FRACTAL Learning Retreat

16-18 October 2019

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Learning retreat process

Introduction

The FRACTAL team successfully secured funding for a costed extension (October 2019-March 2021) to answer questions of scaling associated with transdisciplinary co-production for (urban) climate resilience in (southern) Africa, most notably those of sustaining and streamlining. Through the activities proposed in the costed extension, the team aims to produce knowledge on *inter alia:* i) suggestions for scaling or replicating different transdisciplinary co-production approaches and techniques that have been implemented in the first phase of FRACTAL; ii) actions to enhance sustainability of climate resilience learnings from these techniques; and iii) potential indicators for monitoring the effectiveness of various transdisciplinary co-production and co-exploration processes.

The team trialled a set of virtual methods during a 'virtual learning retreat' to reflect on the body of evidence produced during the first phase of FRACTAL (2015-2019), help consolidate key learnings and set in motion the activities of the bridge funding phase described above. This retreat was a key milestone in the lifespan of the project and will hopefully contribute to a more effective costed extension phase.

The event took place over three days (16-18 October 2019) with the overarching objectives to:

1. Reflect on FRACTAL learning to date, consolidate lessons and identify gaps related to producing and disseminating knowledge;
2. Plan the research design and methodology for the costed extension phase, and think about the scoping report structure; and
3. Discuss roles and responsibilities for the extension phase.

This report provides information on the design and outcomes of the retreat, as well as decisions that were taken and next steps.

Preparation for the retreat

FRACTAL team members from CSAG, ICLEI, Aurecon, UK Met Office and SEI designed the retreat with the aim of supporting involvement of stakeholders across cities. Several approaches, technologies and methods were used before and during the retreat to contribute to this aim, including those described below.

- Development of resources that guided each day, including an overarching guidance document that provided general information for the retreat and each day, as well as a set of questions to guide activities for each day. These resources were available in the FRACTAL Google Drive folder but were also distributed to all participants leading up to the retreat.
- Zoom platform was used for introductions and framing each day at the beginning, as well as reflections and consolidation of what had been generated at the end of each day.

- Email was used for communication about the retreat and to share resources before and during the retreat.
- Google Docs was used for consolidating the ideas, questions and reflections that were generated. A structured Google doc was created for each day, into which participants contributed ideas, information and critical reflections based on the guidance and questions in the overarching guidance document.
- A dedicated Slack channel in which participants posed questions, got in touch with one another, suggested improvements to the retreat or posted messages to keep morale up.
- Whatsapp was used so that participants could reach the retreat convener with any queries or suggestions.

Learning retreat methodology

The learning retreat agenda is provided in Annex 1. All three days of the retreat followed a similar structure; participants were provided a few hours in the morning to tend to their own work after which they would meet in a virtual kick-off plenary to set the objectives for each day, then move into personal reflection/planning time, and finally, share ideas in virtual plenary again. The kick-off plenaries on the second and third day involved lengthy discussions recapping the information that had been generated the day before, with some participants who had not been present adding information.

All reflection and planning activities during the individual work time were guided by a set of questions for each day, and ideas and information generated were put into a centrally located documents on the shared FRACTAL Google Drive. Supporting resources, such as outputs that have been produced during FRACTAL and team meeting reports, were shared with participants before the retreat. All guidance material was emailed before the retreat to support those participants who struggled to maintain internet connection; these participants had the option to email their inputs back to the coordination team at the end of each day (alice@csag.uct.ac.za). The material was also downloadable from the FRACTAL Google Drive. Individuals and groups were encouraged to record and share writings, mind-maps, drawings that preceded their inputs to the shared Google Docs through the Slack virtual retreat channel, email etc.

Day 1: reflecting on FRACTAL learning to date, consolidating lessons and identifying gaps related to producing and disseminating knowledge

The first day helped to establish a 'birds-eye view' of the major learning themes and outputs that have been produced during FRACTAL phase 1, as well as to identify gaps in products and/or dissemination processes to share these learnings and update our "FRACTAL theory". The discussions and exercises were supported by a draft set of FRACTAL learning themes (in matrix format – developed by the retreat design team) as well as the Theory of Change (ToC) that was produced near the beginning of the project.

Chris Jack (CSAG) kicked off the first day with a virtual ice-breaker, asking team members to share some information on how they were feeling by typing into the chat box function on Zoom (rating stress levels, interest, confusion etc. from 1-5). Chris then provided a broader framing for the learning retreat, posing the question of "what are we trying to do here?" He mentioned that FRACTAL has been praised as being "groundbreaking", "impactful" and "the gold standard" and the retreat would help reflect on several critical questions: Why is this so? What made it work? Have we made mistakes from which we can learn? Where do we go from here? What do the answers to these questions mean for our conceptual thinking, our research, our practice and for the funders? He encouraged participants to keep these questions in the back of their minds throughout the retreat. All participants then agreed on the objectives and process for the retreat, as well as those of the first day.

Chris provided an overview of the original FRACTAL ToC, describing each impact pathway and outcome that was originally expected. He reminded participants that although the ToC is useful, it presents impact pathways in a fairly linear fashion, while project, activity and impact pathways are generally much messier in practice. He mapped several key themes and work areas to the ToC outcomes, namely distillation, Climate Risk Narratives (CRNs), targeted modeling, capacity, receptivity, culture shifts and relationships.
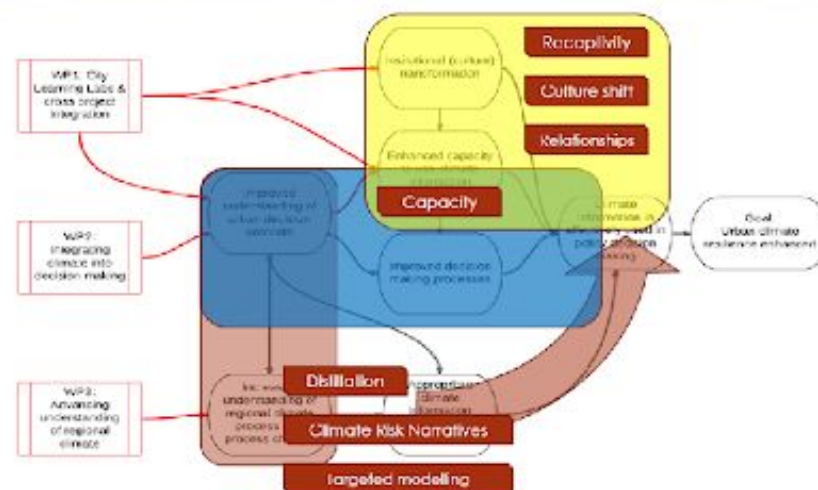
Slides that were shown during the kick-off plenary can be found here.

Individuals then moved into individual/group reflection time to review and contribute to major FRACTAL learning themes, consider how FRACTAL has contributed to the pathways to impact in the ToC, as well as identify gaps in knowledge products and dissemination

processes to share lessons. Each person/group was guided by a common set of questions and participants added their contributions to the "shared consolidation document" on the Google Drive. Apart from the guiding questions and shared consolidation document, the reflection exercise was supported by resources that have been developed during FRACTAL including impact stories developed for DFID annual reporting, a description of case studies to date, a list of outputs and any other resources on the FRACTAL website.

At the end of the individual work time, participants met again in virtual plenary to share information and ideas that had been generated, as well as reflections on the process of the day.

The virtual retreat organiser spent some time after the closing of the first day to consolidate the findings into a 'neat' overview for the kick-off of the second day, which would very much build on these findings (see Findings and Outcomes section below for details).

Day 2: planning the research design and methodology for the costed extension phase, and drafting a learning and scoping report structure

On the second day, participants were provided an opportunity to better articulate the methods, capacities, skills, techniques or processes that will be explored during the costed extension (based on the learning themes and evidence consolidated on day 1, and consider questions the team intends to contribute to, as well as contextual factors that should be taken into account in different cities.

Similar to day 1, the day began with a virtual plenary, during which the team recapped the outcomes from day 1 and set the objectives for day 2. Anna Taylor (CSAG) kicked off with a virtual icebreaker, during which participants were asked to answer one of two questions: If you were to write the FRACTAL play or book, what would your title be? Or, if you had to select one item to place in a time capsule for future climate resilience facilitators, what would it be? Participants provided the ideas described below.

- Anna T decided she would write a play with the title "Coming together to face the future: people, information and tough choices".
- Alice's contribution was an input to a time capsule; in keeping with the theme of flexibility and dynamic processes, she was hoping to bury a recording of Richard Jones dancing to "Billy Jean is not my lover" (from the Lusaka Urban Caucus).
- Lapo wanted to answer both questions; the title of a book, which is "lit futures". She would like to bury the idea of targeted youth involvement.
- Chris' book would be called "Beyond pride and prejudice; an adventure into the jungles of complexity"
- Gilbert chose to share, as an artefact for future generations, the soft ball that has been thrown around for reflections during the Lusaka learning labs.
- Jess answered both; a book entitled "The world needs new ways of thinking and doing: FRACTAL pioneering these answers" and her artefact would be all the items for "Spilling the beans" (in case beans are not available in the future). She would also choose a photo of everyone working together to remind ourselves of the relationships we've built.

