Future Resilience for African CiTies and Lands (FRACTAL)
Annual meeting: 20-24 November 2017

University of Cape Town (UCT), Cape Town

Context of this document

The FRACTAL annual event was held at UCT, Cape Town, from 20-24 November 2017. This document provides information that was both collated and generated at the event, including an overview of and outputs from the sessions. Thinking for the meeting was prompted by distributing a pre-meeting pack, which included: i) logistics information; ii) content information (including updates from cities and clusters); iii) feedback from participants on the 2016 FRACTAL meeting; and iv) the 2016 PAT report.

For a list of participants from tow 2017 FRACTAL meeting, please see Appendix A. A detailed programme for the event is provided in Appendix B.

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DAY 1 (20 November 2017): Where are we now? Stocktake of information and knowledge to date

Session 1: Welcome and introductions

Facilitator(s): Bruce Hewitson
Rapporteur: Kornelia Iipinge
Main outcome: Participants know who's in the room and understand the objectives of the workshop

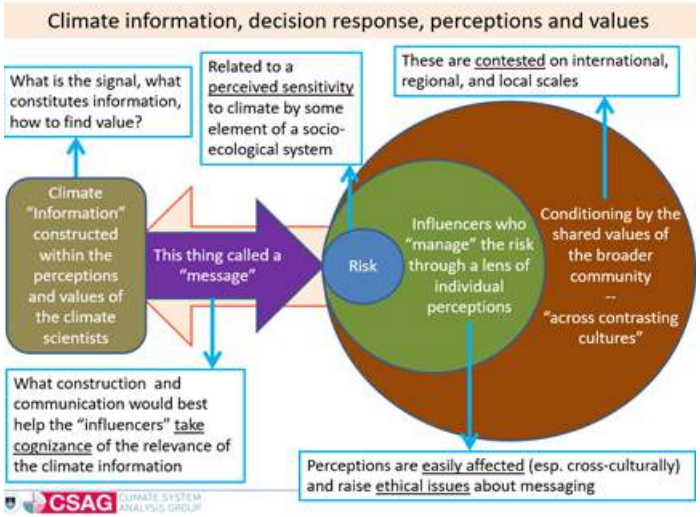
Bruce Hewitson welcomed all participants to the FRACTAL 2017 Annual Meeting. He pointed out that the objective of his session is to discuss critical issues and expectations of the week. He emphasized the fact that participants are the drivers of the week's meeting, and suggested looking forward (i.e. not only showcasing on what we have done thus far). Bruce presented some key messages from the "External observer" report following the 2016 FRACTAL annual meeting (developed by Dr. Bill Gutowski and Dr. Tim Carter), which stated that "*FRACTAL is an exciting project with great potential to undertake some path-breaking, trans-disciplinary research*." He then welcomed the FRACTAL 2017 external observer Dr. Bill Gutowski of the department of Geographical and Atmospheric Sciences, Iowa University, USA.

The essence of the FRACTAL 2017 Annual Meeting (as proposed by Bruce) is about looking forward to achieve FRACTAL's goals, based on what we have accomplished in the past:

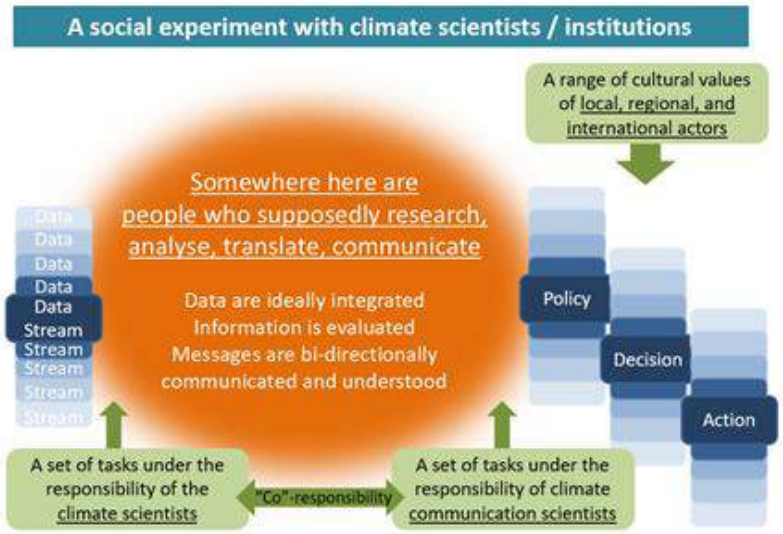
- **To understand the climate processes** driving the African regional climate system's natural variability and response to global change in the recorded history and climate model simulations.
- **To distil defensible, scale-relevant climate information**, informed by and tailored to urban decision making and risk management within their regional dependencies.
- **To use co-exploration of climate information with urban partners** within the systems-thinking paradigm to integrate climate messages within real-world decisions, and enhance the resilience of development pathways.

Bruce then presented some of the many attempts to capture the essence of FRACTAL (shown below). The challenge is to not become wedded to one "lens", but grasp the bigger picture within which any one activity is contextualized. He put forward a few

perspectives of FRACTAL: "The intersection of information, uncertainty, and psychology" and posed a few questions, including: What counts as “regional” climate information? Is that a statement or question? Is it: “This is what counts as climate information!” or “What is it that counts as climate information?”. We carry a huge responsibility because of the potential of triggering decision responses with real world consequences. This process requires self-assessment about facts, perception, interpretation, and values. Bruce’s take on the climate information, decision response, perceptions and values diagram is presented below.

