Not sure

Comment: Multiple choice question testing for the commonality of shared experiences/stories.
Question 4: *Who else should hear your story?*
- o No-one, only me
- o Science policy-makers
- o Rector/president of my university
- o My academic supervisors
- o Faculty
- o University administrators
- o My fellow early career researchers (ECRs)
- o Trainers
- o Minister of Science & Higher Education

- My boss
- International Science Council (ISC) representatives
- My social media followers
- Funders
- Other

Comment: Multiple choice question testing for how important respondents considered their shared experiences/stories to be.

Question 5: *I am aged:*
- 18–25 years
- 26–35 years
- 36–45 years
- Older than 46 years
- Prefer not to say

Comments: Multiple choice question to allow for data filtering by age.

Question 6: *My mother tongue is:*

Comment: Multiple choice question with drop-down facility allowing for data filtering on 22 listed African spoken languages or add other.

Question 7: *The country I work in is…*

Comment: Multiple choice question with drop-down menu allowing for data filtering on 19 listed African countries or add other.

Question 8: *I am…*
- Male
- Female
- Non-binary
- Prefer not to say

Comment: Multiple choice question allowing for data filtering on the gender of respondents.

Question 9: *I have obtained the following levels of education:*
- Primary school (certificate)
- Secondary/high school (certificate)
- Diploma (Technicon)
- Bachelor's degree (University)
- Master's degree (University)
- PhD (University)
- Vocational training
- Other

Comment: Multiple choice question allowing for data filtering on the respondents' educational levels.

Question 10: *My role in LIRA was one of…*
- Principal investigator (PI)
- Academic research partner
- Private sector collaborator
- Community collaborator
- Civil society/NGO collaborator
- Media collaborator
- Other

Comment: Multiple choice question allowing for data filtering on the different roles participants played in LIRA.

Question 11: *I participated in the following LIRA project…*

Comment: Multiple choice question with drop-down menu allowing for data filtering on the 28 listed LIRA projects (including Cohorts 1–3).

Question 12: *In the LIRA project, I engaged with social actors from the*:
- Public sector

- o   Private sector
- o   Non-governmental sector
- o   Civil society
- o   Media
- o   Academia
- o   Other

Comment: Multiple choice question allowing for data filtering on different social sectoral actors engaged with during the LIRA project.
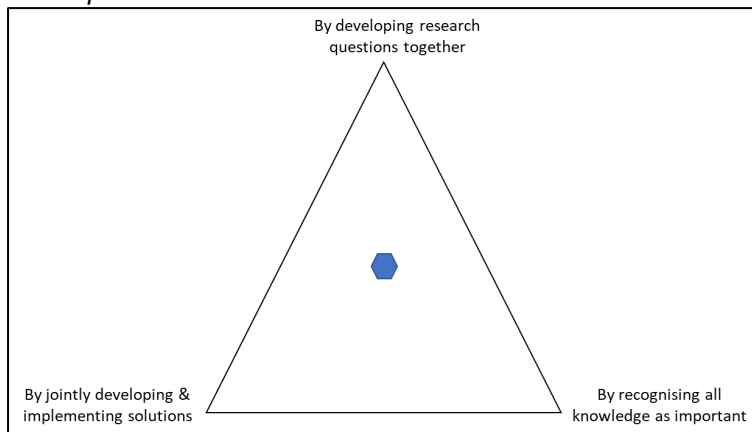
Question 15: *What has been the most significant achievement for you participating in the LIRA project?*

Comment: Open free-text question allowing respondents to share the 'most significant' achievements they experienced in the LIRA project.

Question 14: *What has been the biggest difficulty you faced participating in the LIRA project?*
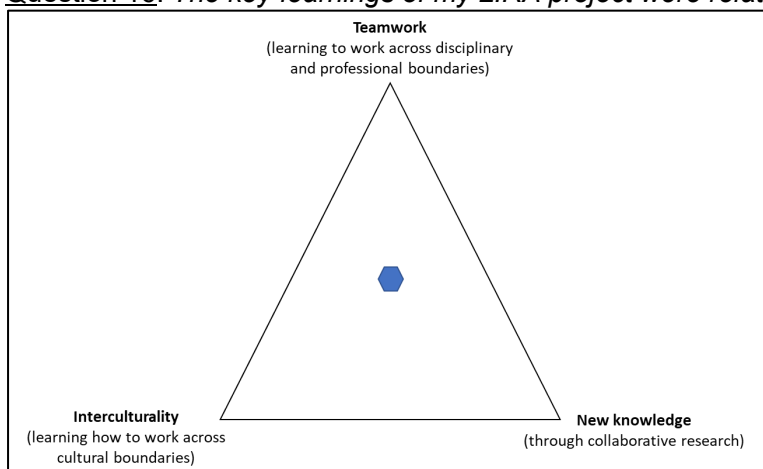
Comment: Open free-text question allowing participants to share the 'biggest difficulties' they experienced in the LIRA project.

