

**TRANSDISCIPLINARITY: ASSESSEMNT OF
METHODS AND CAPABILITIES OF GIRT
PROJECT TEAM MEMBERS IN FOUR HIGHER
EDUCATION INSTITUTIONS**

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Acronyms

AAU	Addis Ababa University
BD	Bahirdar University
ID	interdisciplinary
LU	Lúrio University
MA/MSc	Masters degree
MI	multidisciplinary
MU	Mekelle university
TD	Transdisciplinary



1.INTRODUCTION

Higher education institutions are expected in turn to play a great role in stimulating urban transformation. As one actor in the development arena, it is expected that they are to be sufficiently responsive to urban transformation process and change, especially in addressing problems and priorities of informal settlements in particular women. Higher education institutions, notably Lúrio University, Bahir Dar, Mekelle University, and Addis Ababa University which are of interest to this GIRT project need to be equipped with human and institutional capacities to address urban transformation conceptually and methodologically through effort of knowledge generation, training and communication of research findings that reach deep into informal settlements and slums in their respective cities. By and large, these institutions undertake disciplinary training and/or distant research, whereas there is a polarization view on how to manage informal settlements.

Assessing capacity and underlying capabilities is important because they both contribute to a broader evaluation of the complex and often non-quantifiable criteria of interactions between science and society in transdisciplinary research (Ernø-Kjølhede & Hansson, 2011). Such interactions include but are not limited to, collaboration, integration of knowledge, learning processes, and the performance of cognitive and social functions. It is also analytically interesting to design what kind of TD research is to be implemented and how society and research systems are reconfigured through collaborative, integrative, and ontological work (Frederiksen et al., 2003).

To facilitate the Transdisciplinary (TD) process following (Scholz & Steiner, 2015) that is planned to be initiated in each selected informal settlement in four partner regions, an assessment of TD capabilities is found relevant.

Thus, the objective of this evaluation is to assess the status of know-how about concepts, methods, and capabilities of transdisciplinary research of project team members in the four partner institutions.



2. METHODOLOGY

This section presents the overall research methodology followed to conduct the need assessment. The approach, methods of data collection and analysis are presented here under.

2.1 Approach and method of data collection

The research approach employed to identify the status and needs for transdisciplinary research methods by the project team members is mainly a quantitative approach using a survey method using a semi-structured questionnaire. Accordingly, the survey, a semi-structured questionnaire was designed based on a review of related literature about TD.

Conceptual issues were included in the form of a structured questionnaire followed by capability issues included with a Likert scale question presented in statement forms. Thus, for the Likert scale, items (constructs) that reflect the capabilities of any transdisciplinary research from conceptual, methodological, and skill point of view evaluative statements drawn from the literature were incorporated in the form of statements in the Likert scale prepared questionnaire.

Lastly, assessments of methods of transdisciplinary research were put as multiple response questions assessing whether the team members had previously used or taken training on the TD methods.

The prepared questionnaire was customized in Google form format and self-administered online from February 22, 2023, to March 10, 2023.

2.2 Method of data analysis

To test the validity and reliability of the items and whether they fit to evaluate the status and construct of transdisciplinary of the items about transdisciplinary research, both validity and reliability tests were conducted.

Accordingly, the reliability test was done using Cronbach's Alpha test for individual, cognitive, and collective capabilities assessment constructs in the Likert scale. The Cronbach's Alpha result was .7, .857, and 0.674 respectively. The valid test was conducted with a two-tailed parsons correlation test.



The result of the questionnaire was analyzed by descriptive statistics using percentage and frequency and presented in table and chart formats. The qualitative data collected was analyzed in themes and presented in narrative form.



3. MAJOR FINDINGS

This chapter of the report presents the major findings about the status of project team members knowhow about transdisciplinary research covering the conceptual, methodological and capability dimensions.

3.1 General background information and response rate

As indicated in the backdrop, the sample respondents for this assessment of transdisciplinary research assessment were project team members of GIRT project from the four partner institutions in the south (of Africa). Accordingly, a total of 29 respondents participated in the online survey prepared to assess the conceptual understanding of transdisciplinary research, previous experience in the practical use of a set of transdisciplinary methods and current acquired capabilities for transdisciplinary research as an individual and as a team representing their respective institutions.

The aim of engaging all project members of the partner institutions in the south on one hand is to identify current status of the project team capability about TD research as a baseline to identify major gaps in transdisciplinary research needs by team members to undertake and focus on capacity building of the team with the project activities related to TD research and mutual learning. On the other hand, screening and filtering of project members with previous exposure and expertise in TD is vital to engage them as peer trainers for further capacity-building trainings across the institutions with packages of short courses of TD based on the survey result and willingness to collaborate.

Distribution of respondents by sex and institution

Of the total respondents 21 (72.4% are male and 27.6% are female respondents). MU takes the lead in the number of respondents in the survey, 31%, followed by AAU with 24.1%. Respondents from BD and LU were 20.7% each (Table 1).



Table 1 Team members by their academic Institution

Team members by their academic Institution		Frequency	Percent
	Addis Ababa University	7	24.1
	Danube University	1	3.4
	Bahirdar University	6	20.7
	Lurio University.	6	20.7
	Mekelle University	9	31.0
	Total	29	100.0

Source: Survey result (2023)

3.2 Academic qualification and composition of disciplines in the team

3.2.1 Highest academic level by team members

Table 2 summarizes the sampled respondents by their educational level and qualifications cross-tabulated with their respective institutions. Most of the respondents were with academic qualifications of having a MA/MSc degree amounting 41.4% of the respondents followed by PhD holders at 34.5%. Only 7 (24.1%) were holders of a first level university degree. AAU ranks first having more Ph.D. holders (60%) followed by BD (30%) and DUK (10%). LU and MU have 41.7% of their respondents having a second degree (MA/MSc) each followed by BD taking 16.77%. MU has the highest BA/BSC holders (57.1%). This result can be interpreted in two ways. On one hand the team formation endowed with many expertise having PhD holders opens room for mutual learning, experience sharing and capability to publish with other team members. On the other hand, for actual data collection, young and mid-level expertise would be more feasible as the interviewees would feel more comfortable to talk to them. Therefore, balancing of the groups for actual data collection from the three categories would be more practical.

Table 2 Highest academic level by team members

Name of the Institution		Highest academic level?						Total	
		PhD		MA/MSC		BA/BSC		N	%
		N	%	N	%	N	%		
	AAU	6	60.0%	0	0.0%	1	14.3%	7	24.1%
	DUK	1	10.0%	0	0	0		1	3.4%
	BD	3	30.0%	2	16.7%	1	14.3%	6	20.7%
	LU	0	0	5	41.7%	1	14.3%	6	20.7%
	MU	0	0	5	41.7%	4	57.1%	9	31.0%
	Total	10	34.5%	12	41.4%	7	24.1%	29	100.0%

Source: Survey result (2023)



Composition of different disciplines by the team members

Table 3 summarizes the composition of different disciplines by the sampled team members presented by their respective institutions. The overall result shows that diverse disciplines are well represented, and social sciences streams have dominance over natural science fields. The first initial steps of any TD research would be practicing interdisciplinary research for integration of different perspectives in particular theoretical and conceptual integration to frame the complex problem.

Table 3 Composition of disciplines by team members in the respective institutions

Name of the Institution	Specialization
BD	Environmentalism
BD	Geography and Environmental studies
BD	International Relations
BD	Population Studies/Demography
BD	Socioeconomic geography
BD	Development Studies
LU	Urban Development and management
LU	Planning and management of Informal Settlements
LU	Planning and management of Informal settlements
LU	Sociologist - Major in Health and Development
LU	Nutritionist-master's in public health
LU	Land development and urban management
MU	Civil Engineering
MU	Architecture
MU	Architecture
MU	Building Materials
MU	Housing and sustainable development
MU	Architect and Spatial Development Planner
MU	Urban and Regional Planning
MU	Architecture
MU	Architecture
AAU	Food security and environment
AAU	Economics
AAU	Public and Development management
AAU	Urban and Regional Planning
AAU	Political economy of development and governance



AAU	Development Studies (Gender, Governance)
AAU	Development Studies
DUK	Social and Cultural Anthropology, Sociology

Source: Survey result (2023)

The discipline of Architecture takes the lead with five respondents followed by four Development studies specialists. BD University has team members with six disciplines and specialization namely, Environmentalist, Geography and Environmental Studies, International Relations, Population Studies/Demography, Socioeconomic Geography, and Development Studies. The result implies that all respondents are from the social sciences. LU University has more diverse and more specialized streams in the composition having Urban Development and Management, Planning, and Management of Informal Settlements (two), Sociologist - Major in Health and Development, Nutritionist-master's in public health and Land development and urban management. Expertise from MU are more inclined to technical specializations having one Civil Engineering and four Architectures, Building Materials, Housing, and sustainable development, and Urban and Regional Planning. AAU team is more social scientists dominated having three development studies, Food security and environment, Economics, Public and Development Management, and Urban and Regional Planning.