- Mzime would write a book with the title "How to do science differently: a case of hard climate scientists going mushy". It would be fiction drama and she would include all the main climate scientists as the main characters.
- Paulo chose to write a book with the title "The climate change shield".
- Richard stated that he and Gilbert had the same artefact in the time capsule. His book title was "FRACTAL: it's a family affair".
- Sukaina's artefact was the same; the ball and the climate information box of evidence (with all the interesting conversations and insights from FRACTAL added). The first title that came to mind when she thought of a film was "Mission Impossible".
- Tammy had the same idea as Sukaina; she would also include the climate evidence box – the exercise did not work out exactly as planned, but Tammy thought this was appropriate as most other sources of evidence (apart from climate science) ended up going in the box.
- John put forward a book title "FRACTAL: Tupoyeni science and society". John would like to dedicate the book to Di Scott as the champion of the third space.

After the recap of findings from the first day (see Findings and Outcomes section), Alice provided an overview of the costed extension proposal, as well as roles and responsibilities that had already been defined during the development of the proposal.

Participants then moved into personal/group planning time to deeply consider the methods, capacities, techniques and processes that will be explored in the FRACTAL costed extension phase, the factors that should be taken into account in different cities, as well as the most effective means to share lessons that will be generated during the costed extension. Similar to day 1, each person/group was guided by a common set of questions and provided input to the "costed extension research design and plan" and "learning and scoping report" Google doc if they had time. Apart from the guiding questions, costed extension research and design plan, and the learning and scoping report, this planning exercise was supported by the following resources; i) shared consolidation document produced on day 1; ii) costed extension proposal; iii) costed extension administration document; and iv) sustainability plans.

For activities associated with the "research design and plan" questions, individuals or groups focused first on those activities that are relevant to them or in which they will be most actively involved (e.g. Genito might choose to focus first on the questions related to sustainability activities in Maputo and contribute to relevant sections in the research design and plan), after which they moved to other activities of interest to them.

At the end of the day, participants met again in virtual plenary to share information and ideas that had been generated, as well as reflections on the process of the day. The virtual retreat organiser also spent some time after the closing of the second day to consolidate the findings into a 'neat' overview for the kick-off of the third day.

Day 3: signing off on roles, responsibilities, accountability and next steps

The third day provided an opportunity for participants to discuss roles, responsibilities and next steps for the costed extension phase, based on reflections and consolidation from day 1, and planning from day 2. The conversations on day 3 built on the planning that had already taken place during the development of the costed extension proposal.

The third day was shorter than the previous two, and team members remained on a Zoom call for the duration of the meeting. Alice McClure (CSAG) hosted a virtual icebreaker, during which participants marked a green "tick" next to their name if the statement that Alice read was true for them. The statements that Alice made were: i) for those who've had more than one cup of coffee, use the tick button; ii) for those who are already thinking about lunch, use your tick button; iii) for those who can see the sun shining outside their window, use the tick button; iv) for those who have already listened to some music this morning, use the tick button; v) for those who are feeling excited about the next 18 months, use your tick button; and vi) for those who are feeling anxious about the next 18 months, use your tick button.

Thereafter, Alice provided an overview of the discussion that had taken place the day before. The team engaged in many discussions related to activities for the costed extension, as well as roles, responsibilities and scope of work (e.g. days allocated for partners).

After these plenary group discussions, the team moved into two virtual breakout rooms; one to discuss governance for the costed extension and another to discuss the structure and content of the scoping and learning report (the team did not have time for this discussion during the second day). The groups then met in plenary to provide feedback and close with a short reflection on the whole learning retreat process.

Reflections on the virtual retreat

The following reflections on the learning retreat have been consolidated from insights shared by the team at the end of the first, second and third days. To read individual reflections, see Annex 2.

- An overwhelming amount of information had been shared in preparation for the retreat. The virtual environment required team members to work between several online documents, to keep a large amount of information at their fingertips and to exercise new technology skills; this was a fairly different experience to ways in which participants traditionally engage in team meetings of workshops. Having all material in electronic versions (guidance, google docs for inputs and resources) makes it quite difficult to navigate and keep the strands together; one needs several screens to manage this.
- Several participants found the process much more enjoyable and easier than they had anticipated.
- Participants became more comfortable with the process as time went by.

- Everyone contributed to one document on day 1 and day 2, which helped build an overarching picture. Constant commenting in the shared Google docs helped spark ideas and collaborative work with one another, even though the exercises were individual.
- The solitary nature of the exercises allowed for an unbiased expression of ideas and thoughts.
- It can be intimidating to provide input to the shared Google doc, especially if one spends time working on other tasks and returns to the activity once others have provided lots of input.
- The large chunk of personal time between the plenary sessions introduced an element of flexibility; people could contribute when they had time while working on other important issues.
- It is, however, difficult to deal with distractions in home workspaces; for example, people knocking on your door. Working through the questions and Google docs requires discipline.
- In terms of climate science, distillation and the climate risk narratives dominated the discussion; there was a lot of other climate science that was done but it was difficult to bring this into discussions during the retreat.
- The process was less structured than was originally planned; people bounced between various elements of the shared Google docs instead of working through the questions and adding corresponding inputs in the Google doc.
- For the first day, especially, a space was created for critical reflection on the FRACTAL work: What impact have we seen in cities and how can we be sure of this? What evidence suggests this? This is imperative before moving into the costed extension.
- The fact that the team knows each other well underpinned the success of the event; the face-to-face engagements are therefore very important and cannot be replaced.
- A recommendation for "middle ground" between virtual and face-to-face events was made; providing some funding that allows participants to get away from their offices, while not flying to other countries. This mechanism would allow people to move from their current situation, in which they are distracted by their duties.
- The laughter and humor were important elements of the process.
- Everyone participated well in the process and was allowed to contribute equally; this is different from an environment that can be dominated by a few people.
- The preparation for these types of events is key.
- Team members wished the meeting had taken place face-to-face but agreed that the virtual retreat was a good second option. They would definitely like to undertake more virtual meetings.

Findings and outcomes

Consolidation of lessons from first phase of FRACTAL

Major learning themes from FRACTAL

The draft set of major learning themes from FRACTAL, which had been produced by the virtual retreat organising team, were validated, interrogated and further developed during the virtual retreat. The outcome of this exercise is described below; the understanding of these themes based on FRACTAL experiences (theoretically and practically), as well as information that still needs to be shared about these themes.

Climate information distillation

"The extraction of the essential meaning and most important aspects of something"

What has been seen, learned and produced

Key since the proposal phase was how to distil context-relevant, actionable, robust climate information at relevant decision-making scales from a plethora of sources. This concept has been further developed through experiences in cities and in the climate information cluster. Drawing on city learning experiences, a framework has been developed and tested to support transparent co-generation and development of meaning out of multiple sources of climate (and other) information for decision-making.

Practically, distillation has been demonstrated through the city learning lab processes in the first phase of FRACTAL, during which real climate information needs were identified by city technocrats and other stakeholders (e.g. to increase water security).

The main outputs that have been developed within this learning theme are: a set of Climate Risk Narratives (CRNs) for six FRACTAL cities, a set of CRNs for sites in the HyCristal project, a climate information distillation working paper, a briefing note on what climate information distillation is and why we need it, as well as a case study paper on climate information services in Harare.

What still needs to happen

To better capture or disseminate the concept of distillation, the FCFA synthesis product on distillation needs to be finalised and shared, as well as the 2-page impact story. Several case studies should also be written up to describe the process of distillation including: i) how climate information content was interrogated and used in Lusaka and Windhoek; and ii) the process of producing Lusaka extreme

rainfall modelling for drainage design. A technical brief on the Lusaka/Kafue WEAP work by Aurecon should also be produced and shared.

The team acknowledged that there is still some confusion around the concept of distillation, most notably in terms of boundaries; what constitutes distillation and how is this different from a similar process for climate resilience that would not be considered distillation? This needs to be interrogated in the costed extension phase.

Receptivity

"A way of understanding what is needed for people to be able to open themselves up to engaging with and assimilating different perspectives, frames of reference, values and interests that others bring. Receptivity goes further than simply opening up. Receptivity entails actively and critically reflecting on one's own knowledge and that offered by others (i.e. recognizing various assumptions and framings). This forms the basis for expanding or enhancing one's ability to make less partial, narrow judgements, and to shift one's practices and actions based on a broader view of the system and what changes are underway and are sought (by individuals, organisations and collectively)" (Scott and Taylor, 2019)

What has been seen, learned and produced

The concept of receptivity emerged inductively through experiences in cities, with participants observing and reflecting on the benefits of hearing multiple perspectives during the learning labs and other engagements. Increased receptivity has been observed and expressed by many different participants of these processes; to understand the frames of reference for those contributing to decisions in cities, as well as the various forms of research disciplines.

At a practical level, an example of receptivity was demonstrated during the "Spilling the beans" game that was developed as an output of FRACTAL. During the game, various ways of understanding resilience were interrogated and shared.

A working paper has been developed to explain the concept of receptivity and a shorter impact story is under development.

What still needs to happen

A suggestion was put forward to develop a receptivity self-assessment guide that can be used to explore this concept during the costed extension.

Transdisciplinary co-exploration and co-production (for urban climate resilience)

What has been seen, learned and produced

The ethics implicit in these processes support new ways of working together to deal with complex, emergent problems, bring stakeholders with relevant knowledge and decision-making power together to understand the problem from many perspectives and prioritise solutions, knowledge and information. These concepts have been at FRACTAL's core since the proposal stage and the team is now in the process of articulating how city learning experiences have influenced the understanding of these concepts.

Practical examples of transdisciplinary (TD) co-production during the first phase of FRACTAL include *inter alia* co-development of CRNs and city-specific Climate Capacity Diagnosis & Development (CaDD) processes. The learning labs in cities are also all examples of transdisciplinary processes, during which several knowledge outputs were co-produced. In terms of co-exploration, several "aha" moments have occurred in labs between climate scientists and planners, decision makers and other participants, allowing new and better questions to be framed. Such moments also occurred through exercises such as the terminology game, Analytical Hierarchy Process (AHP; part of the work on structured decision-making methods), systems mapping, role plays, climate information spectrum, unpacking climate information box etc.