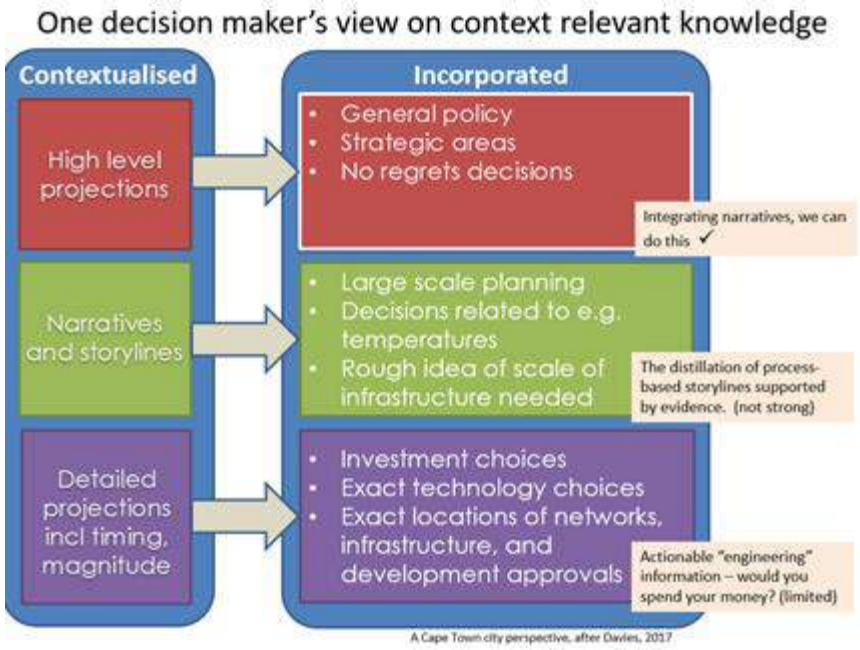


Bruce also put forward another new framing for FRACTAL; a social experiment with climate scientists/institutions (see diagram described below).



Bruce stated that decisions are (ideally) based on knowledge, and knowledge is information in Context. However, we still need to ask and answer the following questions in FRACTAL: i) what is "Information"? ii) can we identify it / bound it? iii) what is entailed in communication? and iv) how do we accommodate the context?

A decision maker's view on the content of relevant knowledge was then presented using the diagram below, which illustrates that the relevance of knowledge is dependent on the type of decisions that need to be made. This slide is taken from a presentation given by Helen Davies at the 5th International Conference on Climate Services (ICCS5).



Bruce then presented priority challenges for FRACTAL, which were adapted and extended from the midterm review:

- **Significant, and transferable entry points to city structures** for optimizing the uptake of climate change information on the 10 to 40 year time horizon (beyond the broad scale of the climate risk narratives).
- **Advancing the understanding of regional climate responses and processes**, including in the context of the drivers of global climate phenomena.
- **A climate information distillation framework** or a clear picture of what such framework might look like.
- **An understanding of "city in a co-dependent region"** in the case study cities and what this means in terms of potential climate change.
- **Practical transdisciplinarity** and finding ways to effectively engage all partners at all stages of the project.

- **Cross consortium collaboration,** and sharing our lessons learned, learning for the lessons of others, and resolving contradictions
- **Delivery of outputs** to academia and to society, in substantive and value forms.

To conclude, Bruce suggested that the team try avoid having lots of problems at the end of the week.

Session 2: Stocktake of knowledge and processes: engaging key messages from the mid-term review

Facilitator(s): Alice McClure
Rapporteur: N/A
Main outcome: Participants engage and build on the key messages from the mid-term review

To present some of the key messages in the mid-term review, Alice facilitated a quiz entitled *how well do you know your project?* The quiz questions are presented in Annex C, with correct answers highlighted in yellow.

Key messages from the mid-term review were also been printed and available on the tables. These are presented below.

Key points: activities, research and Progress

Much emphasis has been placed on the city learning processes in each city as a mechanism to provide direction and move FRACTAL forward. As a result, the fundamental (necessary) research has happened relatively slowly. Although the city learning processes are very important, there is a need to continue FRACTAL-specific research within and across clusters, particularly related to understanding the climate processes, city contexts and linkages. The team should recognise that some of these outputs (decision-making, nexus and climate science cluster) will feed into the city learning processes, and some of them will not. The areas of research that require special attention over the next 18 months are those that contribute to advancing climate knowledge, producing the relevant academic literature, and integrating this knowledge into decision making. We do not yet have full understanding of: i) what climate information would be useful in each city; ii) the structure of

each city region system (physical and institutional linkages) and associated regional dependencies; and iii) the city-region decision pathways for uptake of climate information, there is a baseline of understanding to enable pushing forward with some of the fundamental research questions. Considering this, it is recommended that clear, scoped, and tractable tasks with clearly defined milestones/objectives be set by each cluster (in workplans) and checked by the cross-cutting cluster, particularly those below.

- The climate info cluster: to push the frontiers of science and provide the foundation for activities related to distillation, communication etc.
- The nexus and decision making clusters: to gain an understanding of the city system, and regional linkages.
- The decision-making cluster: to identify climate-sensitive decisions and pathways for uptake of climate information

Key points: internal processes and mechanisms

The internal processes and mechanisms that are currently in place have been effective during the initiation of the project. However, as activities have ramped up in cities, the research and work has become somewhat fragmented. There is a need for roles and responsibilities to be more clearly (re)defined, particularly related to the processes listed below.