Based on the thematic areas for the qualitative research proper mix of composition of specializations should be set up not only to address the complex problem but also bring different perspectives from each specialization.

3.3 Previous engagement of team members in multi-, inter- and transdisciplinary research

Respondents claiming to have a previous engagement in interdisciplinary research accounted for 75.9% of the respondents followed by exposure to multidisciplinary research (69%). Having more than three-quarters of the team with some level of exposure to interdisciplinary research creates the foundation and fertile ground for the project to practice transdisciplinary research. This is because we can consider interdisciplinarity as a first step for transdisciplinary



research. Skills acquired in interdisciplinary research can be applied to transdisciplinary research.

As indicated in the previous section, the main objective of this assessment survey is to identify the gap in transdisciplinary research methods and capabilities. According to the survey result, only 17.2 % of respondents reported having previous experience in transdisciplinary research which shows the gap in exposure to transdisciplinary research. This confirms the need for transdisciplinary research experimentation and practice for the team. Thus, GIRT project can be a good opportunity for team members to engage in transdisciplinary research and practice the methods in the context of informal settlements and women and enhance capabilities. Respondents with no experience in multi, inter, and transdisciplinary research experience were 31%. 24.1% and 82.8% respectively. Thus, 82.8 % of the respondents reported having no previous transdisciplinary research experience. This confirms to the justification of the GIRT project that advocates for application of transdisciplinary research for urban transformation processes.

Table 4 Previous engagement of team members in multi-, inter- and transdisciplinary research

Previous engagement in cross disciplinary research	Response	Frequency	Percent
Multidisciplinary	Yes	20	69.0
	No	9	31.0
Interdisciplinarity	Yes	22	75.9
	No	7	24.1
Transdisciplinary	Yes	5	17.2
	No	24	82.8

Source: Survey result (2023)

Respondents with only Interdisciplinary research experience 31% of the respondents, followed by respondents with a mix of Interdisciplinary and Multidisciplinary experiences 27.6% and 24.1 % claimed involvement in only multidisciplinary research. Five respondents reported having previous engagement in all three types of research in their careers. Diversity in previous involvement among the team is believed to contributes to coaching, mutual learning and collaboration.



Table 5 Involvement in MT, ID and TD types of research before this project

Involvement in MT, ID and TD types of research before this project	Frequency	Percent
Multidisciplinary research	7	24.1
Interdisciplinarity research	9	31.0
Multidisciplinary & Interdisciplinarity	8	27.6
Multidisciplinary Interdisciplinarity & Transdisciplinary	5	17.2
Total	29	100.0

Source: Survey result (2023)

3.4 Conceptual understanding of the team about transdisciplinary research

3.4.1 Capacity of research to support urban transformation.

All respondents have reported a strong belief in the capacity of research to support urban transformation in the African context. This response goes in line with the premise that transdisciplinary research promises to produce social impact and change in societies by addressing societal complex problems. Besides all respondents also reported that knowledge can be produced by researchers and nonacademic actors together. In the disciplinary research paradigms, there is more emphasis on researchers as problem solvers and taking the nonacademic actors as subjects of the research rather than part of the problem-solving process like in the case of transdisciplinary research.

3.4.2 Current state of solution-oriented science practice interactions

To assess the current state of solution-oriented science practice interactions in partner institutions, a question was forwarded about opinion on the existence of solutions-oriented science practice interactions in the research done in their respective institutions. Accordingly, 75.9% of respondents reported existence solutions-oriented science practice interactions in the research while 24.1% reported its absence. In the same vein, opinion of whether the current interventions in informal settlements integrate different bodies and types of knowledge or not including scientific and practical insights, 55.2% reported negative response while 44.8 % reported yes. These responses are perception based and needs further investigation of the reality in later stages of the project when actual transdisciplinary research undertakings start with system diagnosis and sectoral assessments in the qualitative research.



Table 6 Items to assess Conceptual Understanding About TD

Items to assess Conceptual Understanding About TD		Response	%
Opinion on the capacity of research to support urban transformation in Africa	Yes	29	100
Opinion on production of knowledge by researchers and nonacademic actors together	Yes	29	100
Opinion on existence of solutions-oriented science practice interactions in the research done in your institution	Yes	22	75.9
	No	7	24.1
	Total	29	100.0
Opinion on the current interventions in informal settlements integrate different bodies and types of knowledge including scientific and practical insights	Yes	13	44.8
	No	16	55.2
	Total	29	100.0

Source: Survey result (2023)

3.4.3 Extent current interventions in informal settlements do not integrate different bodies and types of knowledge and perceived reasons

On one hand, respondents reported the current interventions in informal settlements do not integrate different bodies and types of knowledge including scientific and practical insights.

The major reasons mentioned for this were, the lack of coordination, knowledge, and life experience of informal settlers mainly youth and women have not been acknowledged, the huge gap between practice and knowledge, a tendency to disregard findings while developing public policies when implementing transformations, limited routine methodologies and involvements, taking eviction as a prominent way of handling informal settlements, and a belief that integration of stakeholders is not that necessary, the intervention is usually from one or two points of views, that address challenges on the surface rather than identifying the root cause. For instance, one respondent put this in this way:

...I don't think that all stakeholders are engaged in an integrated way. The stakeholders are not even known, and they do not know with whom they should communicate. Many informal settlers have access to electricity and water, but the regional municipality is unaware of their presence. This is an indication that those stakeholder groups do not know each other. The other important thing is that informal settlement has different dimensions: economic, social, political, environmental, etc. Those informal settlers are displaced without considering their social interactions or economic well-being

Another argument extracted from the survey shows that:

the intervention is more focused on practical insight which focuses on solving only one immediate challenge, because many times interventions in informal settlements have



political interests, and it many times ends up going in a way that benefits the political first and not the informal settlements, It is the government and its security apparatus who are engaged in the intervention, lack of a bigger effort, continuous adjustment and compromise is required for appropriate intervention, interventions made without considering knowledge integration or insights from different bodies, interventions are mostly focused on sectoral approaches or infrastructural issues which end up having small to no impact on the issue and most of the interventions are solution driven.

In similar manner, issue of power and interest was raised by another respondent:

In informal settlement, there are many stakeholders with diverse power and interest and hence the intervention demands integration of the different types of knowledge from these varied stakeholders.

3.4.4 Extent current interventions in informal settlements integrate different bodies and types of knowledge and perceived reasons

On the other hand, respondents who responded current interventions integrate knowledge justified the current interventions integrate scientific knowledge and practical experiences. as follows:

In the global context, current interventions already apply an integrated approach to different types of knowledge, both scientific and practical. It should be noted that in Mozambique the integrated approaches to interventions are felt more on the theoretical, scientific, and not practical side (although some improvement is beginning to be felt on this practical side).

Some reported that Interventions usually integrate different bodies, but the solutions are by law/ are driven by scientific facts. Others implied some efforts in the pipeline like

The University of Addis Ababa, per the revised Higher Educational Proclamation, has the mandate to link (integrate) research, community services, and training (capacity building). In this respect, the Center for Regional and local development has established relations with urban (federal, regional, local) governments and alumni at one hand, and there is a possibility to collaborate and partner with more institutions working in the area of human rights (in informal settlements, slums, etc.), housing, land planning, infrastructure, etc.



Rather than starting from scratch, GIRT project can investigate the current efforts of knowledge integration efforts and build up on the best experiences to further scale up the efforts.

3.4.5 Whether local knowledge and scientific facts are brought together for decision-making

As a bridge to examine successful knowledge integration efforts, two questions that assess engagement of actors to produce practically relevant and action-oriented solutions and whether local knowledge and scientific facts are brought together for decision-making were included in the survey. For the former, 58.6% reported a negative response while 41.4% reported a positive response. 48.3% of the respondents have a belief that local knowledge and scientific facts are brought together for decision-making whereas 51.7% reported that it does not.

Table 7 Engagement of actors

Opinion on engagement of actors to produce practically relevant and action-oriented solutions	Yes	12	41.4
	No	17	58.6
	Total	29	100.0
Opinion on local knowledge and scientific facts are brought together for decision-making	Yes	14	48.3
	No	15	51.7
	Total	29	100.0

Survey result (2023)

3.4.6 Successful knowledge integration effort or case

Respondents reported some cases of knowledge integration efforts that they are aware of. The first relates to analyzing the impact of the land expropriation program on farmers' livelihood in urban fringes of Bahir Dar, Ethiopia, agriculture-related projects like TRANSACT that employed scenario planning as a method to integrate knowledge from academic and non-academic actors. The case of Yacouba Sawadogo, a farmer in Burkina Faso who has revived traditional agricultural methods and has inspired many scientists in the past decades. The third case reported is the requalification of the Chamanculo neighborhood in Mozambique. The Master plan design of the Tigray Martyrs Project was cited by two team members. In the field of medicine, traditional medicines in Ethiopia were reported as a case. The argument was reported as



Uneducated people particularly in rural settings served as specialists in treating various kinds of diseases before technological advancement. Farmers predicting about climate conditions, way of socialization, peace settlement and negotiation etc. if this untapped indigenous knowledge is supported with technical and scientific values to take care of their cultural and societal territories we will be successful

Another case reported is capacity-building cooperation between our center and the Ministry of Works and Urban Development. With a customized and tailored curriculum, an "Urban Land Management and Administration" program is under implementation starting in 2015.