A working paper entitled *Transdisciplinarity, co-production, and co-exploration: integrating knowledge across science policy and practice in FRACTAL* has been produced, as well as *Unpacking the learning lab approach*.

What still needs to happen

Still to be produced within this theme is: i) a final version of the learning paper; ii) the embedded researcher journal article; iii) a brief and paper on a framework to co-produce climate services; iv) an updated working paper on the learning lab approach based on lessons learned from FRACTAL; v) a journal article on transdisciplinary co-production and co-exploration for urban climate resilience; and vi) a paper on co-exploration in practice.

Capacity development for urban climate resilience

What has been seen, learned and produced

The importance of capacity development at both at individual and institutional levels emerged through FRACTAL, as well as a richer understanding of the capacity required for dealing with climate change issues in southern African cities. The preparation for the costed extension has supported greater reflection of this concept as there is a strong focus on ensuring the TD co-production process in cities.

There are very many practical examples of capacity development activities that have been implemented during FRACTAL including transformative leadership trainings at different decision-making levels (councillors, Strategic Executives, etc.), CaDD work led by SEI with Windhoek Water Dept and bespoke capacity development workshops (e.g. accessing and interpreting climate information in Windhoek). Anecdotal evidence also exists of increased capacity for working in fields related to urban climate resilience, such as the growth of the Early Career Researchers (notably the embedded researchers), as well as the capacity, confidence and knowledge that was built through games and exercises in the learning labs.

Impact stories have been developed on several processes for developing capacity including the importance of relationships and networks, FRACTAL city learning lab approach and co-exploring decision-making processes.

What still needs to happen

There is a need to develop more focused outputs related to capacity development exercises such as the transformational leadership workshops and bespoke training exercises. There is also a need to consolidate the material that was used for capacity development during the first phase of FRACTAL so that this can be applied in the costed extension (e.g. slide decks). Similarly, several support materials should be developed to guide capacity development activities such as: i) the learning lab facilitation guide; ii) the 2-pager on methods and accompanying facilitation guides (AHP, CaDD, Vote with your feet, decision scaling, etc.); iii) the Multiple Streams Framework brief (to support Windhoek water masterplan).

Learning about learning

What has been seen, learned and produced

We describe "what" we have learned through many other learning themes above. The "learning about learning theme" focuses more on the "how": How did these learnings come about? Were there particular aspects, exercises or attitudes that were required for these learnings to emerge? This learning theme is therefore strongly connected to "the process", which has been so important in the first phase of FRACTAL. The need to unpack and perhaps even theorise these processes (associated with TD co-production for dealing with complex problems) has emerged during the project. There are strong linkages between "learning how to learn", capacity development, TD co-production and co-exploration and receptivity (see stylized image below that was created during the retreat). Learning and reflection were included in the project proposal and have remained important throughout, and many activities that were implemented in FRACTAL (e.g. the learning labs) were focused on learning how to learn; how to be iterative, reflexive and allow for emergence. The experiential learning aspect has also emerged as an important part of the learning process, which needs to be well documented.
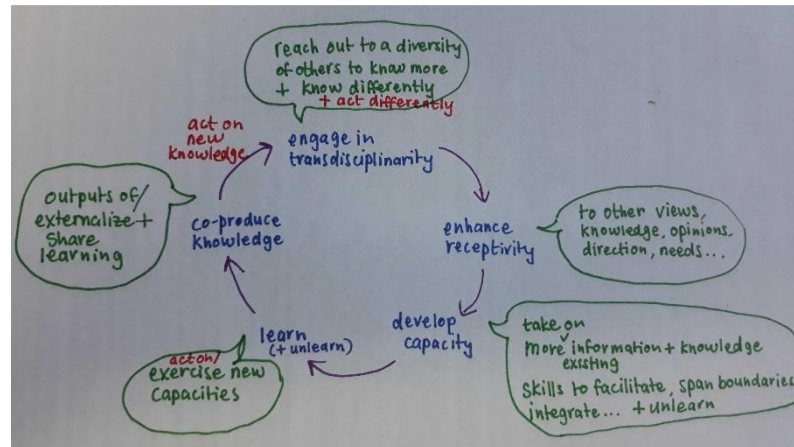
Similar to the capacity development theme, several impact stories that link closely to this learning theme have been developed (e.g. importance of relationships and networks, FRACTAL city learning lab approach and co-exploring decision-making processes), as has a paper on city-to-city exchanges.

What still needs to happen

Data that indicates the value of the process for those involved have been collected (i.e. quotes from interviews and reflections); more outward-facing, easily digestible products should be developed based on these data to share messages about "learning how to learn" (e.g. podcast or catchy brief). A question that needs to be considered when developing outputs is; how can we make these learnings tangible and practical so that other people understand the "magic" of FRACTAL? A suggestion was put forward that we clarify what learning constitutes for the FRACTAL costed extension at the very beginning, as well as how we might measure this, even if it's through qualitative exercises.

Urban climate resilience

What has been seen, learned and produced

The concept of resilience was used in the proposal and has been the longer-term impact/goal shown in the FRACTAL ToC since this time. The concept has been unpacked and explored through FRACTAL (e.g. "spilling the beans" game) and many of the learning themes contribute to building resilience in African cities by supporting consideration of climate change in planning and development. Several outputs related to resilience have also been developed, such as the city resilience think piece and a conference paper on principles for

building resilience (along with a supporting video). However, the team feels quite strongly that not much has been learned about urban climate resilience as an outcome or goal (i.e. what this should look like).

What still needs to happen

Since urban climate resilience is the goal of FRACTAL, an idea was put forward to use this framing at the beginning of activities during the costed extension; to collaboratively define urban climate resilience with stakeholders in the first learning lab and consider how the 'burning issues' map onto this.

Decision making shaping African city regions

What has been seen, learned and produced

One of FRACTAL's main aims was to better understand decision-making that relates to climate change and climate change issues (e.g. water or other resources) in southern African cities, as well as the connections between the city and the region in which it is located. The urban governance work, as well as engagements in learning labs, helped all participants (including those living in cities) to better understand urban decision contexts in southern African cities. For example, much decision-making power affecting cities still resides with the national government, as well as the globalized private sector, and so their receptivity and engagement in distillation activities needs to be enhanced. The team also noted that the decision landscape in southern African cities is strongly linked to finance.

Outputs have been produced from the urban governance work (e.g. the governance working paper, as well as a set of briefs), the Blantyre-Harare SOG project to support multi-stakeholder platforms to explore decision-making pathways related to issues of water under a changing climate (brief) and the innovation think tank project, which aimed to better understand the perspectives and values that underpin decision-making in southern African cities (implemented in Blantyre, Harare and Lusaka).

What still needs to happen

The full suite of lessons related to "Decision-making shaping African city regions" (e.g. connections between scales of government, influences of decisions on resources, etc.) have not been captured adequately in FRACTAL outputs. Effort needs to be dedicated to this during the costed extension phase.

The team should also consider how to track the decision-making landscape over time to better consider climate variability and change as a result of FRACTAL activities (see the section on learning and sharing lessons).

FRACTAL theory, impacts and outcomes

While major learning themes were being interrogated, the team also revisited the FRACTAL ToC (or FRACTAL theory) (see figure below) to unpack how major learning themes influenced understanding of the 'FRACTAL theory', as well as ways in which the first phase of FRACTAL has (or has not) contributed to impact pathways. The team reviewed the six outcomes as shown in the ToC with a critical eye, namely: i) institutional (culture) transformation; ii) enhanced capacity to use climate information; iii) improved decision-making processes; iv) improved understanding of urban decision contexts; v) increased understanding of regional climate process and process change; and vi) appropriate climate information available to decision makers.
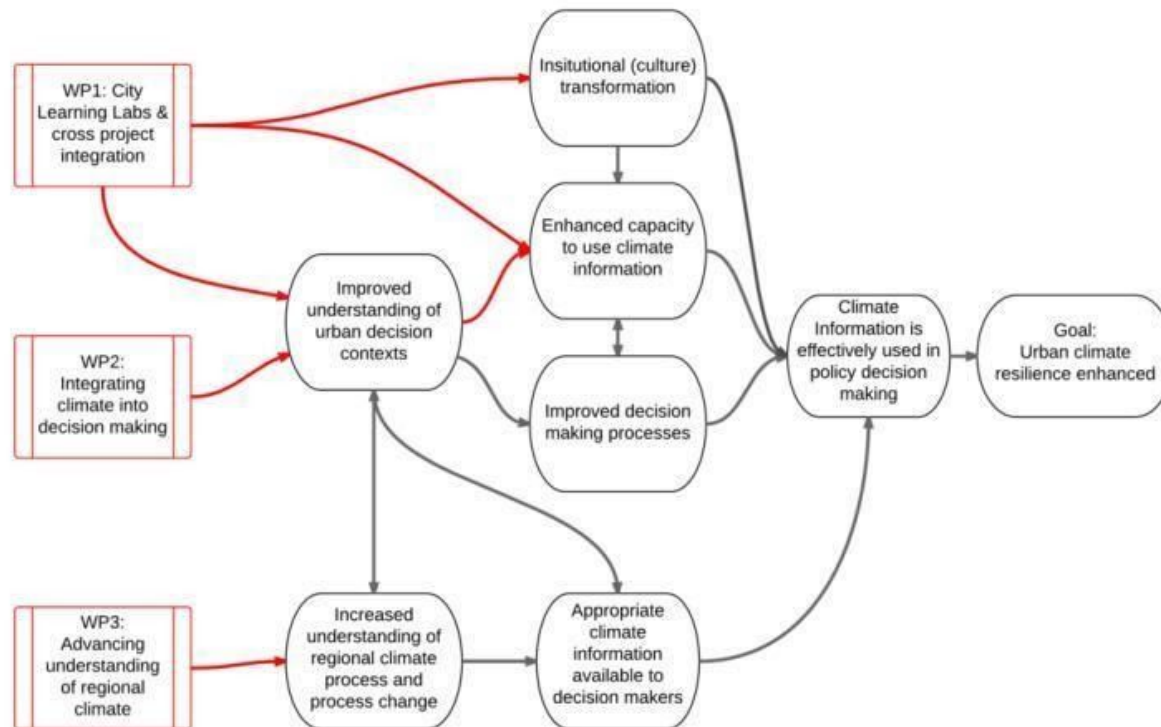
Institutional (culture) transformation

Several partners described how they have seen this outcome as a result of FRACTAL activities, relationships and conversations. The cultural change that was discussed pointed to increased openness to other ideas, inputs and new ways of doing things, an increased valuing of diversity, a culture of inquiry, reflexivity, sharing, learning, collaborating and transdisciplinarity.