- Synthesis and strategic planning: these processes are enhanced by increasing the frequency of cross-cutting calls to every two months and introducing a management committee (all major fund holders), which meets quarterly.
- City learning processes (city vs. cluster research): information flow in and out of city learning processes. A suggestion has been put forward to include a climate informationand decision making representative on every core city task team.
- Creating the critical analytical bridge between the city system and the climate science (exploring the integration of climate science and impacts modeling into decision-making processes, systems-thinking paradigm etc.) vs. management-related processes.
- Establishing a linked portfolio of allocated research tasks in the fundamental climate science

Session 3: Cluster overviews
Facilitator(s): Shaban Mawanda
Rapporteur: Jess Kavonic
Main outcome: Team members are aware of cluster-related work that's ongoing; the scene is set for thinking about how this work is/should influence city planning or the broader research community

The various FRACTAL cluster groups provided feedback through a variety of innovative and interactive approaches. This feedback is presented below.

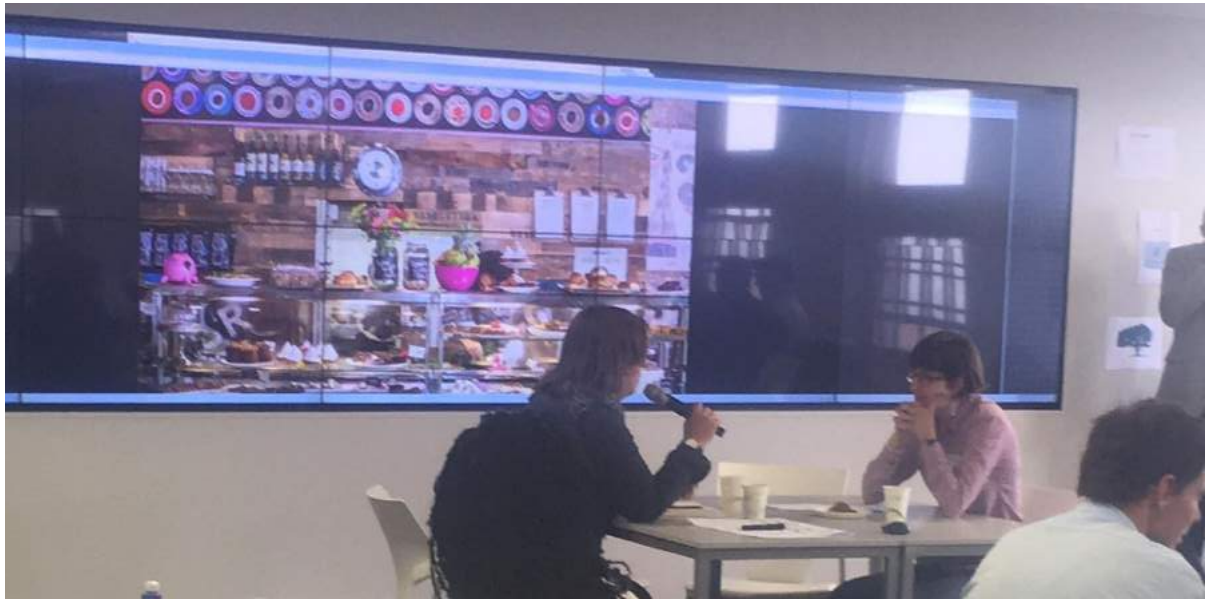
City learning cluster

Different participants from different backgrounds in this cluster **showcased activities and lessons learnt** through performing an interactive play. The first scene of the play unpacked the meaning of the city learning labs. This scene highlighted the fact that the learning labs are entirely driven by city needs and are extremely important in facilitating a neutral setting for a wide variety of stakeholders to come together… During the proposal writing phase it was so crucial to impress upon the funders the importance of bringing stakeholders together and building partnership. Lusaka and Windhoek have had 2 learning labs to date, and Maputo has had one, while 6 embedded researchers have been appointed.

A range of workshops have also been held in all cities. These include 5 workshops in Lusaka (Councilor training, city dialogues, media training and climate science training); Councilor training in Windhoek; Interviews in Maputo; Inception workshop in Blantyre, GEC inception and culmination workshops in Harare and 2 monitoring workshops in Durban. A total of over 90 interviews have been conducted in Tier 1 cities (these link to the decision-making work).

Some of the **reflections on the city learning processes** include the challenge of only having 1 or 2 days where everyone comes together… The city learning process also slows down when project team leaves. The learning labs are such a rich experience (for

integration, relationship building etc.), but a similar process cannot be implemented for each city – process needs to be flexible based on the needs) and the burning issues in all the cities seem to be around water (too little or too much).



The second scene unpacked the role of **embedded researchers** as well as lessons learnt. Through this conversation, the following points were highlighted: i) the process of embedding and appointing embedded researchers is extremely important and took a lot longer than anticipated; ii) the monthly calls are valuable, but it is still difficult to keep up to date with everything that is happening; iii) the process of being an ER is hard… Meeting people, getting invited to meetings etc. is challenging; iv) every city is different and the context is so different, so the cities cannot easily be compared; v) sitting in between both organisations is a challenge and sometimes you are viewed as a spy; vi) city councils undergo massive restructuring which poses challenges; vii) learning labs can be difficult to organise (get people attending) - it is so very crucial to convince people that the project is

worth being involved in; viii) city exchanges unlock opportunities for similarities; and ix) ER's are so important in keeping track of opportunities for mainstreaming climate information.