3.5 Barriers and success factors for knowledge integration

According to Pohl & Hadorn (2008), TD research can face methodological challenges as a result of complexity of problems, diversity of perspectives, case specific nature, and promoting common good. Transdisciplinary research is an approach that involves bringing together different disciplines to address complex real-world problems. This method of research has gained attention in recent years, especially in tackling complex issues. Despite the growing recognition of the importance of transdisciplinary research, several barriers impede its implementation. In the design of TD research understanding barriers and success factors in advance helps to prepare for unknowns that can result from the interaction of different disciplines and stakeholders. The following barriers were reported by the respondents:

3.5.1 Policy and institutional level barriers

Policy and institutional level factors determine the success of Transdisciplinary research. Many factors were listed as major bottlenecks. For instance, the absence of favorable institutional and policy frameworks, very fragmented efforts by actors, lack of collaboration between different stakeholders both local and interdisciplinary experts, lack of coordination and synergy, lack of resources, lack of knowledge sharing environment, lack of policy harmonization between different political parties dealing with land management at local and central level, and non-inclusion of the popular knowledge in the curricula. At the macro level, political instability, and government insights (looking) for those intellectuals who strive to untie the problem of poverty, and sustainability of fundings collaborative and partnership-based programs (in funding and institutional focus).

Table 8 Summary of Barriers and success factors for knowledge integration

Policy and institutional level barriers	absence of favorable institutional and policy frameworks; fragmented efforts by actors; lack of collaboration between different stakeholders; lack of coordination and synergy; lack of resources; lack of knowledge sharing environment; lack of policy harmonization between different political parties dealing with land management at local and central level, and non-inclusion of the popular knowledge in the curricula; political instability, and government insights (looking) for those intellectuals who strive to untie the problem of poverty, and sustainability of fundings collaborative and partnership-based programs (in funding and institutional focus).
Ways of doing research	Availability of documents in local knowledge (Costly in time and Resource); Dissemination of research finding is not accessible (or not in local Language); Dissemination of results in the community after the research is done; Every time is common to restart something already researched and database available; limitation of time; Limited multidisciplinary research methods being; methodological gaps; problems demand multi-disciplinary and transdisciplinary explanations; recommendations focusing on theory (and so-called best practice); Non dissemination of the scientific knowledge in the communities; Too much focus on disciplinarity while development and Understanding and Clarity problem
Personal factors	Expectation; Economic Poverty; Fear; Interest In the topic (2); Interpersonal Interaction; Lack of awareness (3); Lack of commitment and courage; Lack of experiences on the expert (2); Lack Of Participation(2); Lack Of Teamwork With Local Leaders; Lack Of Trust The Other Participants That Their Knowledge Will Be valorized For The Common Good And Not Misused; Language Barrier Between Disciplines(3); Low Awareness About Other People's Ideas; Kindness, tolerance, patience. ; Not Feeling At Ease And Safe. ; Resistance To Change; Ridged Personal Stands; Unwilling To Learn From actors, and working Culture(4)..

Source Survey result (2023) NB Number in brackets shows the frequency of reported factor

3.5.2 Ways of doing research

Other factors that relate to the barriers and success factors for knowledge integration theme are categorized under a generic theme, Ways of doing research. Respondents reported the following factors as barriers related knowledge generation. A total of eleven factors were listed under ways of doing research. There is dominant hierarchical thinking of knowledge structure that disregards the importance of non-scientific knowledge and local and scientific knowledge speaking at different levels. There is also a prominent problem of inclusion, i.e., a lack of integrating the experiences of different stakeholders. There is also a mismatch between problem and method selection. Transdisciplinary research demands more engagement than requires time. These factors are explained in detail here under.



The barriers are summarized here under, the first barrier to transdisciplinary research is its action orientation. Many research projects are designed to generate knowledge and understanding, but they fail to provide a clear plan of action to address the problem under investigation. Transdisciplinary research requires a problem-solving approach that goes beyond knowledge generation to provide solutions to the problem. This approach can be challenging when researchers are not used to working outside their disciplinary comfort zones. Thus, transdisciplinary research requires a paradigm shift in thinking from the traditional research model.

The second factor relates to the hierarchical knowledge structure is the second barrier reported for transdisciplinary research by respondents. The hierarchical structure of academic institutions can be a barrier to effectively integrating knowledge across different disciplines. Disciplinary boundaries, academic interests, and incentives can create knowledge silos that prevent the integration of knowledge from different fields. To overcome this barrier, transdisciplinary research requires a collaborative effort that fosters an atmosphere of knowledge-sharing rather than knowledge-hoarding.

Furthermore, the third factor relates with the less importance given for non-academic actors as a critical barrier to transdisciplinary research. To address complex problems, it is essential to include the perspectives and knowledge of non-academic actors such as local communities, policymakers, and civil society. However, involving non-academic actors in the research process can be challenging due to various power dynamics, varying interests, and priorities. This requires building long-term relationships, trust, and maintaining constant engagement between researchers and non-academic actors.

Fourthly, non-inclusion of all stakeholders is also a crucial barrier to transdisciplinary research. The problems under investigation are often complex, requiring different stakeholders to work together towards a common goal. However, not all stakeholders are included in the research process. This can lead to a lack of representation, voice, and power, leading to a suboptimal outcome. Transdisciplinary research requires an inclusive approach that involves all



stakeholders, including low-income communities, women, and minority groups, to ensure equitable and sustainable outcomes.

The fifth factor is lack of effective dissemination strategies for research outputs is another barrier reported by respondents to transdisciplinary research. The dissemination of research findings and outcomes to policymakers, practitioners, and the public is crucial for the uptake and implementation of recommendations. However, traditional forms of dissemination such as academic journals, conferences, and workshops may not be accessible or applicable to all stakeholders. Transdisciplinary research requires a broad and robust dissemination strategy that reaches all stakeholders through various channels such as social media, community events and workshops, and policy briefs.

The last factor reported by the respondents is the allocation of adequate time as a significant barrier to transdisciplinary research. Transdisciplinary research is a time-consuming process that requires a substantial investment of time and resources. Researchers need adequate time to develop trust between stakeholders, develop common language, establish shared goals and objectives, and generate innovative solutions. This can be challenging under conventional academic structures that prioritize efficiency and productivity over quality.

3.5.3 Personal related attributes /factors

Transdisciplinary research is an approach that attempts to integrate various disciplines to tackle complex problems drawn from multiple perspectives. It requires a range of personal factors, as reported by the respondents including clear expectation, interest, productive interaction, awareness, commitment, courage, experience, teamwork, communication, tolerance, and learning.

Expectation is crucial to transdisciplinary research because it predicts the outcome and success of the work. Expectations can directly influence actions, and positive expectations can lead to a higher level of confidence and satisfaction. Fear is also an essential factor because the fear of the unknown or failure can prohibit progress and hinder creativity. It is important to recognize fear and channel it towards productive outcomes.



Interest is another factor that is necessary for transdisciplinary research. A curious and invested mind can lead to better understanding, discovery, and innovation.

Effective interaction is key in ensuring that all members of the team are engaged and are contributing input to the project.

Awareness is another personal factor that is essential in transdisciplinary research, as it enables team members to understand the complexities and nuances of different disciplines. Through awareness, individuals can develop unique perspectives and ideas that they may not have otherwise considered.

Commitment is another critical factor in the success of transdisciplinary research. It requires dedication to the project and determination to see it through till the end.

Courage is also necessary in this process because the research may challenge assumptions and require individuals to think outside the box. The courage to take risks can lead to novel discoveries and solutions.

Experience is valuable in transdisciplinary research because it can provide insight into past successes and challenges. The ability to draw on one's experience and knowledge can be helpful in navigating difficult situations.

Teamwork is another important factor, as it enables the exchange of ideas and collaboration with others. Through effective teamwork, individuals can draw on the strengths and perspectives of their colleagues to create a comprehensive and innovative research outcome.

Communication is also integral in transdisciplinary research because it bridges gaps between different disciplines and enables individuals to deliver meaningful insights. Effective communication skills can facilitate understanding and collaboration, which are essential for success.

Tolerance is also critical, as it requires individuals to be open to different ideas, perspectives, and approaches. Recognizing and respecting the diversity of disciplines and backgrounds can lead to a richer and more nuanced understanding of complex issues.