As examples of the above, climate and climate change are considered cross-cutting issues in Lusaka and climate change is mainstreamed in key city development policy documents and strategies. Lusaka City Council (LCC) is more comfortable with ideas and terminology related to climate change and associated information and are thus able to make more informed requests for information. UNZA has received several requests for climate change projections. An ongoing project in Lusaka (e.g. Lusaka Water Security Initiative – LuWSI) is explicitly requiring a climate component and the intention is also to develop local area plans that integrate climate information. According to Gilbert Siame, city PI in Lusaka, a hunger to understand more has been institutionalised in the city of Lusaka.

In Windhoek, representatives from the municipality have expressed a strong desire to include "co-learning" spaces in their ongoing climate change work as a result of the benefits experienced from FRACTAL learning labs. Maputo municipality has requested ongoing support from Eduardo Mondlane university to develop an urban resilience hub within their functioning. The cultural shifts in research groups were also acknowledged but need to be further unpacked during the costed extension.

The issue or question of scale was surfaced during the discussion about "Institutional (culture) transformation" with several critical questions posed: What is the relationship between individual, organisational and institutional shifts or transformations? What is the connection between mindset and behaviour change? This question was raised because although there is anecdotal evidence that suggests shifts in people who have participated in FRACTAL, cities and municipalities are somewhat locked into a particular way of working. If FRACTAL has contributed to mindset shifts in individuals and we cannot say we have shifted organisational or institutional ways of working, is the high staff turnover not a big problem? The team also had a conversation about the concept of 'transformations' and what exactly this means; a comment was made that perhaps transformation, as understood in the literature, is a big ask and evidence from FRACTAL suggests that incremental changes have contributed to beneficial and substantial shifts. Gilbert provided good examples of ways in which incremental changes are contributing to a transformation in terms of how climate change is considered and dealt with in Lusaka. Team members suggested that these small shifts and bigger, transformative changes should not be seen as two, very different types of change. It was also suggested that the FRACTAL team positions themselves in the discourses about incremental and transformative change, which are happening at various scales as everyone is trying to understand what transformation means.

Enhanced capacity to use climate information

The team had a discussion related to what this outcome means in practical terms and how it was imagined near the beginning of FRACTAL. Experiences in the project point to the fact that this outcome needs to be expanded. "Use" should be replaced with "interrogate, (co)produce and apply climate information". A question was posed about evidence for this outcome from FRACTAL and, linked to the outcome described above, whether FRACTAL has contributed to enough of a culture shift so that climate change information can be interrogated, (co)produced and applied despite the political, financial and human resource challenges in cities.

Partners from universities described how new relationships (e.g. between the Met Office and the municipality) allow for this, as well as the new proactive approach of (e.g. Gaborone) municipalities when it comes to climate change issues, to which they claim FRACTAL has contributed. A suggestion was made to consider changes associated with this outcome at different time intervals. In the short term, it might be difficult to tell if municipal representatives have increased capacity to use climate information but that, as described above, the local authority might have increased capacity, relationships or confidence to start interrogating what information is needed from the Met Office. An example of Windhoek was provided; there is quite a lot of interaction between the Met Office and City of Windhoek (CoW). In Gaborone, the city has requested a policy forum during the costed extension phase. This indicates a mindset shift (connected to culture shift) because at the beginning of FRACTAL, the City of Gaborone had no interest in climate change; they thought it was a mandate of the national institution and that they should wait to receive information and actions planned from the national level. Now, at the end of the first phase of FRACTAL, the City of Gaborone takes responsibility for climate change issues alongside the national body and are hoping to include climate change information in their own plans.

Based on the evidence above, a suggestion was put forward that the FRACTAL team develop metrics to capture changes at these two different time intervals;

1. Initially: the interest shown (asking for information) and willingness to use the information initially. Because of FRACTAL engagements, city representatives are currently grappling with understanding *how* climate change information might be mainstreamed into their policies and plans.
2. In the longer term: city technocrats and councillors will hopefully acquire climate change information and be able to integrate into policies, plans, building, construction, etc. In this next interval, FRACTAL should support different people to use and integrate the information. The Met Offices in cities should also be proactive and check who can benefit or what climate information people might use for different mandates.

A decision was taken to write up case studies that demonstrate how climate change information has been interrogated, (co)produced and applied through the FRACTAL project, as practical examples and evidence for other cities in similar positions. These case studies

should contribute to answering questions related to how this was done and what others can learn from these cases. A suggestion was also put forward to provide examples of ways in which climate information can be used in decision-making, and the potential outcomes from this. The last suggestion made was to continue the discussion related to expanding the CSAG Winterschool model. This Winterschool should include content on what has been unlearned and learned through FRACTAL, as well as how to take these learnings forward.

Improved understanding of urban decision contexts

See learning theme "Decision-making shaping African city regions".

Increased understanding of regional climate process and process change

Climate scientists in the team described how much of the FRACTAL work focused on explaining and unpacking apparent contradictions, as well as methodological and conceptual approaches; interrogating how scientists can make more confident statements about the future, based on the available evidence. Team members aimed to do this by interrogating the evidence base in a more focused way to provide information in which they are confident. There was agreement within the team that this outcome needs some restructuring... There is still scope for part of the process of change to include: improved understanding of fundamental climate science; what the team is grappling with from the first phase of FRACTAL; how to do this in a way that contributes to distillation (i.e. resulting is useable climate change information for decisions) and not only to science. There is a need for more brainstorming around this within the team.

Appropriate climate information available to decision makers

It was acknowledged that this outcome is strongly linked to the outcome on "improved decision-making processes". Decision makers in any city comprise a large, homogenous group of people and the team has noticed in the first phase of FRACTAL that climate information will likely be more relevant to a particular group of decision makers than others (e.g. Climate Risk Narratives were useful for some participants of learning labs and not others). The various mandates of decision makers link to different types of climate change information for different decisions. The different stages of planning within one group might also call for different types of climate change information.

In summary, the type of decision being made, as well as the stage of planning, needs to be well understood before appropriate climate information can be made available. Based on the discussion around this outcome, the team reflected on the extent to which they are comfortable with developing climate information products that are generic enough so that other people who have not been part of the process can use them. The value of engaging in a co-production process seems huge, particularly in terms of participants connecting with appropriate climate information. However, the team acknowledges the challenges associated with only (co)producing information

and value for those who have been involved in the TD co-production process. The team challenged themselves with a question: How can we produce an output that people do not think is the final answer, but rather they are motivated to interrogate the products, as well as the process of producing these products.

Again, the importance of writing up the case studies as evidence was emphasised as these provide various examples of how "appropriate" climate information was made available or co-produced in different contexts in FRACTAL cities. Several people in the team are thinking about how they can usefully consolidate the work that happened in Windhoek with regards to interrogating climate information, different scenarios, different trainings etc. so that those who have not been part of the process can build an understanding. The focus of these case studies will be less on the processes that were implemented and more on pulling out key content from the process.

An idea was put forward to attach metadata-type information to climate information products that have been and will be produced and applied; perhaps the FRACTAL contribution and consistency across cases can be metadata standards (i.e. what information should be included in the metadata). The metadata would probably include aspects such as references to the processes that have been implemented to understand the context, ways in which content was generated etc. Another important consideration is the "value" of climate change information that is realised during co-production; those who have been part of the process have seen the value of the climate information, so how can we create that value with people who have not been part of the process?

The team noted that the discussions and questions raised were core to the concept of distillation, which should help answer the question "how do we know if the climate information is appropriate?"

Improved decision-making processes

The team discussed what is meant by the term 'improved', asking questions related to how we judge this. In light of the learning theme above, the following suggestion was put forward; improved decision-making processes are those that are more collaborative, democratic and inclusive, based on a deeper/stronger evidence base, and robust against a range of future scenarios.

In terms of tracking if decision-making processes have improved, a suggestion was put forward for the team to revisit the knowledge that was generated through the decision-making and governance work from the first phase of FRACTAL to consider how decision-making processes have changed. For example, in Windhoek, three options exist to check whether decision-making processes have improved. The current situation could be compared with information in case studies that describe decision processes and provide some insight into how decisions are made (e.g. UJAMs and groundwater aquifer recharge). More practically, the team could also look at the original ToR for the Windhoek Climate Change Strategy and Action Plan (CCSAP) and compare original plans for the CCSAP and the

Integrated Climate Change Strategy and Action Plan (ICCSAP) as a result of FRACTAL work. The same is true for Water Master Plan; if FRACTAL intervenes and the project unfolds differently, the outcome might be different from the original ToRs.