Question 15: *How can science and society work better together to support sustainable development in Africa?*
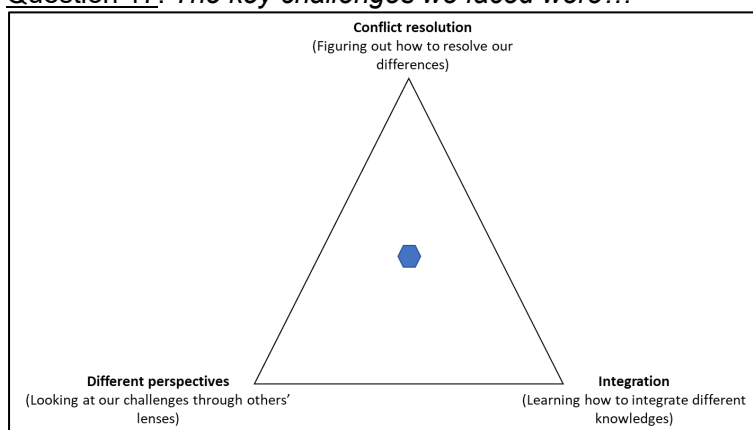

By developing research questions together

By jointly developing & implementing solutions

By recognising all knowledge as important

Comment: Triadic question allowing respondents to indicate which of the three listed areas – joint research questions, solution implementation or knowledge equivalence – would contribute to better working relations between science and society for supporting sustainable development in Africa. The closer participants positioned the marker to any of the corners in the triad, the stronger that description is considered in relation to their viewpoints. Placing the marker in the centre of the triad meant that respondents placed equal value/weight on all three aspects listed.

Question 16: *The key-learnings of my LIRA project were related to …*

Teamwork
(learning to work across disciplinary and professional boundaries)

Interculturality
(learning how to work across cultural boundaries)
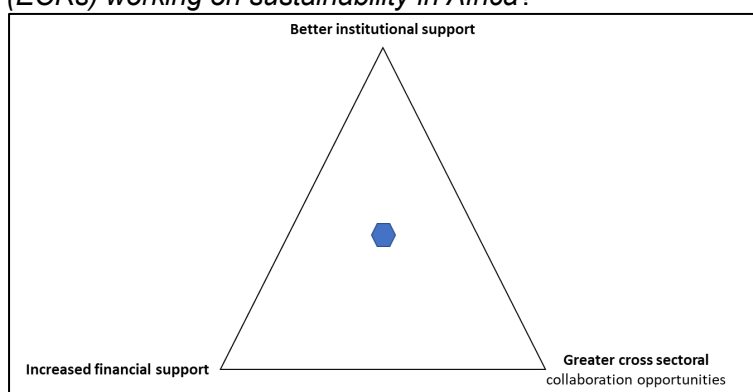
New knowledge
(through collaborative research)

Comment: Triadic question allowing respondents to indicate whether teamwork, interculturality or new knowledge acquisition were regarded as the key learning areas gained during LIRA. The closer participants positioned the marker to any of the corners in the triad, the stronger that description is considered in relation to their viewpoints. Placing the marker in the centre of the triad meant that participants placed equal value/weight on all three aspects listed.

Question 17: *The key challenges we faced were…*

Conflict resolution
(Figuring out how to resolve our differences)

Different perspectives
(Looking at our challenges through others' lenses)

Integration
(Learning how to integrate different knowledges)

Comment: Triadic question allowing respondents to indicate which of the three areas – conflict resolution, perspectivism or knowledge integration – were the key challenges they faced in LIRA. The closer participants positioned the marker to any of the corners in the triad, the stronger that description is considered in relation to their viewpoints. Placing the marker in the centre of the triad meant that participants placed equal value/weight on all three aspects listed.