Finally, learning is an essential personal factor because it allows for growth and development. Learning from both successes and failures can help individuals refine their skills and knowledge, leading to better outcomes in transdisciplinary research.

In conclusion, these personal factors reported by the respondents are necessary for the success of transdisciplinary research because they encourage growth and development and enable productive collaboration. By recognizing and cultivating these factors, individuals can contribute to a robust and innovative research outcome.

3.6 Experience in drawing on research methods and bodies of knowledge from more than one discipline

Of the respondents, 15 reported experiences in drawing research methods and bodies of knowledge from more than one discipline. The most relevant reported experiences are summarized in bullet points here under

- Analyzing the impact of land expropriation program on farmers' livelihood in urban fringes of Bahir Dar, Ethiopia
- Influence of housing conditions in informal areas on the public health of its inhabitants. Nampula, combining Informal settlement + Public health + sociology and environment.
- Development of the urban district plan for the district of Nampula, where the work team was composed of architects, engineers, sociologists, geographers, jurists among others and used different work methodologies.
- Writing scientific articles with specialists from different areas of knowledge.
- Combining knowledge from sociology and anthropology linking knowledge from public health and epidemiology.
- Knowledge and technology transfer of plastic fiber reinforced hollow blocks to small enterprises.
- Research based design projects in architecture, urban design and urban planning
- Architectural and planning projects.



- assessing potentials of PPP development in Ethiopia, drawn methods of policy (political science), economic aspect (economics) and legal framework issue (law).
- Research undertakings in the university are conducted across different disciplines, which are mega in nature demanding at least the participation of three different areas of specialty/departments.
- application and exercise scenario planning.
- urban redevelopment projects on river sides in Mekelle that incorporated different disciplines.
- research in West African cities GPS-tracking of (illegal) dumping sites, a method practiced in geography and participation in a Model African Union session, a method designed in political sciences.
- urban research agenda which drew researcher from geography, political science, anthropology, economics, and education
- Linking political economy, gender, humanitarian aid, peace and security

3.7 Engaging non-academic actors and experience in integrating different knowledge inputs

Table 9 summarizes the response about the involvement of societal stakeholders from outside academia in the co-construction of research agendas and knowledge outcomes which 55.2% reported involvement while 44.8% have no prior experience in engaging non-academic stakeholders. Most of the respondents 79.3% reported having experience in integrating different knowledge inputs to reach new understandings that transcend the boundaries between disciplines and knowledge forms which can be a good foundation for the GIRT project.

Table 9 Engaging non-academic actors and experience in integrating different knowledge inputs

	Yes	16	55.2
	No	13	44.8
Involvement of societal stakeholders from outside academia in the co-construction of research agendas and knowledge outcomes	Total	29	100.0
	Yes	23	79.3
	No	6	20.7



Experience in integrating different knowledge inputs to reach new understandings that transcend the boundaries between disciplines and knowledge forms?	Total	29	100.0
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Source Survey result (2023)

3.8 Capabilities for transdisciplinary research

The capability of the team members in terms of acquiring a certain features of transdisciplinary research skills was assessed by following the work of O'Donovan, et al (2022) Capabilities for transdisciplinary research designed following Sen's capability framework as a theoretical base and adopting practices in UK based TD research projects.

Some scholars have categorized some thematic areas for identifying capabilities for transdisciplinary research namely team formation, and competence, project design in relation to content, project focus, project structure and management, learning and reflection, id and td integration, scientific results and practical results. (Batorowicz & Shepherd, 2008; Bergmann et al., 2005; Pohl et al., 2010).

Accordingly, the capability questions were categorized into three major themes, individual tacit capabilities, collective capabilities, and cognitive capabilities. For each theme selected item questions were prepared that fit into each category. Some items for collective capabilities may have some overlap with the individual tacit capacities as well as some nature of collective capabilities. For this report, the overlapping items are discussed under individual capabilities.

3.8.1 Individual tacit capabilities

Individual tacit capabilities mean skills, aptitudes, competences, and capabilities to advance career prospects of researchers (O'Donovan et al., 2022). Under this theme, eleven constructs were used to assess TD capabilities at individual level. According to Bozeman and Rogers (2001), many of the capabilities necessary for research involve social and political skills in addition to cognitive ability. These skills are not explicitly taught in textbooks but are instead informed by expert practice and include things like tacit knowledge and experiential knowledge acquired by individual researchers (Heckman and Corbin 2016). These individual capabilities are performed in the social setting of research projects and require management



of information and decision-making (Klein 2006). They are also influenced by personal background and can include individualistic ambitions such as having an identity as a researcher (Lau and Pasquini 2008). Perception of team members about the eleven constructs are discussed as follows.

Skills, aptitudes, competences, and capabilities to advance career prospects as a researcher

For the generic item, “I have the skills, aptitudes, competences, and capabilities to advance career prospects as a researcher”, majority of the team members reported a positive response, 34.5% reported strongly agree followed by 58.6 % agree. Only 3.4 % responded as strongly disagree and neutral respectively. From the academic qualification data discussed in first part of the findings section, since majority of the team members earn above a MA/MSC degree, it is expected that they would respond having the tacit and experiential knowledge accrued as a researcher.

Tacit and experiential knowledge accrued as a researcher

Accordingly, 51.7% reported “agree” for having tacit and experiential knowledge. Only 17.2% of the team members were certain about it with a response category of “strongly agree”. In this item question, 24.1% reported a “neutral” position of having this expected knowledge followed by 6.9% who reported “strongly disagree”. This confirms the need for enhancing transdisciplinary research capabilities to enhance the exposure of the team with real experiential knowledge that can be acquired from integrative research such as that of transdisciplinary research.

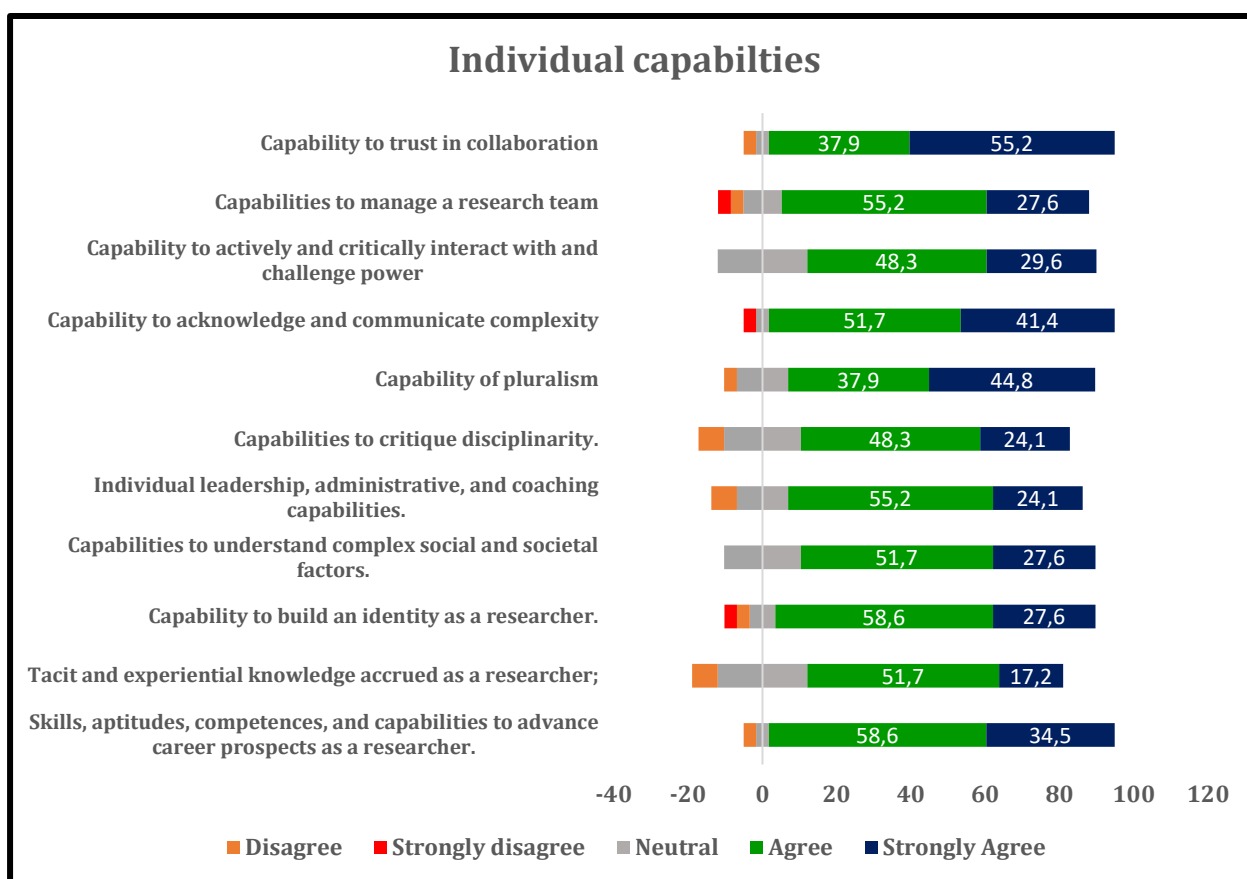
Capability to build an identity as a researcher

As a prerequisite project member were assessed their position with regards to capability to build identity as a researcher and 86.2% envision themselves or portray the identity as academic researchers. This confirms the foundation for any transdisciplinary research as having a certain discipline centered accumulated knowledge and experience that can be utilized in any transdisciplinary research and having the basic knowledge of doing qualitative and quantitative research as academia.