Anecdotally, several people involved in FRACTAL (Water department, SEs, etc.) have explained shifts in terms of how they think about approaching climate change issues compared to how they thought at the beginning of FRACTAL. The team has seen things like the CSAP become the ICCSAP (a more integrated approach), and the Strategic Executives have stated that they want to know more about what people are doing on the ground, which was not common before a more integrated approach. The costed extension phase might provide an opportunity to establish, more rigorously, what these shifts in decision-making processes were so we should introduce more structure to the way in which assessments are made.

Related to this outcome, the "formal decision-making methods" (i.e. formulaic steps that provide options and guidance for making robust decisions) that were trialled in FRACTAL did not prove very successful in the first phase of FRACTAL, at least in terms of the intended outcomes. The methods (Analytical Hierarchy Process for example) did lead to different outcomes; not to prioritise adaptation options or screen options towards implementation, but to provide a process for deeper discussions. These methods allowed people to step out of their silos, understand different perspectives and start unpacking some drivers of decision making.

The team agreed that there is a need to understand the baseline with regards to decision-making processes in the costed extension, as well as a method for documenting change (see section on Learning and sharing lessons).

Outstanding knowledge products

Based on the activities undertaken to review, interrogate and consolidate major learning themes, FRACTAL theory and impact, several knowledge products were identified as outstanding; to be produced during the costed extension (see list below). Those responsible for producing these products are listed in brackets after each output.

1. Distillation synthesis product (Chris J)
2. Using decision scaling (or participatory robust decision-making) approach and/or Multiple Streams Framework example to support design and implementation of the Windhoek Water Supply & Sanitation Master Plan during the sustainability phase? - in finalization of Windhoek WEAP model (Rebecca I)
3. Receptivity paper (Di S)
4. Self-assessment guide (a simple tool) to notice and document when, how and why one's own receptivity is enhanced or reduced
5. Transdisciplinarity, co-production, and co-exploration journal article (Anna T, Di S, Anna S and Alice M)
6. Paper on co-exploration in practice (Sukaina B)
7. Learning lab manual (Learning lab working paper team – Bettina K lead)

8. 2-pager overview on methods and accompanying facilitation guides (AHP, CaDD, Vote with your feet, decision scaling, MSF) (SEI)
9. MSF brief (Anna T)
10. Experiential learning brief (Alice M)
11. African city region piece (Di S's governance work?)
12. Cases of decision-making (interrogating, co-producing climate knowledge) (Anna T, John M, Kornelia I and others – Windhoek; Gilbert S, Richard J, Bettina K and others - Lusaka)
13. Urban climate resilience framing (as a guide) (learning lab team)
14. FRACTAL resources (Slide decks, games, etc.) (CSAG)
15. Winter School model
16. Lusaka extreme rainfall modelling for Lusaka drainage design (UKMO)

Planning for costed extension

The FRACTAL team has been working on the design of the costed extension since May 2019 and have developed a proposal that was accepted by DFID, NERC and other members of the steering committee. The learning retreat allowed for team members to home in on activities in different cities and consider next steps based on the major lessons from the first phase of FRACTAL.

The costed extension activities fall within three broad objectives, as described below.

1. Scope the scalability of transdisciplinary co-production and co-exploration processes for climate resilience learning by implementing more streamlined approaches.
2. Support learning within the region to design and implement transdisciplinary co-production and co-exploration processes (capacity development).
3. Support the transition of the existing processes within Lusaka, Windhoek, and Maputo into a sustainability phase.

The planning during the learning retreat took place at a finer, activity-based scale.

Activities, opportunities & challenges

Several opportunities for streamlining processes across cities and activities, as well as increasing the effectiveness of these in the costed extension phase, were identified during the learning retreat. Many of these opportunities relate to lessons and information generated from the first phase of FRACTAL. These opportunities are described below.

- Use the distillation framework and 'climate evidence box' as a tool for distillation activities.
- Use resources that have been developed during the first phase of FRACTAL (slide decks, 2-pagers, etc.).

- Unpack where and how these TD co-production processes might be taken forward in existing governance structures, or whether space could be made for them.
- Be sure to share lessons from and with other FRACTAL cities.
- Track the change in decision processes as a result of FRACTAL interventions through participatory monitoring (including reflective and self-formulated indicators).
- For teams implementing sustainability activities (Lusaka, Maputo and Windhoek), bring someone on board to support the linkage and administration function (e.g. part-time student). The management team needs to be sure to allow for this in contracts[1].

City- or activity-specific opportunities are described below.

City learning labs and dialogues in Harare

Lead: CUT (co-lead is ICLEI and RCRCCC)

Support: UB, UM, CSAG, Met Office, SEI, Aurecon

The City of Harare has recently committed to the establishment of a climate change desk under the office of the Town Clerk. The decision presents an opportunity for FRACTAL to influence the ways in which climate change considerations are learned, actioned and institutionalised in the longer-term. The FRACTAL team in Harare attribute this decision partly to the first phase of FRACTAL, during which the activities described below were implemented.

- A START-funded Global Environmental Change (GEC) project that unpacked water and energy systems, urban governance and decision-making in Harare. The team found that "decision-making processes and policies that affect the water and energy sectors for Harare are archaic and need to be strengthened in order for the city to cope with, adapt to and build resilience to climate changes and if water and energy provision is to be efficient for now and in the future". The team visited Lusaka and Windhoek during the implementation of this project.
- A SOG project, which aimed to explore the existing decision-making pathways for the cities of Blantyre and Harare in the context of water-related issues under a changing climate. During the "learning labs implemented in each city, stakeholders identified opportunities and barriers to effective decision-making in the water sector based on selected decision case studies. Stakeholders also came up with recommendations on how to improve decision-making in the city to make the water sector resilient to climate change. A comparative analysis was also done between the city of Harare and Blantyre through city-to-city learning where Early Career Researchers (ECRs) from both cities attended each other's learning labs".

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[1] Raul, the focal point at Maputo Municipality has agreed to fulfil some of the linkage functions.

- A NERC-funded project to support the development of a city-region knowledge base and practitioner network in support of climate risk narrative co-production in Harare (aka NERC narratives project). This project aimed to better understand the ways in which stakeholders in Harare engage with climate narratives.
- A CDKN-funded project, during which think tanks were implemented to explore the values and perceptions that underpin decisions in Harare. This project unpacked the decision to upgrade Morton Jaffrays water works to do so, highlighting five issues related to decision-making in the city; crisis decision-making in the water sector, politics, overriding efforts by technocrats, policy and legislation challenges, muddled decision-making processes and limited financial resources.

Several other city-specific opportunities were acknowledged during the learning retreat. The Leading Integrated Research for Agenda 2030 in Africa (LIRA2030) project (*Transforming southern African cities in a changing climate*) is being led by CSAG and is exploring how concepts of transformative adaptation do or could land in southern African city contexts, with Durban and Harare as case studies. Representatives from the City of Harare are involved in learning labs for the LIRA2030 project and have visited Durban on an exchange. The project has a strong focus on ecological infrastructure to build climate resilience.

The *Improved Municipal Planning in African CiTies (IMPACT) for a climate resilient urban future* project is being implemented in Harare and Blantyre, with ICLEI as lead. The project investigates how enhanced collaboration mechanisms in municipal planning in African cities can enable climate resilient development. IMPACT has a strong focus on the Nationally Determined Contributions and linking municipal and national government (multi-level governance & finance). There's a chance that some travel budget for ICLEI could be covered under IMPACT.

The team acknowledged the political and socio-economic volatility in the country over the past while, which should be considered when organising and implementing activities. Another potential challenge is stakeholder fatigue associated with the various activities described above. Representatives from the City of Harare are involved in many projects while also being extremely busy with everyday work responsibilities. The budget limitations associated with the extension phase should also be considered and learning labs planned accordingly.

Several specific recommendations were made for streamlining the activities in Harare, as well as better understanding and unpacking change from FRACTAL. These are described below.

- Using the urban climate resilience framing at the beginning of the learning lab process (e.g. three horizons?)
- Begin with a thorough content (decision landscape) analysis and identify a relevant decision process (building on the information generated during the first phase).
- There are many youth groups who could be involved in the learning lab processes.

Policy dialogues in Gaborone

Lead: UB

Support: UNAM, CoW, ICLEI

The team in Gaborone has developed climate change narratives with city stakeholders through the NERC narratives project, thereby supporting initial discussions related to climate change. The team has also implemented a 4-day climate scenario and action workshop, which helped create a link between planning authorities and the Met Department. The City of Gaborone has requested support from FRACTAL in the costed extension phase to implement policy forums.

These forums will consist of a three-day meeting based on the findings from the scenario plans developed during the first phase of FRACTAL, to better understand their "destination" (goals) in these plans. The municipality would like to explore climate-related vulnerabilities for Gaborone, as well as ways in which existing planning processes and budget allocations can contribute to the goal (i.e. which budget areas and planning opportunities they can take advantage of). The city officials would like to develop a climate change framework that fits into planning and budget opportunities of the city. Included in this, they would like to develop a simple mechanism to get real and relevant information from the local Met Department. The team in Gaborone is hoping for lots of participation from the Met Office but would like support with the proper distillation process.