Question 18: *In your view, what conditions would strengthen the role of early career researchers (ECRs) working on sustainability in Africa?*

Better institutional support

Increased financial support

Greater cross sectoral
collaboration opportunities

Comment: Triadic question allowing respondents to indicate which of the three areas – institutional support, financial support or cross-sectoral collaboration – would strengthen ECRs' abilities to work on sustainability challenges in Africa. The closer participants positioned the marker to any of the corners in the triad, the stronger that description is considered in relation to their viewpoints. Placing the marker in the centre of the triad meant that participants placed equal value/weight on all three aspects listed.

Question 19: *In my experience, participating in the LIRA project we…*
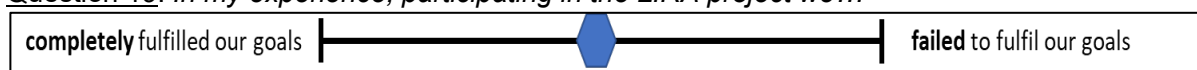
completely fulfilled our goals ————————————————— **failed** to fulfil our goals

Comment: Dyadic/polarity question allowing respondents to share their experiences with goal achievement in their LIRA projects: *completely* achieved versus *failed* to achieve their goals. The closer respondents placed the marker to one side or the other of the slider, the stronger they felt about the choice listed. Placing the marker in the centre of the slider meant that they felt neutral about their achievements.

Question 20: *Working with people from different sectors was…*

too difficult (we simply didn't cope) ————————————————— **very easy** (working with others didn't pose any problems)

Comment: Dyadic/polarity question allowing respondents to share their experiences of how difficult versus easy it was to work with people from other (non-academic) sectors. The closer respondents placed the marker to one side or the other of the slider, the stronger they felt about

the choice listed. Placing the marker in the centre of the slider meant that they felt neutral about this aspect of the LIRA project.

Question 21: *Having to look at our sustainability challenges through others' lenses was…*

| **impossible** (just too difficult trying to look through our own and others' lenses) | | **straightforward** (very easy; no problems looking through others' lenses) |

Comment: Dyadic/polarity question allowing respondents to share their experiences with the perspectivism challenge – i.e. being able to look at situations *through* the lenses of others. The closer respondents placed the marker to one or the other of the slider, the stronger they felt about the choice listed. Placing the marker in the centre of the slider meant that they had a neutral opinion about how difficult this aspect of the work was.

Question 22: *Based on your experiences and involvement in the LIRA project, what could strengthen future transdisciplinary research for sustainability in Africa? Please share three key recommendations:*

Comment: Open-ended question allowing respondents to share three key recommendations for strengthening future transdisciplinary research for sustainability in Africa.

Annex 5

Introductory Events

September 12 & 16, 2022, online

RESULTS

In this summary of the LIRA final evaluation introductory event we provide you with the most important information shared during the event. We share insights gained from participants for the final evaluation and provide an outlook on the next steps.

Information shared

The overall objective of this final evaluation of the LIRA programme is **to learn from your projects for the implementation of future programmes** on transdisciplinary research for sustainable development in Africa.

This final evaluation will **integrate insights gained from your reports and reflections** conducted in the course of the projects and **expand these further through a dialogical and formative evaluation** now that all cohorts have finalized their projects. The evaluation is dialogical in the sense that we prioritize narrative approaches and create spaces for exchange. It is formative in the sense that it should allow us to learn *with* and *for* all involved while learning *from* the projects and LIRA programme to develop recommendations for future programmes which is required from the funder (Sida).

We will conduct a **sequential mixed methods evaluation design** that combines document analysis, a survey with the SenseMaker tool and workshops with group discussions and focus groups for in-depth explorations of the most important issues and in different actor constellations. The evaluation design enables us to:

a) **identify factors contributing to key achievements and challenges**
b) **gain insights into continued effects and project legacy, and**
c) **make contributions and recommendations for future programmes.**

Thereby, the specific LIRA objectives will be taken into account:

— Strengthen ECRs working on sustainable development in Africa
— Strengthen scientific knowledge and leadership on Agenda 2030
— Foster research collaboration in Africa
— Enable financial and institutional support for transdisciplinary research practice.