During one of the scenes a discussion around **narratives** occurred. This conversation surfaced an opinion that narratives are a great way of integrating climate data as well as starting conversations. The hardest thing is for the city to understand the complexity of climate change. Cities need things in the simplest format. It must be remembered that timeframes for decisions are complex as the decision makers want information over 5 years. Taking climate information to the national level is challenging and requires attention; the narratives provide the opportunity for things to be contextualised.

The final scene provided points for all to consider throughout the 2017 learning event:

- Thought is needed around how to bridge the divide between supply-led and demand-driven decisions;
- There is still a need to understand what each city actually needs; and
- Research at city level to understand city processes is crucial.

A question was then posed to the city cluster: Are we in the situation where identifying climate information needs (entry points) is just not where the city is yet, particularly in terms of being able to use the detailed information? Even if FRACTAL provides information, HOW it will be used is really the issue. There is almost no engagement between MET offices and city councils. Answer: Two things we need to do more: training is very important – need to invest more in training (in an interactive way) & city dialogues (more) to take the city conversation forward as it really is the process of these that is so important.

<u>Climate information cluster</u>

Various members of this cluster presented on the work they are currently doing. The points below capture the main topics discussed during this presentation. A big challenge is actually presenting what this cluster is doing (due to jargon and technical words)

A range of activities are taking place:

- The main learning: political, finance etc. constraints is the main challenge for decision making NOT shortage of climate information.
- A lot of work with the city learning lab processes – engagement within the cities.
- Involved in small opportunity grants – information provision.
- Value add to the decision-making cluster i.e. integrating the value that climate data streams add to DM i.e. questions around model agreement; what do we do when models disagree, can we learn from disagreements; what do we do when historical trends disagree; what can we do?
- A lot of focus on climate process i.e. how do the various things interact; how do you measure things; how do you see how process change link to one another?
- Significant stakeholder engagement; climate research to build confidence in trends and projections and governance work
- Climate Process Chains – trying to advance understanding of southern African climate (interrogating models and processes linkages).
- Physical process only i.e. cloud formation; El Nino (know they integrate etc. but are trying to CONCEPTUALISE these better)
- Looking for Indices for describing rain over southern Africa.
- Looking at different historical data sets – how do they represent the projections.
- "All models are wrong, but some are useful" – trying to see which models are useful.
- Narratives – learning as they are going (focus on process of producing is the most value not actually the product that comes out of the end).
- Also looking at how people perceive climate information.

The climate information cluster finished off by stating that the overall focus is still undertaking climate science, then integrating the findings into the city processes (i.e. distill it); the narratives is kind of performing this role at the moment. There is a lot of good working ongoing but the cluster proposed changing its outlook; work that is being undertaken has value but the timeline for propagating or making change at the city is very long. The narratives have sparked a lot of interest in FCFA; FRACTAL team

members are supporting the development of for HYCRIYSTAL. The cluster has also now started seeing the integration points for distillation of information… There is huge potential to get a lot of outcomes from the narrative work

Questions posed to the climate cluster:

1. Are you getting questions from cities about the different models? Or do they just trust you? What is the sense in the city with the trust of the models you are presenting? Answer: Depends who engaging with; there's been a lot of work done, and there are many existing reports to prove this. The cluster has not yet been personally challenged. Interestingly, when climate information was presented to the Minister of Environment and Water in Lusaka, he responded by saying: yes we know but what are the solutions? They are challenging the approaches.
2. What has been the most challenging part of engaging in the learning lab process? Answer: city decision makers are asking some basic questions, and how they can use models themselves. Models are intellectual tools, but the cluster is struggling to find solutions with the messy complex environment of cities. They need to be comfortable with the messiness. Not being able to be honest (not being able to say climate change is not climate change variability; what your real issue is you do not have the observations – being honest about what you can do).
3. How far have you engaged with the national MET officers in the city? Answer: Not much at all.

Decision making cluster

Mzime has joined the cluster as co-chair!

The cluster presented a "karaoke powerpoint" on their work (i.e. all participants presented a slide on someone else's work that they were not involved in). This encouraged keeping language simple and accessible to everyone. Key points from this process are presented below.

Governance overview: several documents that describe the conceptual method for undertaking governance research have been developed. Decision making tools, research on process research, and governance work is becoming more aligned. The

team has collected primary data in Maputo, Lusaka and Windhoek, and transcription of these documents is currently underway. Once this task has been undertaken, the data will be analysed to identify the patterns underlining DM processes in cities.

Content and discourse analysis: this is a method for analyzing text. It involves reviewing key documents to see the extent climate change has been taken into account in the policy. To date, the discourse analysis has not been undertaken broadly but trends have been noticed in two case studies, one of which is neoliberal terms in Windhoek. The content analysis is, however, taking a huge amount of time because it is focusing on many words. There is consequently a need to rework the method.

Reviewing background docs: these were used to develop contextual information about each city; the documents themselves might not be taken forward, but the information in the documents will likely to be integrated into the nexus conceptual mapping process for cities.

Actor mapping: this process was implemented to try understand entry points. It was a process that the decision-making cluster thought could be taken forward by the embedded researchers, but there were a number of conversations around explicitly mapping the shadow spaces… whether this process is ethical. Actor maps will surface as a result of the governance research.

Other work in cities

- **Blantyre**: have accessed additional funding, which they have used to profile FRACTAL, and for getting to know all stakeholders. A stakeholder map has been developed through these processes in Blantyre.
- **Harare**: have undertaken literature and policy document reviews (in the water sector), a needs assessment and institutional mapping process, key informant interviews, and visiting different cities.