Capabilities to understand complex social and societal factors

The capabilities to understand complex social and societal factors is one of the skills that is assumed to be practiced and cherished when one engages in transdisciplinary research. As a premise transdisciplinary promises to address complex social problems. Individual and team level capabilities of understanding and thinking out of the box sound very compulsory. Accordingly, 20.7% reported a neutral position, showing the gap to be filled whereas 79.3% reported some exposure and skill to have the capability to understand wicked problems.

Figure 1 Capability for TD research: Individual tacit capabilities



Source Survey result (2023)

Individual leadership, administrative, and coaching capabilities

Transdisciplinary research demands individual leadership, administrative, and coaching capabilities as the collaborative nature of transdisciplinary requires leading team with diverse interest and expectations as a researcher. Besides working with nonacademic actors can be a challenge for beginners as bringing on board by convincing and empowering nonacademic



actors to exercise their significant role in solving complex societal problem with joint research undertakings starting from problem framing up to finding solution. Thus, the team sounds to be confident in having these skills as reported in the survey by 79.3% of the respondents. This response can be interpreted at two levels. At team level the experienced team members can fruitfully coach and lead by example for others. However, at broader level of nonacademic actors, intact skill may be required to fully engage the nonacademic actors. 20.7% of the respondents claimed to have a neutral and negative response that displays the need for equipping members with these skills throughout the period of the project.

Capabilities to critique disciplinarity

For the capability to critique disciplinarity, 72.4% of participants agreed or strongly agreed that they own this ability. This indicates that most researchers recognize that being able to critique boundaries across disciplines is crucial for conducting TD research.

Capability of pluralism

For the ability of pluralism, 82.7% of participants agreed or strongly agreed that they had this ability. This indicates that most team members recognize that embracing different perspectives is essential for bridging the gap between different disciplines.

Acknowledge and communicate complexity

For the capability to acknowledge and communicate complexity, 92.1% of participants agreed or strongly agreed that they have this ability. This indicates that most recognize that being able to communicate complex topics is important for disseminating research findings.

Capability to interact with actively and critically and challenge power

For the capability to interact with actively and critically and challenge power, 78% of participants agreed or strongly agreed that they had this ability. This indicates that most members understand the importance of critically engaging with power structures to develop new knowledge.

Capabilities to manage research team

For the ability to manage a research team, 82.7% of participants agreed or strongly agreed that they had this ability. This indicates that most interdisciplinary researchers recognize the



importance of managing and effectively communicating with teams to achieve research objectives.

Capability to trust in collaboration

Finally, for the ability to trust collaboration, 92.1% of participants agreed or strongly agreed that they had this ability. This indicates that most interdisciplinary researchers recognize the importance of trust when collaborating across disciplines.

The results indicate that researchers possess the capabilities necessary to conduct TD research. However, there is still room for improvement, as some participants indicated neutrality or disagreement with some of the capabilities. These findings highlight the need for TD training programs to explicitly train and reinforce these critical skills. Furthermore, the project should investigate the relationship between these capabilities and successful TD research collaboration in latter stages of the project.

3.8.2 Collective capabilities

This section of the report provides an overview of a Likert result that was conducted to gauge the collective capabilities of a research team in transdisciplinary research. The result serves as a baseline for understanding the team's strengths and weaknesses.

In terms of collaborative and social practices with stakeholders, the Likert result showed that the team had a high level of agreement, with 48.3% strongly agreeing and 48.3% agreeing. However, when it comes to mutual accountability for research, the result was mixed, with 51.7% agreeing and 41.4% strongly agreeing, but 3.4% strongly disagreeing.

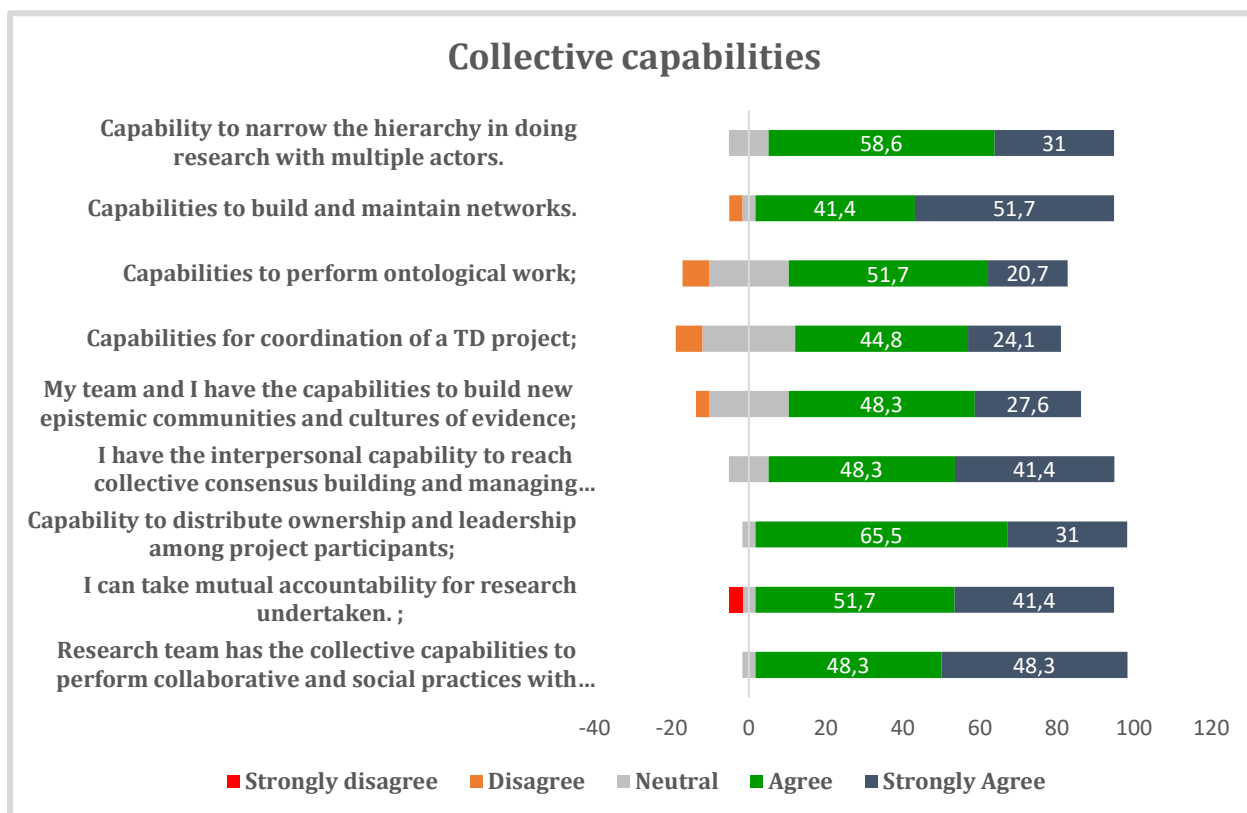
In terms of distributing ownership and leadership among project participants, the result showed that the team had a high level of agreement, with 65.5% agreeing and 31% strongly agree. Similarly, for building and maintaining networks, there was a high level of agreement, with 41.4% agreeing and 51.7% strongly agree.

However, the result showed that the team has shown some gap with some aspects of transdisciplinary research. For instance, when it comes to interpersonal capability to reach collective consensus building and managing tensions, 48.3% agreed, while 41.4% strongly agreed. The remaining 10.35% were neutral.



Furthermore, the team sounds having challenges in building new epistemic communities and cultures of evidence, with 48.3% agreeing and 27.6% strongly agreeing while 20.7% in neutral position. Similarly, for coordination of a TD project and performing ontological work, the result showed that the team faced challenges, with a relatively high percentage of respondents expressing disagreement.

Figure 2 Assessment result of collective capabilities for TD research



Source Survey result (2023)

Lastly, for narrowing the hierarchy in doing research with multiple actors, the result was mixed, with 58.6% agreeing and 31% strongly agreeing and 10.2% taking the neutral.