Members of the evaluation team come from South Africa, Botswana, Mexico/Brazil, Switzerland/ Austria and Australia. They have a background in inter- and transdisciplinary research, sustainability science and intercultural studies.

Insights gained

The events provided an opportunity to hear about PIs' expectations, possible challenges and key learning areas for the final evaluation.

A. Expectations

— Further learning about the projects and from others' experiences, particularly from a decolonial angle

— Gaining feedback and orientation for future projects and transdisciplinary research

— Learning about the successes and limitations of transdisciplinary research and ways to communicate research to policy-makers

— Providing recommendations for institutional transformation

— Expanding the reflections and reaching actors not actively involved but relevant for transdisciplinary research legacy

— Identifying further learning/capacity-building needs.

B. Challenges and recommendations for the final evaluation

— Take previous evaluation experiences and results into account. Participants showed concern about fatigue around information gathering and reflection exercises in previous stages.

— To learn how to strengthen transdisciplinary research for Agenda 2030 in cities in Africa, involving community members and representatives from various sectors and communities

— Contacting stakeholders requires collaboration between the evaluation team and PIs, given their relationship with stakeholders

— Availability may be difficult for local actors given changes in institutions. Also, the first cohort finished years ago and some stakeholders could be difficult to reach. Some shared strategies were to generate specific ways of contacting groups of stakeholders; for example, official letters and telephone.

— Time and motivation are important factors to consider. It was suggested to simplify the evaluation process as much as possible.

C. Key learning areas

— **Knowledge co-production and action-oriented approaches to research**. There is great potential for knowledge co-production to tackle sustainability problems, with people willing to engage even under difficult conditions.

— **Contextualized methodologies and solutions for African cities**. Bring skills and creativity of stakeholders into fruition through transdisciplinary research, rather than pursuing validating strategies from the Global North.

— **Institutionalization of capacity building for collaboration**. Foster network building with university actors and use the abilities of community members, scientists and others to collaborate.

— **Power dynamics and dealing with differences**. Deal with differences in language, worldviews, power, attitudes and attributes, and recognize how decisions are influenced by power relations.

— **Funding and economic conditions**. Financing transdisciplinary research projects is an opportunity for ECRs researching sustainable development as funding for collaborative research is rare.
— **Research/academic standards**. Programmes need to include the different costs, unquantifiable outcomes and timing/temporal scales of transdisciplinary research.
— **Institutional transformations**. Adequate institutional structures, processes and relations are required to enable impactful transdisciplinary research.
— **Communicating transdisciplinary research processes and outcomes.** Learn how to bridge research and policy through transdisciplinarity to have more impact.

Next steps

SenseMaker Survey: As agreed during the introductory events, we will contact your project collaborators that you have included in the Excel sheet (those having been actively involved in your LIRA project). We **kindly request you to follow up on our correspondence** with your research partners to motivate them to participate. The survey will be online for 2 weeks.

In November 2022 we will conduct further online workshops that include focus groups and group discussions.

The evaluation will be finalized by February 2023. We will share the results with you and provide executive summaries for different target groups with the aim of supporting future transdisciplinary research for sustainable development in Africa.

This summary was written by Ulli Vilsmaier and Isabel Bueno and reviewed by all evaluation team members.
September 30, 2022.

Annex 6

Workshop I: Strengthening and up-scaling collaborative research and knowledge co-production

30, November & December 5, 2022, online

RESULTS

Overall objective: Based on experiences from the LIRA programme, collectively learn about how institutions can support inter- and transdisciplinary sustainability research in Africa.

Main question:

1. How can collaborative research and knowledge co-production be strengthened and up-scaled?

The focus group discussion brought forward diverse actions and recommendations for how to strengthen and up-scale collaborative research and knowledge co-production. Special attention was paid to concrete actions and who can take them. Similar entries were grouped and clusters generated inductively. In part, categories overlap and in some cases categories are not at the same level. This is to ensure visibility for specific, but important, themes; for example, language, considering the relevance of this aspect, which could otherwise be overlooked if categorized as communication.