A **review of decision process and support methods** was undertaken, which profiles a range of decision methods which could be applied in the cities to better understand decision-making processes and lead to more informed decisions about adapting to climate change.

An **adaptation inspiration booklet** was also developed, which profiles a number of different case studies; this is an interactive and useful guide that also provides an SGD and climate risk overview.

Nexus cluster

At the beginning of the nexus cluster conversation, some background was provided on where this cluster arose from. Currently, this cluster is focusing on developing tools for mapping the city system (conceptual maps). The cluster is also undertaking water supply system modelling (WEAP), using the case study of Lusaka. The preliminary findings from this study indicate that the effects of climate change are not likely to shape the availability of water as much as other factors related to planning, such as infrastructure for water distribution. Considering this, cities should work towards implementing a holistic approach that incorporates and strengthens many areas of the city to make it more resilient.

Questions posed to this cluster: are we going to be able to use the approach implemented by Simon in FRACTAL? Answer: Mapping out the innovation techniques to climate future drought is very important, but we also need to be aware of the difference between the different cities.

Session 4: A look into the heart of southern African cities: findings from governance research

Facilitator(s): Davison Muchadenyika
Rapporteur: Alice McClure
Main outcome: Team members have a deep understanding of the city governance arrangements, use of climate information etc., and how these key messages can be used to direct FRACTAL activities

Davison Muchadenyika presented some preliminary findings from the governance research that he has been undertaking with Di Scott, Brenda Mwalukanga, Hecralito Mucavele and Kornelia Lipinge. This overview is presented below.

Davison introduced the session by explaining that the aim of the governance work is to discover entry point and areas of receptivity. The various elements of governance that are explored include: discourses; actors; legislation, policies and mandates; decision-making; and materialities. Initial findings for some of these elements are presented below.

Decision-making

- National state dominates decision-making and budgets (water/energy). There is an over-emphasis on the national level when dealing with climate change, national platforms for engagement. As a result, one might expect very little traction on city-level interventions on climate change. There is also an over-concentration of data at a national level, which is not filtering down to cities.
- There are various platforms & processes of decision-making in the 3 cities (Maputo – MA& MC; Lusaka (Committee system; Windhoek (Mgt Co, SEF). City level councillors are key decision makers but because of bureaucracy, they can only make recommendations.
- Triggers for climate sensitive decisions have been experienced (crisis/shortages). However, there is no evidence of use of climate information in the cities. There is interest in climate information for seasonal forecasting and short time scales; but no interest in the long term. Considering the accessibility, relevance and format of data for decision-makers is vital.
- Opportunities exist for integrating climate information if one chooses to work directly with water & energy utilities. Commodification of services is stripping cities power & financial resources. Decisions on water are a result of various actors at different scales with different interests (Maputo has a complex arrangement; Lusaka has a frustrating arrangement; Windhoek seems workable though with challenges). Co-operation and risk sharing is, however, evident. Two of the three cities expressed a keen interest to control water supply.
- In terms of energy, there is little that cities can influence on decision-making (except Windhoek). Consultants in PPP provide interesting components of water governance in Windhoek (unconventional water sources)
  Key actors include water and energy utility companies which FRACTAL must engage.

Policies, mandates & actors

- Colonial legislation/policy persists in influencing cities.

- National level policies are articulate on climate change, water & energy issues. However, they do not sufficiently locate cities as vital actors. National government leadership in efforts to respond to climate change is evident in the three countries. City-level policies still lag behind in problematizing climate change & response strategies. As a result, policies & projects are still dominated by international actors (donors) (external drivers), which has an impact on operationalization. City budgets are yet to reflect climate change support.
- Maputo & Lusaka have no mandate to provide water & energy (this weakens the position of these 2 cities to respond to impacts of climate change).
- The human resource capacity exists in the cities, but there are frustrations by the tensions between local & national gvt & lack of financial resources to action.
- Shift of influential actors from public to private sector.
- The use of climate information/data is still peripheral.

Discourses:
- There is a marked & worrisome shift towards commodification of services with less interest in social development; for example, 'water as a commodity' (water demand management). Such shift doesn't seem to benefit cities; rather it's serving the national government & private sector elites.
- 'Energy efficiency' is dominant energy discourse.
- There is an emerging resilience discourse, supported by the global discourse.
- Water security is a recurring discourse (e.g. LUWSI), which has different social implications to the conventional Integrated Water Resources Management (IWRM) discourse, which frames water resource legislation.

Materialities
- Cities have very different geographies and climates; they therefore experience different problems.
- Most of the water infrastructure is old and poorly maintained... Governance of infrastructure is spread across entities. The lack of mandate on water & energy is affecting coordinated infrastructure planning, development and maintenance.
- There is an over reliance on external actors for infrastructure financing.

- Addressing climate change in the 3 cities needs to confront the reality of infrastructure deficit.

In conclusion, Davison presented the following points: The awareness & need to act on climate change in the 3 cities is evident. However, resources in cities are an issue: therefore, climate change interventions should focus on cost-saving on the part of citizens & local authorities. Based on the engagements, the hypothesis is that Fractal engagement is building receptivity to climate change at all levels not only looking for 'entry points'. There is an opportunity for FRACTAL to provide accessible, relevant & well packaged climate information to decision-makers. The challenge to locate cities at the epicentre of climate change interventions remains.

Session 5: FRACTAL poster session

Facilitator(s): Izidine
Rapporteur: N/A
Main outcome: Following on from cluster overviews; the team has more time to engage disciplinary work through poster presentations.