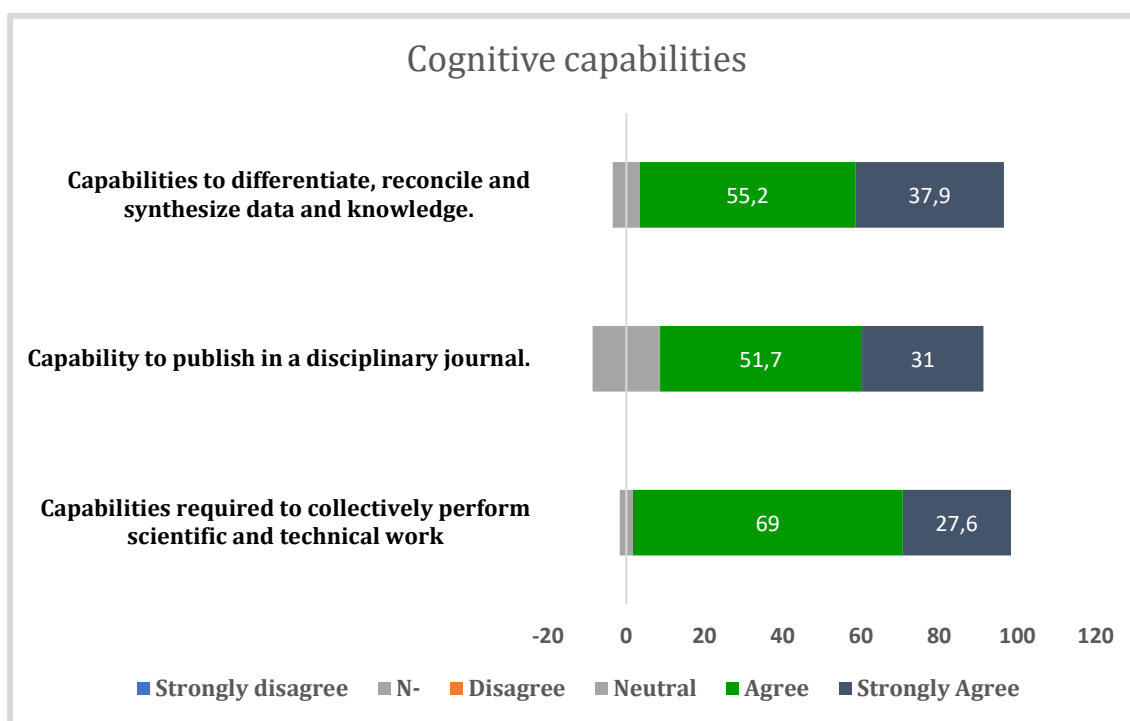
Based on the Likert result, the research team has several strengths, such as collaborative and social practices and distributing ownership and leadership among project participants. However, there are also areas where the team needs to improve, such as building new epistemic communities and cultures of evidence and performing ontological work. The team

should focus on building consensus, managing tensions, and reducing hierarchies to become more effective in transdisciplinary research.

3.8.3 Cognitive capabilities

The report on cognitive capabilities for transdisciplinary research reveals that most participants strongly agree that they possess capabilities required to collectively perform scientific and technical work. However, a small percentage of participants remain neutral on this aspect.

Figure 3 Cognitive capabilities



Source Survey result (2023)

Further, a significant proportion of participants agree and strongly agree that they possess the capability to publish in a disciplinary journal. However, a notable proportion of participants remain neutral on this aspect as well. A vast majority of participants agree and strongly agree that they possess the capabilities to differentiate, reconcile and synthesize data and knowledge. However, a small percentage of participants remain neutral on this aspect.



Overall, the baseline report suggests that participants possess cognitive capabilities required for transdisciplinary research. However, it is important to identify areas where participants need further training and support to enhance their cognitive capabilities for effective transdisciplinary research.

3.9 Use of transdisciplinary research methods by the respondents

In the questionnaire, respondents were asked about a list of transdisciplinary methods with their objectives related to transdisciplinary research whether they have exposure in using them and if they have taken any training on the methods in their academic and professional careers. The methods were categorized as:

- methods for coproduction of knowledge,
- dialogue methods for knowledge synthesis
- methods for change
- methods research integration and implementation
- methods of dynamic system thinking
- methods of engaging and inferencing policy and
- methods of integration

3.9.1 Use of methods for coproduction of knowledge

Transdisciplinary knowledge coproduction refers to the entire process of joint knowledge production between experts from different disciplines, sectors, and decision levels, including joint problem formulation, knowledge generation, application in both scientific and societal practice, and mutual quality control of scientific rigor, social robustness, and practical relevance (Polk, 2015). Transdisciplinary knowledge coproduction encompasses synthesis through transdisciplinary knowledge integration. In the context of large research programs, the latter refers to the process of taking stock of individual project results and generating new knowledge by establishing novel (i.e., previously unrecognized) connections between them (Hoffmann et al., 2019).

Coproduction of knowledge is a process of jointly creating knowledge between different stakeholders. It involves collaboration between diverse groups from various sectors who



bring their expertise and knowledge to solve complex problems. The importance of coproduction of knowledge has increased due to the complexity of social, environmental, and economic challenges that need innovative solutions. Therefore, it has become necessary to explore methods of coproduction of knowledge for this project.

Use of selected eight methods for coproduction of knowledge were assessed by the team. Delphi method is the most ranked used method by the team accounting 20.7% followed by three methods namely actor constellation method, most significant method, and story wall method each having 17.2%. Soft system methodology and toolbox approach were reported by 10.3% of the respondents. Three types of knowledge tool were 6.9%. (See table 10)

Table 10 Methods for coproduction of knowledge

	Methods for coproduction of knowledge	Use		Training	
		N	%	N	%
	Soft systems methodology	3	10.3	2	6.9
	Toolbox approach	3	10.3		
	Three types of knowledge tool	2	6.9		
	Actor constellation method	5	17.2	2	6.9
	Delphi method	6	20.7	1	3.4
	Emancipatory boundary critique	1	3.4		
	Most significant change technique	5	17.2	1	3.4
	Story wall method	5	17.2	2	6.9
	Other				
	Hierarchy analysis method	1	3.4		
	Stakeholder mapping	1	3.4		
	Participatory appraisal	1	3.4		
	Scenario planning methods	1	3.4		
	Citizen science	1	3.4		
	Participatory action research	1	3.4		
	Concurrent triangulation method (three-pronged approach - matrix, theory and data)	1	3.4		

Source Survey result (2023)

Emancipatory boundary critique, hierarchy analysis method, stakeholder mapping, Participatory appraisal, scenario planning methods, citizen science, participatory action research and concurrent triangulation method (three-pronged approach - matrix, theory, and data).



3.9.2 Dialogue methods for knowledge synthesis

Dialogue methods of knowledge synthesis are a set of methods that are used to bring together different people to share their knowledge, experiences, and opinions on a particular topic. These methods aim to create a platform that enables participants to exchange information, learn from each other and discover new ways of thinking about the topic in question.

The idea behind dialogue methods of knowledge synthesis is that multiple perspectives are better than one. By bringing together people with different backgrounds, experiences, and perspectives, it is possible to create a more thorough and comprehensive understanding of a particular topic than would be possible if everyone were to approach it in isolation. This is especially important in today's rapidly changing world, where new information and innovations are constantly emerging, making it more important than ever to be able to work collaboratively and learn from one another to keep pace with the changes.

Scenario planning is a strategic planning method used to explore and prepare for alternative futures. The method involves identifying and developing alternative scenarios to generate different possible outcomes. Scenario planning begins with a clear understanding of the status of the situation, followed by identifying the key drivers of change and evaluating the uncertainties associated with each driver. Scenario planning highlights the potential consequences of each scenario, identifies gaps in knowledge, and aids in strategizing actions to mitigate the impacts of each scenario. Team members with exposure to this method account 20.7% of the respondents.

One of the two methods that the team had acquaintances is the Delphi technique (17.2%), which involves a series of surveys and questionnaires in which experts in a particular field are asked to provide their opinions on a specific topic. This process typically involves several rounds of feedback and iteration, with participants being encouraged to revise their ideas based on the feedback they receive from others. Like Delphi, the other most ranked method used is appreciative inquiry (17.2%). It is a positive change method used to focus on strengths and opportunities. The method involves identifying the positive attributes of an organization and exploring how these strengths can be leveraged to create positive change. Appreciative



inquiry begins with identifying the positive qualities of individuals and groups, then using these qualities to create a shared vision and purpose. The method emphasizes collaboration and encourages individuals to identify shared goals and take ownership of the change process.

Nominal group technique (13.8%) is a problem-solving method that involves generating and evaluating alternative solutions. The technique involves a group of individuals sharing ideas and collectively ranking them based on their perceived importance and relevance. Nominal group technique begins with the identification of a problem, followed by individuals generating ideas independently, then sharing them with the group. Participants subsequently discuss ideas and rank them based on their relevance, to create a shared understanding of the best possible solution.

Consensus Development Panel, Soft Systems Methodology: Strategic Assumption Surfacing and Testing, Principled Negotiation, Ethical Matrix and Strategic futuring were reported by 3.4% of the respondents.