Inductive category	Description	Recommendations
Enabling co-design	Initial phase that shapes the orientation of the collaboration project and the actors' interaction: diagnosis, documentation, engagement, mapping, etc.	- Pre-project phase: Ample time should be allowed for adequate stakeholder mapping and engagement in project co-design - Be informed about what the community has done to approach the issue - Call it a 'project' rather than 'research' - The co-design phase: promote key stakeholders' engagement in defining the project as well as setting the goals and knowledge targeted
Framing societal problems/project	Identifying pressing actions and problems with societal relevance	- Identify the broad issue (what is affecting peoples' livelihoods) and actions together - Work collaboratively to solve real community problems
Securing/activating involvement of sectors/ fields of action	Strategies to foster inclusion and interaction of sectors/fields of action according to their involvement and strategic action	- Foster government involvement in education regulation and promotion - Identify actors from informal sectors: who they are, what they do - 'Whatever you do concerning the informal sector, make sure that the actors are part of it.' Work with leaders to achieve effective actions and honour informal sector's contribution. - Foster meetings in the community: listen to the people and plan with leaders - Use social media, radio and other media to promote engagement - Foster engagement with civil society organizations that can help create links with different sectors
Nurturing trust, transparency and communication	Practical tools and attitudes for open and respectful collaboration	- Communication of research objectives and results is critical to acceptability - Get people to know you, the way you think and support the environment - Foster trust between academia and other sectors - Foster transparency and make research open access - Provide consistent updates: mini-briefs to all stakeholders using different communication platforms

Sharing power, roles and keys for participation	Distributing facilitation roles, leadership and key activities to promote participation	- Share the power of designing/facilitating processes - Share facilitation between community or society leaders and CSO/NGO professionals - Promote community's ownership and leadership - Use neutral places for meetings: 'place matters' - Respect different time availabilities by organizing parallel meetings - Allow for partners to propose approaches and help guide the process
Informing policies and decision-making processes/ accountability and co-responsibility	Constellations and arrangements that promote collaboration research with situated outcomes oriented to policies and institutional decision-making	- Produce results and evidence in short time for the promotion of policies - Lead situated research that can influence policies - Advocate through local radio
Including language translation/inter-linguistic strategies	Use and recognition of local languages and communication between diverse languages	- Include people from communities to help as translators - Develop and communicate knowledge products in the local language - Consider language barriers to promote African teams
Learning/training for collaboration	Tools and processes that promote training and learning within and between projects, also across countries.	- Use participatory approaches - Interact with projects from other countries - Encourage PIs to conduct trainings/ sensitization on Td process to the research teams and stakeholders - Share the lessons with projects from a similar terrain to improve projects - Share lessons across countries with similar challenges to improve experiences
Teaching through transdisiplinary research projects	Involve students and apply teaching practices in the collaboration process	- Engage students in transdisciplinary research projects - Foster volunteering
Improving institutional conditions/strategies	Promotion of institutional tools to influence relations, outcomes and changes in policies, regulations, systems, etc.	- Community leaders should present generated data to government representatives and break institutional walls between communities and local government - Build systems that support research engagement - Gain recognition of municipalities with help through LIRA - Map talents from LIRA projects: a platform for future cooperation and specific demands to match actors
Fostering continuity (results, impact and engagement)	Up-scaling projects' activities and impacts	- Identify and fund post-research engagement in successful projects - Plan for follow-up activities of collaborative research projects for communities to advance their actions

		- Continue involving the informal sector: build an agenda together for continuous engagement despite the change in conditions

Annex 7

Workshop II: Institutional conditions for collaborative sustainability research in Africa

December 13, 2022, online

RESULTS

Overall objective: Based on experiences from the LIRA programme, collectively learn about how institutions can support inter- and transdisciplinary sustainability research in Africa.

Main questions:

2. How can institutions support inter- and transdisciplinary sustainability research in Africa?
3. How can future programmes strengthen institutional conditions (universities, governmental and other societal organizations) for inter- and transdisciplinary sustainability research in Africa?

The focus group discussion brought forward diverse institutional challenges for inter- and transdisciplinary research and actions to strengthen collaboration in six main fields of action that have been identified during the workshop.