The final session before lunch provided time for team members to view posters that have been developed for various events within the FRACTAL lifespan.

Session 6: Reflection, wrap-up and next steps

Facilitator(s): Chris J
Rapporteur: Alice
Main outcomes: Outcomes from the day (disciplinary and cluster work) are surfaced and participants have an opportunity to reflect.

Chris provided a reflection of Day 1, during which the work that has been done in FRACTAL was explored. He posed the following questions to the team, around which small group discussions were facilitated.

1. Who has met someone they have never met before? (many people raised hands)
2. Who can see a clear path forward for the next 18 months? Who knows what they need to be focusing on? (about a third of people raised hands)
3. What has surprised you most from today? Feedback about the amount of work that has been undertaken in FRACTAL.
4. What is your greatest fear for the next 4 days? Feedback around not having a clear plan after many days of discussions.
5. What is your greatest desire for the next 4 days? Coming out with a clear plan!

DAY 2 (21 November 2017)

Session 1: Climate science auction

Facilitator(s): Bettina and Richard
Rapporteur: Meggan Spires
Main outcome: Participants experience a "taster" of the relevance and importance of current climate info for cities, or the importance of context to produce climate information.

The first session of day 2, run by Bettina and Richard, took the format of a skit and an auction. Initially, the climate scientists replicated a climate science cluster call, which included a report back on a learning lab, where city x was most interested in how climate change will affect health, e.g. malaria, heat stress.

Bettina posed the following question to climate scientists: what makes a good climate information question? The response to this question are presented below.

Specific
Understanding of current risk
Nice if ground-breaking scientifically (spend our money on this)
Useful to know how the answer will be used (what type of decision)

The response from the city representatives was that the information needs to be able to enter complex, sectoralised and politicised space within cities; an effective (co-production?) process is thus essential. One can only develop the questions if/when you are a part of messy city processes.

Following these introductory thoughts, instructions for the session were provided: city groups and climate scientists would work in groups to develop questions that would be bid to the other group (i.e. cities would develop questions and pitch to climate scientists, and climate scientists would develop questions and pitch to city groups). Three external observers would provide feedback at the end of the session.

Questions pitched by cities:

1. **Harare and Gaborone**: Can the climate scientists give Harare/ Gaborone nearer term projections re rainfall? 30 years or less.
2. **Maputo**: What are the predicted changes in intensity and frequency of heavy rainfall events in Maputo City by 2030?
3. **Cape Town**: What is the likely change in the return period of a similar drought (as is occurring now) in the future? / and / Can we identify what the thresholds for action are, based on climate data?
4. **Durban**: ...Withdrawn post scientists spending most of their beads on the Cape Town question.
5. **Blantyre**: How will the Lake Malawi levels be affected by climate change in the next 20 years? (Hydrological cycle).
6. **Windhoek**: What will the rainfall pattern be in the next 15/ 20 years in Khomas (water source for Windhoek)? / and / What will the rainfall and runoff pattern and distribution be in Khomas in the next 20 years (frequency of below normal and above normal)?

Questions from scientists:

1. What were the climate conditions in your city that led to recent flooding/ drought and how will these change (relationships) in the future?
2. What information (from the range of observations and climate models) should the city use and how should they choose?

3. What is the changing likelihood, frequency and duration of multi-year drought (or wet), in the city/ cities, within the context of observed variability?

Feedback from external observers:

- Co-production is a very appropriate response
- People were struggling to narrow to one question
- Climate scientists table was arguing about details, how much specificity should be in a question to be of interest to a city.
- This might be a nice exercise to develop a proposal.
- An ethical issue was noticed; most climate scientist beads (money) was being spent on the Cape Town question
- When the City of Cape Town table said they wanted to lead a consortium, other cities joined up to bid in a separate consortium

For more information on these questions, see notes from the targeted climate information cluster research session on page 52

Session 2: How is what we've learned shaping knowledge for resilience in FRACTAL cities? (Part 1)
Facilitator(s): Anna T & Gina
Rapporteur: Victor
Main outcomes: Team members understand the FRACTAL activities that are ongoing within the cities, and how these activities are contributing to resilient development
The next substantial chunk of the day focussed on exploring the changes that are already evident in cities as a result of FRACTAL. The following questions guided a talk show-style feedback session:

1. What have we learned about resilience in FRACTAL cities?
2. How have we learned it?
3. What impact is what we've learned (1) and/or how we've learned it (2) having in the city? i.e. is anything possibly different to what it would have been without FRACTAL?

Anna T. introduced the radio show titled shaping knowledge for resilience in FRACTAL cities (Tupopyeni oFRACTAL), her guests and her co-host Gina.

The first set of questions were directed at **Brenda Mwalukanga from Lusaka, who chatted about the recent media training in Lusaka**. It was noted that media is a good platform for disseminating FRACTAL information to a larger audience. Journalists help to craft complex climate information into easy and simple messages that can be understood with majority of populace. Media is also a good platform for raising awareness. A press release is almost ready for circulation. FRACTAL has gained traction in Lusaka because of a number of elements including the passion by the ER and Lusaka team. A challenge that was recently

experienced was that of timing: at the last learning lab, the government minister arrived earlier than the team! Brenda recapped the burning issues in Lusaka: unregulated water abstraction, flooding, poor water quality, declining underground water. Advice for other team members: be proactive so that city stakeholders remain fully involved.