Elections were held during the week of 21 October 2019 so by the time the first meeting takes place in the costed extension phase, new political councillors will be in place and the environment committee will be new. This provides a good opportunity for developing capacity. Lapolang Magole, the PI in Gaborone, will further plan with David (focal point at the City of Gaborone) to understand which city partners to include, apart from the mayor who has been integrally involved.

The importance of including the youth in deliberations and planning was noted in the learning retreat.

Specific suggestions for streamlining activities, as well as better understanding and unpacking change from FRACTAL, are described below.

- Home in on a clear and fairly narrow policy domain/process (i.e. bound the focus), building on the first phase of FRACTAL.
- Apply lessons from Windhoek and other places such as Cape Town (through city exchange mechanism).

Dialogues to further develop narratives in Blantyre

Lead: UM

Support: ICLEI, CSAG, BCC, UNZA

The work proposed in the costed extension phase will leverage relationships with colleagues from UMFULA who are also working on further developing Climate Risk Narratives for the Shire River Basin. It will also build directly on the narratives activities that were implemented during the first phase of FRACTAL, supporting conversations related to potential impacts of climate change.

Similar to Harare, team members in Blantyre are working alongside ICLEI on the IMPACT project.

Activities implemented in the costed extension phase will build off understanding developed during the first phase of FRACTAL, namely unpacking the potential decision to turn waste to energy in the form of "think tank" sessions with a number of stakeholders in the city (through the CDKN-funded innovation think tank project). This work supported exploration of perspectives and values that underpin decision making in southern African cities. The team also worked alongside Harare colleagues and ICLEI to implement the SOG project to explore decision-making pathways related to issues of water under a changing climate in these two cities.

Team members in Blantyre would also like to work towards fostering coordination between policy makers and implementers in the city, who often have conflicting mandates. They hope to achieve this through co-production processes that involve *inter alia* both groups of stakeholders.

An idea was put forward during the learning retreat to explore the development of narratives in Blantyre from the perspective of marginalised groups.

Sustainability activities in Maputo to support the development of the urban resilience hub

Lead: Eduardo Mondlane

Support: CSAG

Building on relationships and motives developed during the first phase of FRACTAL, Eduardo Mondlane University aims to support Maputo Municipality to develop an urban resilience hub during the costed extension phase. This partnership would support the implementation of climate change projects and consider the information in the development of climate change infrastructure. The new head of the directorate in which climate change is housed is Theresa; this is beneficial for the team as they have a good relationship with her. Raul (who is also part of that directorate) offered to pick up some linkage functions that were originally fulfilled by Hecrálito.

CSAG and EM are also involved in a new CORDEX project, which could link to activities in the costed extension.

Sustainability activities in Lusaka to continue the TD co-production and co-exploration for urban climate resilience

Lead: UNZA

Support: UKMO, RCRCCC, Aurecon

The team in Lusaka is interested in maintaining the conversations about climate change in the city through a forum driven by UNZA, LuWSI and the local Met Department, perhaps hosting this quarterly. They would like to see more involvement from the Met Service, which requires some dedicated thought on which elements of distillation the Met Service could (and should) pick up. The UK Met Office FRACTAL team members have already involved Zambia Met Dept in activities as they are using some of their data in the extreme rainfall analysis, which stemmed from distillation activities during the first phase of FRACTAL. UK Met Office would like to offer Zambia Met Dept more involvement and co-authorship on the paper that will be developed based on the results of this exercise. A phone call should be set up with the Met Department in Lusaka to understand how they see their engagement in the conversations and exercises into the future, and to not step on anyone's mandates. An idea was put forward to approach the Zambia Met Dept through the director as the team might experience challenges going through middle management.

The team is also interested in finalising the process of producing information related to extreme rainfall for integration into infrastructure design. Team members from the UK Met Office are currently wrapping up the analysis, after which they will touch base with LuWSI/Brenda to find out if/how work has informed what they are doing. As described earlier in the report, case studies should be written to describe how climate information has been developed and integrated into planning. These case studies could provide examples for other departments that might use climate information in the future. A similar case study should be developed to describe how information has been integrated into the Strategic Framework and Action & Investment Plan for Lusaka during the FRACTAL project. The contribution of FRACTAL processes to the development of Integrated Development Plans (IDPs) could also be explored. Tracking the use of FRACTAL outputs is also important. How are institutions using and integrating climate information?

Through other funding, RCRCC will implement a series of tactical urbanism activities work in George (Lusaka) with a strong youth focus.

Sustainability activities in Windhoek to support the next phase of the ICCSAP

Lead: UNAM

Support: Aurecon, UB, SEI

The team in Windhoek is interested in supporting the next phase of the Integrated Climate Change Strategy and Action Plan (ICCSAP) through co-developing a Monitoring, Evaluation and Learning (MEL) plan (supported by research institutions), as well as mainstreaming

the plan and indicators into different departments and sectors. The ICCSAP includes a capacity development aspect, which provides a good opportunity to link with the fellowship programme in the costed extension.

A climate change desk has been set up within the environment directorate in the City of Windhoek; implementing the climate change strategy will be one of the main mandates of the person who's sitting at that desk. There are some questions about whether Olavi Makuti (focal point for FRACTAL in the city) should take on the role with some extra support. A suggestion was put forward to encourage the person who supports Olavi (if this is the case) to attend the fellowship programme.

FRACTAL also undertook an in-depth analysis of the Windhoek Managed Aquifer Recharge Scheme (WMARS) during the first phase of the project and many lessons that were surfaced from this case could be applied to the Water Supply Master Plan, which is currently under development (Aurecon involved). An idea has been put forward to Introduce softer decision support methods. Similar to the Lusaka activities, case studies should be written up by the team describing how climate information has been integrated, as well as what content was produced through the distillation process.

The youth of Windhoek, which have been very involved in the first phase of FRACTAL, will likely remain involved in activities in the extension phase. Work was also undertaken through a SOG in the first phase to better understand energy in informal settlements; the FRACTAL team in Windhoek notices an opportunity to keep the City of Windhoek and representatives of informal settlements connected through extension phase activities.

The team at UNAM would like to develop a proposal for founding a sustainability institute, as well as a climate change research group. Windhoek plans will be further fleshed out with partners from City of Windhoek.

Exchanges across FRACTAL cities to support experiential learning

Lead: CSAG

Support: TBD

City exchanges will be implemented to support capacity development through experiential learning (e.g. involvement of Gaborone and Blantyre stakeholders in the design and implementation of the Harare learning labs, or Windhoek involvement in Gaborone policy dialogues). Another important benefit of these exchanges, which is evident from the first phase, will be climate resilience learning across cities. City exchange activities will be strongly linked to network activities; opportunities to create and sustain networks will be leveraged.

Since CSAG holds the budget for these exchanges, a clear template including protocols for application and exchange activities will be developed to track the process and increase efficiency.

A suggestion was put forward to include civil society representatives in the exchange to support inclusivity.

Virtual fellowship programme for capacity development to support climate resilience learning processes

L: RCRCCC

S: UNZA (and others)

The virtual fellowship programme will support capacity development associated with experimental and experiential process design, as well as process facilitation and training in conflict management/mediation. The concept of "champions" was discussed while developing the original costed extension proposal; those people that expressed a strong desire in the first phase of FRACTAL to learn these sets of skills will be targeted to apply for the training, as well as others. Those attending the fellowship will need institutional support and the process should be transparent so that when people commit, they understand what they're signing up for, how much time they will spend on these activities, the potential benefits etc. and can share this information with their institutions. An idea was put forward to develop MoUs & ToRs for individuals and organisations involved in the programme to clarify expectations and confirm commitment.

FRACTAL team members will need to think carefully about how to plan for and manage the virtual process. A working group should be set up to further develop the idea of the fellowship and launch it. The team should also capitalise on face-to-face events that will take place in the next 18 months.

The fellowship programme should support the development of technical outputs as supporting material for those not taking part. A suggestion was put forward to actively encourage women and young people to apply for the fellowship (perhaps have a female quota?)

The question related to the Embedded Researcher element remains... DFID are keen on understanding how to scale up the ER approach, so the team needs to brainstorm where and how this might be explored.

Topical consortia-specific and cross-consortia reflections on TD co-production approaches

L: CSAG

S: RCRCCC, Met Office, SEI

The original idea for this activity was to produce a series of webinars to share major lessons from FRACTAL. However, during the learning retreat, the team discussed the fact that people don't find webinars very exciting and decided to challenge themselves to produce a podcast. Several team members even began pursuing potential avenues for airing these podcasts (e.g. The Conversation Africa). The team will need to think carefully about the content that they choose to share and consider worthwhile topics as there is so much information available about co-production. A suggestion was put forward to explore sharing lessons or information through other interesting means, such as augmented reality (e.g. goggles).

Networking activities

L: ICLEI

Strongly linked to the city exchange programme, the team acknowledges the need to strengthen existing networks and seek funding for strategic events in 2020, as well as making use of existing programmes (e.g. transformative actions programme). The United Cities and Local Governments convention could be a good place to start this activity. The networking activities will maintain, at their core, principles associated with equality and equity.

The team is also keen to increase their online and social media presence to support this networking during the costed extension phase.

Responsibilities

Once the team had brainstormed ideas for activities in different cities and considered next steps based on the major lessons from the first phase of FRACTAL, they discussed the governance and responsibilities associated with the costed extension.

The team agreed on four principles by which the extension phase should be governed; i) distributed responsibility and decision-making power (i.e. those leading tasks are responsible for making sure they happen); ii) continuation of the "buddy" support system (i.e. co-chairs of groups and cities paired together as learning partners; iii) streamlining the coordination functions by implementing fewer calls and taking away the "clusters"; and iv) take inclusivity very seriously and keeping up good communications (e.g. partners are free to join calls or discussion as they wish). These principles build on what has worked well in the first phase. Distributed responsibility is an important shift; at the beginning of the first phase, The team didn't have a clear implementation plan (i.e. the process was more emergent) but now everyone has a much clearer sense of what needs to be done and has had the chance to learn from others.