No team member has experience in Future Search Conference and Open Space Technology. Open Space technology is particularly well-suited to large group discussions on complex issues. Open Space technology typically involves a series of discussions and breakout sessions on a range of different topics, with participants being free to move from one session to another throughout the course of the day. This approach encourages participants to take an active role in shaping the conversation and allows them to explore different perspectives and ideas in a more flexible and dynamic setting.

Table 11 Dialogue methods for knowledge synthesis

Dialogue methods for knowledge synthesis		Use		Training	
		N	%	N	%
1	Consensus Development Panel	1	3.4		
2	Delphi Technique:	5	17.2		
3	Future Search Conference:				
4	Nominal Group Technique:	4	13.8		
5	Open Space Technology	0			
6	Scenario Planning:	6	20.7	6	20.7
7	Soft Systems Methodology:	1	3.4	2	6.9



8	Appreciative Inquiry:	5	17.2	2	6.9
9	Strategic Assumption Surfacing and Testing	1	3.4		
10	Principled Negotiation	1	3.4	1	3.4
11	Ethical Matrix: Other	1	3.4	1	3.4
12	Strategic futuring	1	3.4		

Source Survey result (2023)

3.9.3 Transdisciplinary Methods for change

The world has always faced several challenges, and the need to address these challenges has led to the evolution of various methods and techniques over time. Interdisciplinary and transdisciplinary methods have been introduced to solve complex issues that involve different disciplines and domains. Transdisciplinary methods of change are essential for addressing issues that are beyond the scope of individual disciplines, and here, we will examine why.

Traditionally, the disciplinary approach, which relies on experts in individual disciplines, is the most common approach to solving problems. However, this approach only deals with issues at a surface level, failing in cases of complex issues where several challenges are intertwined. In such cases, transdisciplinary approaches are necessary because they broaden the perspectives of different disciplines and domains, leading to a more comprehensive understanding of the problem. The collaboration of diverse disciplines like sociology, psychology, economics, and science ensures a comprehensive and holistic approach to the problem. Additionally, transdisciplinary methods can also foster innovation.

Moreover, the adoption of transdisciplinary approaches has the potential to build trust and encourage accountability. Collaboration between disciplinary experts and stakeholders can bring transparency and openness, which is essential for building trust. Stakeholders also feel accountable for contributing, thereby increasing their involvement and commitment to achieving the desired outcomes.

Transdisciplinary methods of change are necessary for addressing complex and multidisciplinary problems that are beyond the scope of individual disciplines. These methods foster collaboration and integration of information from different fields, thus leading to comprehensive and holistic solutions. Furthermore, the transdisciplinary approach fosters innovation, builds trust, and fosters accountability, leading to sustainable solutions.



Only stakeholder analysis (44.8%), scoping (13.8%), and Walt Disney circle, Assessment and Change of Limiting Beliefs, and After-Action Review were reported by 3.4% of respondents.

No team member reported experience in Wheel of Multiple Perspectives, Art of Dividing a Pumpkin and Ralph Stacey’s Agreement and Certainty Matrix.

Table 12 Methods for change

Methods for change		Use		Training	
		N	%	N	%
	Walt Disney Circle	1	3.4		
	Assessment and Change of Limiting Beliefs	1	3.4	1	3.4
	Wheel of Multiple Perspectives				
	Art of Dividing a Pumpkin				
	After Action Review	1	3.4	2	6.9
	Scoping	4	13.8	1	3.4
	Ralph Stacey’s Agreement and Certainty Matrix				
	Stakeholder Analysis	13	44.8	4	13.8
	Other (SWOT)	1	3.4		

Source Survey result (2023)

3.9.4 Methods Research Integration and Implementation

In recent years, research integration and implementation have been increasingly recognized as crucial aspects of creating meaningful change and progress in various fields. Research integration involves the systematic and strategic use of different types of research to develop more comprehensive insights and to address different aspects of a complex problem. On the other hand, research implementation involves the effective translation of research results into real-world practices and interventions. Both research integration and implementation involve a range of methods and approaches to ensure that research findings are effectively used in decision-making and practice.

Quantitative risk matrices (17.2%), Power cube (6.9% and Unknowns’ taxonomy and Framing: a quick guide accounted for 3.4% of the respondents. Unknowns’ matrix and ADOPT (Adoption & Diffusion Outcome Prediction Tool) were methods that the team has no exposure so far.



Table 13 Methods for research integration and implementation

Methods Research Integration and Implementation	Use		Training	
	N	%	N	%
Quantitative risk matrices	5	17.2	2	6.9
Unknowns' taxonomy	1	3.4	1	3.4
Unknowns' matrix				
ADOPT (Adoption & Diffusion Outcome Prediction Tool)				
Framing: a quick guide	1	3.4	1	3.4
Power cube	2	6.9		
	9			

Source Survey result (2023)

3.9.5 Methods (Dynamic) Systems Thinking

Dynamic systems thinking is a methodology that is used to analyze complex systems that change over time. This methodology encompasses both quantitative and qualitative approaches to model behavior over time. The two categories of dynamics are continuous and discrete. Continuous dynamics models change that occurs continuously over time, while discrete dynamics models change that occurs discontinuously or in steps. There are several methods of dynamic systems thinking, including systems dynamics, agent-based modeling, and scenario building. The survey result shows that Introduction to systems thinking (13.8%) and Systems thinking tools (6.9%) were the two methods reported by the team.

Table 14 Methods for (Dynamic) Systems Thinking

Methods (Dynamic) Systems Thinking	Use		Training	
	N	%	N	%
Introduction to systems thinking	4	13.8	4	13.8
Systems thinking tools	2	6.9	3	10.3
System archetypes basics			1	3.4
Applying systems archetypes				
	6			

Source Survey result (2023)

3.9.6 Methods of Engaging and Influencing Policy

Influence and interest matrix (10.3%) and five why techniques (3.4%) were the only methods the team had previous experience. Transdisciplinary methods of engaging and influencing policy come with different approaches.



3.9.7 Methods for Integrating Methods

Transdisciplinary integration methods are critical in today’s world of complex, interconnected problems that require collaborative and holistic approaches. Integrating different disciplinary perspectives and knowledge is necessary to address complex problems because no single discipline holds all the answers. Transdisciplinary integration methods are a set of procedures and practices that facilitate collaboration among multiple disciplines for a shared goal of solving complex problems. This essay will discuss some of the various methods of transdisciplinary integration, their advantages, and disadvantages.

Integration through research questions and hypothesis formulation was employed by 31% of the respondents, followed by Integration through conceptual clarification and theoretical framing (24.1%), then Integration through development and application of models (13.8%). Only 10.3% reported Screening, using, refining, & further developing effective integrative scientific methods and 6.9% of the team reported use of Integrative assessment procedures and Integrative procedures and instruments of research organization. Transdisciplinary integration methods are valuable in addressing complex problems that require integrated solutions.

Table 15 Methods for Integrating Methods

Methods Integration Methods	Use		Training	
	N	%	N	%
Integration through conceptual clarification and theoretical framing	7	24.1	4	13.8
Integration through research questions and hypothesis formulation	9	31	4	13.8
Screening, using, refining, & further developing effective integrative scientific methods	3	10.3	3	10.3
Integrative assessment procedures	2	6.9	2	6.9
Integration through development and application of models	4	13.8	2	6.9
Integration through artifacts, services and products as boundary objects	1	3.4		
Integrative procedures and instruments of research organization	2	6.9	1	3.4
	28			

Source: Survey result (2023)

3.10.8 Methods by institution

Table 16 summarizes the reported methods that the team has exposure by institution, category of the method and total number of responses. The method with highest response is Delphi technique (9) followed by stakeholder analysis (8) and Integration through research questions and hypothesis formulation (8). Scenario planning and Integration through conceptual clarification and theoretical framing was reported by 6 respondents each. Four methods namely appreciative inquiry, most significant change, quantitative risk matrices, and story wall method were reported by 5 respondents each. Methods that got a response rate of four were actor constellation method, integration through development and application of models, introduction to systems thinking, nominal group technique, scoping, and soft systems methodology. Methods for coproduction of knowledge, methods of integration, methods for change, and dialogue methods are the categories with highest respondents.