Lulu from Durban was second guest on Tupopyeni oFRACTAL. She chatted about the focus on the **FRACTAL/D'RAP work that involves setting up a long-term biodiversity monitoring framework that somehow includes climate information**. She explained that Durban is self-funded and thus different approach compared to Lusaka. Lulu emphasized on the importance of Partnership and long-term monitoring, especially since FRACTAL has started looking at its legacy. Key eThekwini partnerships that she mentioned include: several NGOs and CBOs, University of KZN (UKZN), KZN wildlife. Lulu explained that the success of these partnership has strengthened comradeship, and everyone wants to learn more about FRACTAL. Lulu noted that these partnerships were built on trust and that it took hard work and time to bring everyone on board.

The third guest on Tupopyeni oFRACTAL was **Mzime Murisa from Harare, who spoke about the city exchanges in which Harare representatives have recently taken part**. She explained that representatives from a few different organisations in Harare visited Windhoek to explore passive and active adaptation management strategies of Windhoek in order to compare the risks and vulnerabilities in the energy and water sector with Harare. They visited the Namibia Energy Institute, Windhoek Goreangab water reclamation plant, the Windhoek City Council, and had a meeting with the FRACTAL team. A pertinent learning from the visit was the cross cutting themes around water across cities (supply and demand) as well as energy supply (currently low).

The fourth and final guest for the morning was **Kornelia, who spoke about the climate narratives process in Windhoek.** She spoke about the interest that was sparked for this process through learning labs, which has likely been supported by the development of the Climate Change Strategy and Action Plan for Windhoek. She mentioned that stakeholders are keen to better understand the climate vulnerability of the city to develop an effective plan (i.e. FRACTAL has "hooked into" a receptive space for climate-related issues). Kornelia also spoke about the process of encouraging city stakeholders to attend the learning lab (including high-profile reps for the city), which involved LOTS of knocking on doors.

Tea break

Session 3: How is what we've learned shaping knowledge for resilience in FRACTAL cities? (Part 2)
Facilitator(s): Anna T & Gina
Rapporteur: Chris L
Main outcomes: Team members understand the FRACTAL activities that are ongoing within the cities, and how these activities are contributing to resilient development

The second session followed the same format but focussed on Blantyre, Maputo and Johannesburg.
Questions related to the **CDKN-funded innovation think tanks, of which Blantyre is a part, were put forward to Burnet**. He described the Blantyre-focussed think tank through the conversation.

The project is exploring the decision to convert solid waste into energy. The city only has one dump site in the city, and there are negative consequences on health with heavy rainfall. Through the think tanks, private-public partnerships; and residential collection of solid waste will be investigated. The Blantyre research team has already lobbied buy-in from Ministry of Agriculture, Ministry of Water, the Department of Climate Change and Met services. the Ministry of Local Government and Local Development (80% of Malawi population live in rural areas), the Ministry of Land, Ministry of Urban development and civil organizations (NGOs) - e.g. Climate Change Network, Water Sanitation health and appropriate development technology.

Two questions from the floor were then posed:

1. Q: you have an active and enthusiastic network in Blantyre, what is driving the enthusiasm in the city? A: people see and understand the need through new weather-related impacts especially in the city.
2. Q: What methodological approach are you using for the think tanks? Would be good to replicate these in other cities. A: a 3-step process has been undertaken: i) desktop study which involved reaching out to stakeholders; ii) lobbying CEOs of departments and then asked for them to endorse contact persons for think tank participation; and iii) have

engagement/collect data

The next set of participants, **representing Maputo, were Genito/Hecralito**. The following key points were raised in their **conversation related to the word "resilience"**

The Climate change plan in the Department of Climate Change incorporates the idea of resilience. Resilience is an imported word (no word like this in Portuguese). The idea of urban resilience has been around for a while for Disaster Risk Reduction. The 2000 floods impacted Maputo and this was a climate change awareness trigger. FRACTAL contributes by strengthening existing partnerships and helps to identify entry points for mainstreaming climate change into policy. It has also highlighted water availability questions.

Three questions from the floor were then posed:
1. Q: As many of the plans are funded by external agencies, would FRACTAL be better suited to mainstream climate change into policy or influence current external funded plans? A: It is difficult to change current plans.
2. Q: Other organizations have developed plans and conducted studies related to the effect of climate change on cities. Does the city want its own studies in addition to these or does it have access to the external projects. A: These projects produce documents usually in English and it is difficult to translate. This is a bigger problem than is thought – it delays implementation. FRACTAL could contribute in translation of these documents.
3. Q: We hear a new bridge is being built in Maputo. What climate information was used in this project? A: Consultants looked at climate change and information was incorporated into the plan.

The final participant for ***Tupopyeni oFRACTAL***: Let's Talk FRACTAL was **Coleen Vogel, from Wits University, who spoke about participation as a self-funded city, especially the embedded research process**. The following points were noted.
JHB decided to be part of FRACTAL For Fear of Missing Out (FOMO) ;). The project's method is unique, which was appealing. Coleen explained that FRACTAL forms part of an existing MoU, within which the team would like to use the narratives framing. She also explained that the city would like to co-develop a training module with Wits (leadership and climate change). Coleen is

interested in exploring this with FRACTAL. Coleen explain that embedding researchers in the City of Johannesburg (CoJ) has not been easy… even if both CoJ and WITS want this, the university has financial constraints. Coleen finished off by explaining that humility is needed in the realm of resilience work in the city. We need to listen, reflect and co-create, build trust. Lots of time and effort is required to do this. We are scientists and academics, how does our Theory of Change (ToC) work in the applied context of the city in a long-term?