In terms of pragmatics, monthly task team meetings should be implemented, driven by city-based agendas. There should also be one monthly larger call, including all partners, which should replace the COMIC. This call will be chaired by CSAG (as secretary to set up the call and take minutes) and one other (rotating chair); it will serve to provide administration and activity updates for everyone and

support cross-pollination across all cities. The digest will become a distilled version of the larger group meeting for those who were not able to attend.

The following calls will therefore take place:

- Blantyre, Gaborone and Harare (streamlining) - each month.
- Lusaka, Maputo and Windhoek (sustaining) - each month.
- Uber call for capacity development activities (overall) - quarterly.

Cluster co-chairs should be decided ASAP.

Learning and sharing lessons

An important reflection based on the conversations during the first two days of the retreat is the need for light, structured, efficient and inspiring means to track progress during the costed extension, as well as effectively consolidate and share messages.

Better understanding change through learning

The team agreed that there is a need to better understand the baselines in all cities so that changes can be tracked over time, including the formal and informal elements of decision making in cities. An example method for understanding the decision-making space was put forward; work done in the "innovation fund think tanks". These baseline understandings will be developed by city teams.

The team should consider two broad categories of indicators of learning during the costed extension; one category that indicates whether the transdisciplinary co-production and co-exploration process have been effectively streamlined or sustained (consistent across cities), and another related to whether these activities are making an impact in cities. More specific indicators will likely be developed for tracking changes in cities and several suggestions were put forward during the retreat e.g. checking the requests of organisations involved for climate information (do representatives know which information is relevant to them?). An idea was also put forward for departments to develop their own indicators based on intentions. Anecdotal evidence from documented cases in the phase of FRACTAL can also be gathered and used to set targets or criteria.

Team members agreed that participatory learning methods (action research or participatory impact method) will be most effective to track changes in cities during the costed extension. Everyone involved in the project can track and understand improvements or changes in decision making processes through such methods. These methods should also work for the capacity development aspects of the costed extension; self-formulated indicators and participatory methods should help track the development of capacity over time for

those involved. Fellows of the programme would also produce short assignments associated with the various aspects of the programme.

It is important that processes and indicators associated with tracking learning are inspiring for all involved.

The coordination team at CSAG should put forward a set of draft indicators that are "contextualised" in various cities and activities.

Sharing the lessons through the learning and scoping report

The team kicked off the discussion about the learning and scoping report by considering the main objective of the costed extension. Essentially, the team hopes to explain what is special and important about the TD co-production and co-exploration processes and suggest practical ways in which these can be scaled (i.e. less "black box" and "FRACTAL magic"). The team should be interrogating which lessons can be transferred to other programmes (e.g. CLARE). An idea was shared to produce a peer-reviewed paper and a more practical summary with recommendations on the scoping and scaling, such as the web-based resource.

The team should pull in different activities and findings and bundle them into a neat "bouquet". To streamline, it would be great if this report is not a separate entity; all the communications products should weave into this learning and scoping report and the document should be produced in a more interactive format (e.g. downloadable PDF but can also navigate to particular areas of the report online). The content should be easily digestible but should also demonstrate well what has been done. For example, it could include video excerpts (maybe 3D clips?) and reflections is much more appealing way, which links with the experiential learning ethic. One example is the 4th National Climate Assessment from the US, which includes lots of videos and the experience of reading is more immersive.

The output described above would also be a really great legacy document for FRACTAL.

An idea to develop this into an audiobook was also put forward; this can be produced relatively cheaply if a professional reader is hired. The potential to integrate "storyscapes" should also be explored.

Essentially, the team is interested in bringing the different elements together in a way that shows the complexity of the matter, but also ways in which to navigate through this complexity so that a difference can be made on the ground.

Annex 1: Learning retreat agenda

Time	Session	Facilitator(s)	Session topics and structure	Resources & guidance
Day 1 (16 October): reflecting on FRACTAL learning to date, consolidating lessons and identifying gaps related to producing and disseminating knowledge				
10h30-12h00	Introduction to learning retreat and day 1 *Virtual plenary*	Alice & Chris	Introductions and objectives ● Welcome to everyone and participants touch base ● Overview of the costed extension ● Overview of the objectives for the learning retreat ● Objectives & process for day 1 ● Presenting Theory of Change	● Costed extension proposal ● Knowledge frontiers table
12h00-16h00	Consolidating FRACTAL learning *Non-virtual personal or group reflections*	N/A	Personal (or group) reflection on learning themes, key outputs, FRACTAL ToC and impact pathways, as well as gaps in products or dissemination processes.	Guidance: reflection questions Input: shared consolidation documents Extra resources: full list of recorded FRACTAL outputs, description of FRACTAL pilot studies from DFID annual report 2019, draft impact stories from 2019 DFID annual report, FRACTAL website

16h30-17h00	Plenary feedback *Virtual plenary*	Richard	Feedback from group/personal reflections	Shared consolidation document
Day 2 (17 October): planning the research design and methodology for the costed extension phase, and drafting a learning and scoping report structure				
10h30-11h30	Introduction to day 2 *Virtual plenary*	Alice & Anna	● Recap of major outcomes from day 1 ● Objectives and process for day 2 ● Overview of the scoping report structure (current)	
11h30-16h30	Planning for the costed extension *Non-virtual personal or group reflections*	N/A	Personal (or group) planning: building on FRACTAL phase 1, opportunities, challenges, learning objectives and plan, inclusivity considerations, potential outward-facing products and scoping report structure	Guidance: forward-looking questions Input: Costed extension research and design plan, and learning and scoping report structure Extra resources: costed extension proposal, overarching guidance document & sustainability plans
16h30-17h00	Plenary feedback *Virtual plenary*	Jess K	Feedback from personal/group planning time	Costed extension research and design plan, and learning and scoping report structure
Day 3 (18 October): signing off on roles & responsibilities				

10h30-11h30	Introduction *Virtual plenary*	Alice	● Outcomes from days 2 and 3 ● Overview and process for day 3	
11h30-12h00	Signing off on project activities *Virtual plenary*	Anna	Overview of activities by activity leads & signing off by other partners	● Project Gantt chart ● Overarching guidance document
12h00	Signing off on governance structure for costed extension *Virtual plenary*	Chris	Governance structure for the project presented, discussed and finalised	Draft governance structure
13h00-13h30	Reflection & closing *Virtual plenary*	Bettina	Reflection of the virtual retreat and goodbyes	

Annex 2: Full set of reflections from the virtual retreat

Day 1

- Gilbert initially thought that the virtual retreat process would be difficult and boring but found that it was, in fact, much easier and more interesting than anticipated. The constant commenting between participants in the consolidated Google Doc was very helpful, and the working environment was flexible; one could manage their inputs and breaks. He stated that he agrees with the themes that were proposed in the table but the theme on "Decision making shaping African city regions" needs more work and thought; it wasn't explored deeply in many cities and the lessons were perhaps not captured well, yet it is such a crucial aspect of our work.
- Lapo agreed that the process is a lot more workable than expected but that she had to deal with people knocking on her office for much of the day, which made working quite difficult. She mentioned that she actually became more comfortable as time went by. She agreed with much of the summaries that have been put forward but wanted to home into the aspect of learning; perhaps the aspect of experiential learning should be a theme on its own? She emphasised the iterative nature of the processes and this turned out well. The city learning processes made space for non-technical people to contribute and feel like they are useful. She also hoped the aspect of trust could be better emphasised as this was a very important contributor to the learning process.
- Chris supported Lapo on the element of trust and encouraged the team to think more deeply about where this fits in (in our FRACTAL theory). He realised that capturing some of the climate science outputs is something that was missed; the distillation and narratives dominated while there was a lot of other climate science work done. He thought that we need to clarify the concept of distillation better through ongoing discussions to be sure we know where the bounds are. He found the process fine and was impressed how everyone kept engaging. Gilbert added that Chris has been an inspiration to him during the project; he is a natural scientist who is able to move beyond his own field and has handled the science that he does well, as well as expectations.
- Alice mentioned that she initially panicked because she didn't see much action in the Google docs but once inputs started and people began to comment on the doc, ideas were sparked, and momentum was gained. She also mentioned that it was far less structured that she thought; she thought we would work methodically through the questions but found herself bouncing around the document quite a lot between the learning themes and ToC. She was really impressed with what was produced and thinks it will be useful for the team moving forward as well as the broader FRACTAL team. She mentioned a few key themes that she thinks need fleshing out; learning, capacity development and capability building, city resilience and decision making for African city regions. She urged the team to think about which outputs need to be produced ASAP to guide the costed extension.
- Jess mentioned that she also moved around the documents quite a bit and that she really enjoyed the day. She felt like she was asking more questions than perhaps generating reflections. She realised how she felt a bit afraid to contribute as an individual in the beginning, more so than in a face-to-face environment but realised that the team knows one another well and trusts one another

and therefore felt more comfortable contributing. Alice mentioned that these questions are healthy; that it is important to be critical as a team and wonder if the approach has been effective, whether we've written enough.