Field of action	Challenges	Actions/Recommendations
Improving tools, continuity and fruition in the collaboration process	- Difficulties by academics to accept non-academics as having relevant and valued contributions to their research. 'The grantees had to change either the methodology or the research question because they realized that when they get the outside perspective from people who are not in academia, their dynamics and what is deemed relevant are totally different from what you thought in the lab.' - Project timing doesn't include implementing solutions and post-research engagement. People gain many skills collaborating (social ties, soft skills from manoeuvring and inter-relating with non-academics, local authorities or people within the community), but are limited in the implementation of actions by time frames in projects. 'You feel such a loss when you've done something so good, you've involved so many stakeholders, you've built on what the research is going to do and the recommendation you think they could employ, and then you say "goodbye – the funding from the research is done and I hope you will use the results".'	
Going from a culture of suspicion to a culture of trust, collaboration, reflection and creativity	- Within the institution: lack of motivation - The system does not promote collaboration - Lack of funds for collaboration - Less scope for collaboration than for single-authored publications - Culture of suspicion: there is difficulty sharing information even within the same institution - Suspicion about what the other person will do	- Bring external pressure to secure connections with governmental institutions - Provide research funding for collaboration - Change the traditional culture of working alone, hiding information and suspecting of others at the level of the institution and between government and academic institutions - Promote education campaigns on the importance of working together - Foster data sharing, publication policies, repositories of data and repositories of publications
Valuation of transdisciplinary and societal research	- The balancing of socially relevant science and basic science is something that universities and funding agencies are not attuned to appreciate - Institutions don't always appreciate creative innovative processes of knowledge production - Constant changes in topics/themes from granting institutions lead to unsustained efforts	- Foster innovation in scientific enquiry - Promote transdisciplinary research funding - Create awareness and appreciation of the value of the changes we are trying to achieve in the processes
Decolonization of knowledge and knowledge production	- Knowledge production of native African scholarship, and Africa in general, gets marginalized in a political economy around knowledge production that is hegemonically northern	- Reconfigure editorial boards to have more African scholars - Consider LIRA 1 grantees as potential leaders in shaping some of these processes, being appointed to editorial boards and refereeing articles

	- 'To create policies that are open enough and flexible to allow these new emerging issues while they [universities] continue the traditional path'	- Foster creativity and innovation in knowledge production by balancing between meticulousness of administration and financial management and the space for inquiry-generating scientific questions, cracking the data and coming up with innovative societal-relevant knowledge that fills in the scientific basic knowledge
Publishing and publishing/research incentives	- Difficulty being published in science journals because transdisciplinary research is not valued. Biases to favour non-collaborative research exist in the science sector. - A few journals value transdisciplinary research, but astronomical cost - Difficulty bringing needed change within our institutions, but also within the space that shapes how our institutions operate. The culture of our institutions is not only internally but also externally derived. Publishing is one example.	- People should not be penalized for collaborating in publications (e.g. having less scope); there should be incentives - Create or consider specific avenues for publishing collaborative research results
Infrastructure	- There is usually no institutional provision of basic infrastructure like internet access	- Create deliberate effort to develop, equip and support researchers that conduct transdisciplinary research. Institutions must facilitate spaces, timings, materials and infrastructure resources
Focus on process and continuity so that social-environmental change can really occur	- Funds are directed to outputs and outcomes – the funds should be process oriented, not output oriented. 'At the moment, funding agencies are not able to fund long-lasting processes'; 'Transdisciplinary research is relational, it is all about building those relationships: who is ready to fund this? It doesn't work that way at the moment, it's all focused on outputs. How can we change that? If we are able to change that I think it could have significant positive implications for the future development of transdisciplinary research.'	- Promote key outcomes and impacts of the projects, not just to shift from short project-based funding to longer-term funding - Shift from funding outputs and outcomes to funding long-lasting processes
Promoting transdisciplinary research education	- Lack of skills and training in collaboration tools (Google docs)	- Foster inter- and transdisciplinary curriculum development and pedagogy within universities. Promote teaching that is transdisciplinary as a way of normalizing transdisciplinary research, bringing in voices from beyond the university. - Consider transdisciplinarity not being only research-centred but also about how we train and how we teach - Include transdisciplinary research as pedagogical practice and work beyond the university
Research on institutional change	- Limitative allocation of funds for administrative support – we saw this was a key bottleneck in project implementation - Forced cross-country collaboration. Bringing different countries together made it more complex for projects and even more difficult for early career scientists to manage.	- Promote effective funding and support to work with non-researchers/administrative staff; evaluate the effectiveness of funding and actions - Engage the university administrative staff from the research proposal on, especially people in charge of the budget reallocations.