Table 16 Methods by institution

	AAU	BD	LU	MU	Frequency	Category of the TD method
1.	Delphi method (6)		Delphi method (3)		9	Methods for coproduction of knowledge,
2.	Integration through research questions and hypothesis formulation (3)	Integration through research questions and hypothesis formulation	Integration through research questions and hypothesis formulation (2)	Integration through research questions and hypothesis formulation (2)	8	Methods of integration
3.	Stakeholder Analysis (5)	Stakeholder Analysis (2)	Stakeholder Analysis	Stakeholder Analysis (4)	8	Methods for change
4.	Integration through conceptual clarification and theoretical framing (4)		Integration through conceptual clarification and theoretical framing	Integration through conceptual clarification and theoretical framing	6	Methods of integration
5.	Scenario Planning (3)	Scenario Planning (2)		Scenario Planning	6	Methods for coproduction of knowledge,
6.	Appreciative Inquiry (3)	Appreciative Inquiry	Appreciative Inquiry		5	Dialogue method
7.	Most significant change technique (3)		Most significant change technique;	Most significant change technique	5	Methods for coproduction of knowledge,
8.	Quantitative risk matrices (2)		Quantitative risk matrices (2)	Quantitative risk matrices	5	Methods Research Integration and Implementation
9.	Story wall method		Story wall method (3)	Story wall method	5	Methods for coproduction of knowledge,
10.	Actor constellation method	Actor constellation method	Actor constellation method	Actor constellation method	4	Methods for coproduction of knowledge,
11.	Integration through development and application of models (2)		Integration through development and application of models (2)		4	Methods of integration
12.	Introduction to systems thinking	Introduction to systems thinking	Introduction to systems thinking;	Introduction to systems thinking	4	Methods (Dynamic) Systems Thinking
13.	Nominal Group Technique (2)	Nominal Group Technique	Nominal Group Technique		4	Dialogue method
14.	Scoping; 3	Scoping;			4	Methods for change
15.	Soft Systems Methodology (2)		Soft systems methodology (2)		4	Dialogue method
16.	Integrative assessment procedures		Integrative assessment procedures;(2)		3	Methods of integration
17.	Toolbox approach (2)		Toolbox approach;		3	Methods for coproduction of knowledge,



	AAU	BD	LU	MU	Frequency	Category of the TD method
18.			Framing: a quick guide	Framing: a quick guide	2	Methods Research Integration and Implementation
19.	Influence and interest matrix	Influence and interest matrix			2	Methods of Engaging and Influencing Policy
20.			Power cube	Power cube	2	Methods Research Integration and Implementation
21.	Screening, using, refining, & further developing effective integrative scientific methods		Screening, using, refining, & further developing effective integrative scientific methods		2	Methods of integration
22.			Systems thinking tools	Systems thinking tools	2	Methods (Dynamic) Systems Thinking
23.	Three types of knowledge tool	Three types of knowledge tool			2	Methods for coproduction of knowledge,
24.	Unknowns taxonomy			Unknowns' taxonomy	2	Methods Research Integration and Implementation
25.				After Action Review	1	Methods for change
26.	Assessment and Change of Limiting Beliefs				1	Methods for change
27.	Consensus Development Panel				1	Dialogue method
28.	Emancipatory boundary critique;				1	Methods for coproduction of knowledge,
29.		Ethical Matrix			1	Dialogue method
30.			Five-why technique		1	Methods of Engaging and Influencing Policy
31.				Integration through artifacts, services, and products as boundary objects	1	Methods of integration
32.				Principled Negotiation	1	Dialogue method
33.	Strategic Assumption Surfacing and Testing				1	Dialogue method
34.	Walt Disney Circle;				1	Methods for change
	53	13	29	20	111	
35.			Hierarchical analysis		1	
36.			Participatory appraisal		1	
37.	Concurrent triangulation method				1	
38.	54	13	31	20	114	

4. CONCLUSION

The assessment report result indicates that the team members have a sound understanding about the transdisciplinary research at conceptual level. Practical exposure of the team is mixed with some having some exposure whereas some have no exposure at all. This creates a good learning platform and confirms to the basic premise of the project. With the prereading and transdisciplinary workshop discussions it is believed that this gap is addressed.

The capability assessment result that assessed the individual, collective and cognitive capabilities, sounds a bit inflated with most of the team members claiming to possess the capacities required for the transdisciplinary research. Overall, it shows the team preparedness to undertaking the research. The capabilities will be tested throughout the project period as some features will be deemed necessary at the design phase but more importantly when site and stakeholder engagements start, the capabilities will be validated. In later stages of the project, when negotiating and advocacy for the solution-oriented results demands working and collaborating with policy makers and politicians some of the capabilities will be evaluated further.

Some team members have previous exposure to the methods of transdisciplinary research with prior training. This experience will be shared among team members in the form of training and experience sharing platforms. Delphi method, Integration through research questions and hypothesis formulation, Stakeholder Analysis and integration through conceptual clarification and theoretical framing were the most ranked methods known by the respondents.

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Annex.

Table 17 Capability for TD research

Capability for TD research	No	Yes	100%
I have the skills, aptitudes, competences, & capabilities to advance career prospects as a researcher.	5	95	100
I have the tacit and experiential knowledge accrued as a researcher;	19	81	100
I have the capability to build an identity as a researcher.	10	90	100
I have the capabilities to understand complex social and societal factors.	10	90	100
I have the individual leadership, administrative, and coaching capabilities.	14	86	100
I have the capabilities to critique disciplinarity.	17	83	100
My research team has the collective capabilities to perform collaborative and social practices with stakeholders in society;	2	98	100
I can take mutual accountability for research undertaken. ;	5	95	100
I have the capability to distribute ownership and leadership among project participants;	2	98	100
I have the interpersonal capability to reach collective consensus building and managing tensions;	5	95	100
My team and I have the capabilities to build new epistemic communities and cultures of evidence;	14	86	100
I have the capabilities for coordination of a TD project;	19	81	100
I have the capabilities to perform ontological work;	17	83	100
I have the capabilities to build and maintain networks.	5	95	100
I have the capabilities required to collectively perform scientific and technical work	2	98	100
I have the capability to publish in a disciplinary journal.	9	91	100
I have the capabilities to differentiate, reconcile and synthesize data and knowledge.	3	97	100
I have the capabilities to perform integrative work.	9	91	100
I have the capability of pluralism	10	90	100
I have the capability to acknowledge and communicate complexity	5	95	100
I have a capability for reflexivity	5	95	100
I have the capability to actively and critically interact with and challenge power	12	90	102
I have the capabilities to manage a research team	12	88	100
I have the capability to trust in collaboration	5	95	100
I have the capability to narrow the hierarchy in doing research with multiple actors.	5	95	100



Reliability result

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.761	.766	11

Inter-Item Correlation Matrix

Ind I have the skills, aptitudes, competences, and capabilities to advance career prospects as a researcher.	1.000											
Ind I have the tacit and experiential knowledge accrued as a researcher;	.788	1.000										
ind I have the capability to build an identity as a researcher.	.329	.106	1.000									
ind I have the capabilities to understand complex social and societal factors.	.333	.460	.164	1.000								
ind I have the individual leadership, administrative, and coaching capabilities.	.141	.360	-.046	.313	1.000							
ind I have the capabilities to critique disciplinarity.	.405	.375	-.041	.248	.449	1.000						
ind I have the capability of pluralism	.082	.181	.036	.337	.326	.186	1.000					
ind I have the capability to acknowledge and communicate complexity	.127	.242	.034	.269	.530	.090	.464	1.000				
ind coll I have the capability to actively and critically interact with and challenge power	.054	.072	-.218	-.074	.418	.290	.398	.333	1.000			
ind coll I have the capabilities to manage a research team	.280	.330	-.085	.110	.328	.000	.465	.321	.422	1.000		
ind I have the capability to trust in collaboration	-.080	.100	-.024	.352	.262	-.037	.635	.428	.103	.157	1.000	



Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.857	.854	11

Inter-Item Correlation Matrix											
coll My research team has the collective capabilities to perform collaborative and social practices with stakeholders in society;	1.000										
coll I can take mutual accountability for research undertaken. ;	-.044	1.000									
coll I have the capability to distribute ownership and leadership among project participants;	.167	.466	1.000								
coll I have the interpersonal capability to reach collective consensus building and managing tensions;	-.098	.548	.156	1.000							
coll My team and I have the capabilities to build new epistemic communities and cultures of evidence;	.233	.477	.338	.540	1.000						
coll I have the capabilities for coordination of a TD project;	-.015	.490	.240	.633	.560	1.000					
coll I have the capabilities to perform ontological work;	.209	.362	.252	.210	.481	.414	1.000				
coll I have the capabilities to build and maintain networks.	-.032	.446	.433	.537	.608	.593	.389	1.000			
ind coll I have the capability to actively and critically interact with and challenge power	.303	.391	.252	.273	.244	.343	.360	.106	1.000		
ind coll I have the capabilities to manage a research team	-.067	.642	.292	.526	.241	.529	.185	.421	.422	1.000	
coll I have the capability to narrow the hierarchy in doing research with multiple actors.	.233	.298	.147	.623	.503	.384	.403	.591	.535	.311	1.000



Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.674	.670	3

Inter-Item Correlation Matrix

cog I have the capabilities required to collectively perform scientific and technical work	1.000		
cog I have the capability to publish in a disciplinary journal.	.306	1.000	
cog I have the capabilities to differentiate, reconcile and synthesize data and knowledge.	.327	.577	1.000