- Rudo described how the day went well and that it was more flexible as one was able to multitask. She also emphasised the fact that she was interrupted quite often in her office. She and Chipo put forward the idea that FRACTAL brought away a new way of doing things; in Zimbabwe the main focus has been on rural areas, so FRACTAL has pushed the boundary by making city stakeholders think about climate change adaptation. Another reflection that she and Chipo had; within the theme of capacity development, FRACTAL brought about an innovative way of capacity development by incorporating Early Career Researchers, which is different from relying on experts in a field to produce information. This approach is grooming future researchers and leaders. She mentioned a few outputs that are being developed; the city narratives paper being produced by Chipo et al., an opportunities paper that describes the opportunities for using climate information in city decision making. On the ToC, FRACTAL has led to a much better understanding of context, but this understanding has been built in Lusaka, Maputo and Windhoek as learning labs took place in these cities.

- Sukaina explained how the activities that other people contributed helped her to contribute but that she didn't have enough time, particularly for the ToC. Her initial observation was around the co-exploration work and keeping the concept distinct from the co-production work; we need to write this up either in the two-page guidance document, in the scoping and learning report or even in a journal article. She was hoping to hear from Rebecca on taking the WEAP work forward.

- John didn't have enough time to go through the learning themes and ToC in detail but wanted to reflect on the fact that this process is very important as we are opening up to say "let us look back critically and say whether we've achieved what we wanted to achieve", as this can form the basis for the next steps. If we, as a team, are confident that we have a product and process that can be upscaled and streamlined, it a good first step, or to say "what can we change now?" so that we improve. John enjoyed the process but was keen to make inputs later in the evening. The fact that everyone is looking at one document is different and important.

- Rebecca stated that she went into two meetings straight after the opening plenary and when she returned to the document, it was intimidating to see how much more had been added to the document. She was able to provide some input but was hoping to look at the ToC later in the day. She mentioned the urban climate resilience theme as something that needs more thought, as well as the concept of receptivity; she thought we could more about this concept. The process went quite well but she was distracted at times. She mentioned that the solitary nature of the process allowed for one to provide an unbiased opinion or idea into the document, which was helpful.

- Tammy explained how the process had been interesting but that it does require quite a lot of discipline. She spent her time thinking about the distillation activities and the learnings that have been developed through FRACTAL. She also gave some thought to the capacity development activities; there was a gap in the learning theme table, specifically related to outputs, in terms of the climate training activities.

- Richard added that there are elements of the process that are useful but big screens are necessary as there are so many strands that one needs to follow. He wanted to emphasise that the retreat is likely quite successful because of the trust that has already been built in the team; it would likely be a different outcome if we didn't know one another. Face-to-face is therefore pivotal to building trust within the team, while these virtual meetings can complement these sessions. He also spoke about the capacity development learning theme; there are many activities that we need to capture. He echoed what Chris mentioned about distillation; it is such an important aspect of FRACTAL that we need to have multiple outputs related to this in terms of process and principles, as well as clear examples of how it has played out in terms of defining the problems as well as the information that is required.

Day 2

- Alice: similar to yesterday, many contributions were related to see what people were contributing and commenting on inputs. I tried to look at all activities and think about how they link together and could inform one another. Focused most on methods being tested and streamlined, as well as indicators, which was quite difficult. Feel impressed that everyone contributed up to the last hour.
- Anna: mainly in research design document; most recent contribution is related to the dissemination of products (consortia and cross-consortia). People don't find webinars very exciting, so we are hoping to challenge ourselves to produce a podcast – perhaps "the conversation" to produce something interesting? The comment function is particularly interesting – commenting on each other's contributions.
- Bettina: it was tough to come back from holiday and contribute to a google document, I was also torn between needing to get other things done and writing in the document. Thanks to the team for preparing this but for me, personally, working on a google doc is not the most inspiring but I was happy to hear Anna's suggestions of a podcast. The google doc is a good way to generate but we need the critical conversation afterwards.
- Chris: I had to fight another fire, so I've been tracking and watching comments. It's been really interesting seeing comments that have been generated by a broader group of people.
- Genito: I am trying to catch up with everything that happened so am midway... no comments for now.
- Gilbert: today has been the most difficult and disturbed day; have had many invitations to attend other meetings. The few minutes that I did spend on the doc, I found extremely interesting to input and comment on other people's inputs. I focused on our sustainability plans and tried to make sense of those based on the work undertaken yesterday and the conversations that we had this morning. I haven't finished for Lusaka; I want to input later.
- John: I felt good about the day; I set an hour or so aside and didn't allow anyone to come in. I made some comments on the Windhoek activities; the outputs and thinking about marginalised. Now that we have a foot in the city, perhaps we can become a link between informal settlements and the city, to see how they can address each other's needs. Informal settlements are illegal but

more than 70% of the city's residents live in informal settlements. We need to look at best ways that we can balance a policy and informal settlements, based on science but also on trust. I think the informal settlements expect more of us since the energy SOG.

- Lapo: I agree with everyone; we should isolate ourselves. Today was my so-so day but I am much more comfortable with the process; I could navigate better and learn from other colleagues etc. Because of the distractions, I contributed less than hoped but I did add to the Gaborone and Harare activities. We would like very much that Blantyre and Gaborone share the experience of the learning labs in Harare. I highlighted the importance of having a facilitator who knows what s/he is doing, but also who is neutral. As locals, we are sometimes limited in what we can say to the city – it can be quite tricky with limited influence. We're hoping that Windhoek can also contribute.
- Mzime: it's been an interesting day; today I made more time to be present although the morning was better. Unfortunately, the Harare team was not able to join but I tried to make some suggestions etc. I'm really excited about some of the more innovative ways that we are hoping to tell the FRACTAL story. I really like the podcast idea as mentioned by Anna. I would like to mention that START is working on a special issue and those are some of the products that we can produce to reach a wider audience. Yesterday I was overwhelmed, today I feel better but it's not easy to see how we will narrow it down and get things started.
- Paulo: in terms of contributions; I didn't contribute as much I wanted to, maybe because I'm feeling a bit upset about what I must do. I didn't go through the documents in a way that I would have wanted but I would like to give contribution on the weekend. I'll send everything that I have in mind to Alice and she can place. With regards to Maputo specifically, it would be a good idea for FRACTAL to get in touch with some of the bigger funders as there are some projects that they are putting on tender to have a component of climate change; maybe FRACTAL can approach them and ask what they would like to see in terms of climate change.
- Richard: like others, it's been a frantic day with other things so definitely not contributing as much as I would like. Mainly looking at and commenting on what was added for Harare. Also added to Lusaka sustainability plans; what we can build on. It would be good to have a side conversation with Gilbert about that. I felt frustrated that I wasn't able to contribute more.
- Sukaina: not much different; frustrated that I couldn't do more – I could see that there are very many interesting things in the documents that I'd like to reflect on. Mainly added to Windhoek sustainability methods and indicators for success.
- John: I would like to echo what Lapo said on policy discussions; it would be good to have external facilitators as it allows for colleagues to be on the side and make suggestions, coming from outside (e.g. from Gaborone). It also helps members of Lusaka, Maputo and Windhoek who have been running some of these activities to also have an opportunity to express learning had in terms of how LLs have been facilitated.

Day 3

I liked.....
- The flexibility_meeting up with everybody again! Nice_Colective planning_Lovely_Now thats co-creation

- The laughter (and affectionate teasing) throughout
- Love reflecting - so time to do this was great (also impacts/parallels for other works beside FRACTAL).
- The guidance document.
- Discussing and reflecting on the very real impact that the first phase of FRACTAL has had
- The gentle guidance through this process & excellent preparation and updating of documents
- Everyone participating and engaging in the process
- Flexibility
- That this was possible: More than a day discussion
- Hearing everyone's voices again and reconnecting so easily to each person; hearing that the enthusiasm and passion for the work is still alive is inspiring every time we meet. Humbling to work with such a great team
- Reconnecting and reflecting on what we've done, and where this is great team!
- The level of enthusiasm from everyone who took part (and the Olafur music!)
- Hearing the voices and thoughts and ideas of all our wonderful colleagues, spread far and wide
- Met Office participants playing "snap" with partners over the artifact to be buried for future climate resilience practitioners
- All the amazing preparation that had gone into all the documents and questions and exercises, seconded by us all!!
- That when I was able to re-engage after an interruption there was always useful stuff to do (backing up the previous comment)
- Many participating
- How FRACTAL meetings always feel like a 'family gathering'

I wish....
- I was out of here (this office). Would have been able to focus more.
- The snacks shared were real. Me too!
- I had more time. Seems easier to be fully committed to this kind of meetings when one travels
- My local colleagues joined
- We could chat over a cup of tea and catch up on other non-FRACTAL news
- We could have done it face to face, but glad we tried it this way!
- Wish it was in person but worked so well this way too (largely because we are all familiar with each other, and fab guidance provided by Alice)
- Everything could be written up by a different, virtual version of myself (kidding - this will be important and enlightening)
- I could have given my full attention to the activities
- We could meet in a virtual space more often - engaging in creative discussions around opportunities
- We can secure some solid funding through CLARE to continue on this amazing foundation
- I wasn't distracted by other deadlines

I wonder....

- Whose idea it was:)
- How to make a powerpoint with a moving image.
- If I didn't put my out of office on and pretend I was travelling if I would have gotten as much time to invest
- If the preparation is worth it? We do things on the fly when we all together but this time Alice had to really prepare
- How this could possibly work with a group of people who don't know each other well.
- How different it would have been if Bruce was with us
- How we'll accomplish so much with so little resources
- If we manage our ambition in this short and resource constraint time ahead
- What to tell partners after the bridge phase, bridge from Fractal first, but to where?
- What our conversation will be in 18 months time
- If I will have support to fill the ER gap
- How on earth have we built such a beautiful family