		'Then you get champions within the university who would be responsive when the issues on accounting or communicating the results of the research, people in communication and finance department and also any relevant project that would benefit.' - Find tools for cross-country collaboration and learning - Create a work package to investigate institutional strengthening within the next phase of the programme (LIRA 1 researchers could be involved) - Make institutional strengthening one of the future goals

Annex 8

Workshop III: Training early career researchers conducting transdisciplinary projects

February 2, 2023, online

RESULTS

Overall objective: Based on experiences from the LIRA programme, elaborate on recommendations for future trainings for ECRs to lead and conduct transdisciplinary sustainability research projects in Africa.

Participants: Trainers of the LIRA programme and coordinator of the training programme within LIRA 2030.

Main questions:

1. What are key features that enable learning and capacity building in a programme on transdisciplinary sustainability research in Africa?

2. How can training programmes strengthen and promote transdisciplinary research that takes into consideration African Indigenous methodologies, context conditions and needs?

The group discussion brought forward positive experiences related to the LIRA (training) programme and specific recommendations for future programmes.

Key dimensions	Positive experiences of the LIRA (training) programme	Recommendations
Position of trainings in the programme	- Trainings before the full proposal of the programme. Being at the very start, it creates joint basis of all grantees.	
Composition of content	- Varied approaches in the training: toolbox, case studies, field trips, exercises (group and individual), etc. - Flexibility built into training design: enable contextual change - Sequence of empirical experiences in transdisciplinary research projects (application) and theoretical learning - Combination of transdisciplinary research (methodological) and specific topics (sustainable urban development) - Enabling to work on own projects along key common questions - Self-reflection guidelines to be used by projects with whole project team	- More on knowledge integration across disciplines and practices - Enable and foster reflection on how to work with different knowledge systems - Attribution of change: how to measure outcomes and impact of transdisciplinary research at the societal level? - Trainings should include concepts/theories, practical aspects/how to do transdisciplinary research, but also capacities regarding being a transdisciplinary scientist (e.g. publishing strategies) - Clarity on researchers' role, contextuality, self-reflection, trust-building, the art of co-design and co-communication that defines how you are going to design a training - Bring in capacities in project management for transdisciplinary research - Consider that trust building in research processes is essential to the success of research projects - Trainings should prepare researchers for situated context-sensitive research, including local methods of engaging and delivering research to ensure local community context is well captured, and how to enable continuity for policy processes and design - Trainings should be people/community designed and people-centred
Interconnectedness of training components	- Staggered capacities to strengthen and support via the different training components - Modular accessible training content enabled sequencing and replication - First basics, then more inputs step by step corresponding to advances in projects	- Think about sequencing and what participants can effectively digest for deep learning – less is sometimes more - Combine training with coaching, peer learning and networking along the timeline
Peer learning/ networking	- Research fora as spaces for reflection, sharing and peer learning - Coaching events during the project cycles - In-person meetings were important for peer group learning/ networking	
Trainees' abilities and multiplying effects (train the trainer)	- Huge amount of innovation and potential in trainees (which would remain untapped without funding programmes such as this)	- Rebrand from capacity development to leadership development; capacity development suggests a deficit

	- Locating trainings in different African cities was insightful and a learning opportunity - Duration of trainings (multiday) with all participants in the same place resulted in community building: in-depth and peer learning and networking (also in peer learning/networking)	- Trainings need to work with the trainees as experts in their field and context, and foster the reflection on how we integrate methods working with different knowledge systems (local and regional) - Make use of LIRA 1 grantees as future leaders and trainers for future programmes
Trainer team qualities and composition	- Trainers across disciplines - Good spirit among trainers - Dialogues among trainers to continuously develop trainings - Training team worked well together, good collective experience - Having a core team with additional trainers at different sessions added variety and interest - All trainers present during full training event promoted exchange and learning between trainers	-
Target groups of trainings	- Focus on PIs and integrating Co-PIs at least in one training - Field trips in training cities showed principles in action. It allowed possible interaction with local societal actors (also in *Composition of content*)	- Not only focusing on early career researchers, but with researchers in the middle who regularly don't get funding - Capitalize on learning within all groups (trainers, trainees, project partners, students, etc.)
Institutionalization of trainings	- (Negative experience) Difficulties of conducting transdisciplinary research as an early career scientist working on a 2-year grant-funded programme	- Institutional support required - Moving toward research centre-based transdisciplinary research programmes. If it is institutionally based, in some ways it becomes ethical.