A question was put forward from the floor:
Q: What training is asked for and what levels of staff? A: Initially it was; what is climate variability, climate change, (basic climate 101 questions), but now we are moving on to "What kind of questions should we be putting forward to the mayor's office?" This requires thinking about leadership skills training.

So, in closing Tupopyeni oFRACTAL, Anna posed the question to the audience: based on all that we have heard through the talk show (but taking a step back from the specifics of what is going on each city) what might we say is the FRACTAL difference emerging across these cities… or what is the FRACTAL dividend or value-add, as the economists would say? Session 4 aimed to answer this question.

Session 4: How is what we've learned shaping knowledge for resilience in FRACTAL cities? (Part 3: synthesis)
Facilitator(s): Anna S & Izidine
Rapporteur: Liz
Main outcomes: reflections and thoughts on how FRACTAL shaping knowledge for resilience in African cities?

Anna and Izidine posed three questions to the team, around which small group discussions at the different tables were facilitated. Each table was tasked with developing a 'tweet' style, 15-word statement to answer these questions:

1. What is the FRACTAL impact so far in the cities?
2. What have been the successes and failures so far?
3. Given the learning, how can FRACTAL move forward?

Responses from the small table discussions are presented below:

Question 1

- In Windhoek FRACTAL has increased awareness on climate change, particularly at senior level and encouraged cross sector and city collaboration.
- Increased collaboration within city through learning labs. See people coming from different places and committing themselves to taking actions.
- Harare and Gaborone: awareness raising, partnership, trust building, change perceptions of researchers.

Question 2

- Failures are useful. Successes: city partnerships and awareness on climate change. Failures: high expectations and scheduling calls – if you're not an ER it is hard to attend all the calls.
- Successes - Development of partnerships, policy briefs, press releases, training. Failure - not conducted contextualized research, or avoiding duplication of work.

Question 3

- Joint planning, joint exploration of next steps, focused Learning Labs, Fractal 2
- Climate resilience: Just add research to action. #thirdspace #leavingalegacy #fractalout #ERs

Session 5: Integration session 1 – nexus mapping

Facilitator(s): Piotr, Di, Katinka, Genito
Rapporteur: Lulu

Main outcomes: Team members have a deeper understanding of the nexus “systems mapping” approach and process; as a tool for integration of different activities, knowledge types, perspectives etc.

The main objective to the nexus integration was to introduce the nexus mapping exercise to the team as a tool for integration of different activities, knowledge types, perspectives etc. Piotr explained that the nexus mapping approach contributes to resolving burning issues, and identify entry points for climate information. A top-down approach is generally used in systems mapping, but this form of mapping is more of a bottom-up approach. The basic principles are: i) mapping is done in a 'problem-orientated' way and not from a city-system perspective; ii) it's participatory and transdisciplinary (integrating many different knowledge types); iii) the value is in the process and outcomes; and iv) contested views should be articulated and consensus shouldn't be forced. In this process, visuals, as well as narratives around the visuals, are used. Climate information entry points should emerge from the process but are not the focus (i.e. not used to drive the process).

Importantly, the factors that cannot be controlled shouldn't be included on the map; e.g. on a Cape Town map drought shouldn't be on the map but rather the governance issues surrounding the issues caused by the drought... Drought isn't the issue; the issue is that systems weren't in place to deal with the drought consequences. The mapping process can then be taken further by mapping additional resources to solve the problem.

This introduction was followed by an exercise during which crises were mapped by participants for various cities (on large A0 paper). The feedback from groups on this exercise included the following points.

- This form of mapping is also named 'messy mapping' of wicked problems.
- Teams shouldn't over-think the issues or draw too many linkages between issues as this complicates things.
- It's easy to get drawn into and losing oneself in a specific issue and miss out on exploring other issues. It was mentioned that that's not necessarily a bad thing since it could indicate the importance of the issue.
- One team mentioned that sometimes there are unintended realization of implications of issues.

- It was mentioned that in 30 minutes teams determined the city issues which took FRACTAL 2 years to determine. However, it was acknowledged that partners arrived at the point where they could map issues because of their involvement in FRACTAL.
- Outsider perspectives and inputs in the city-team's mapping were useful to interrogate and add value to accepted assumptions and statements.
- A discussion revolved around whether all voices in the team were equal, and if not whether they should be equal. It was also discussed that teams could be rotated to see how much value would be added by different perspectives.
- A discussion on contested views, and how these were dealt with, also took place; some teams resolved it through negotiations (indicated with dotted circles instead of solid ones) and others through 'forced consensus' (tongue in the cheek).

Session 6: Integration session 2 – identifying climate sensitive decisions and contribution to decision making processes

Facilitator(s): Liz, Simon and Sukaina

Rapporteur: Brenda

Main outcomes: Team members have a deeper understanding of the approaches to identify climate-sensitive decisions, and attempts to integrate climate information into decision making.

Simon Dadson presented feedback on some work that integrates decision scaling (a decision methods approach) with modelling. Through this process, the model variability and uncertainty is collapsed in a manner that policy makers can use for decision making. This involves a climate scenario led approach, which begins with an envisioned scenario of the future, and associated pathways. The approach enables better understanding of a system (for example a water system), and how it is being managed. Knowledge on the different components of the system (environmental and socio-economic/decisions) needs to be provided by different stakeholders who hold this knowledge. One starts with the decision that needs to be made, and constraints are then integrated into the model as thresholds, taking into consideration the potential effects of climate change.

An example from Turkenel was presented by Simon: a severe drought was experienced in 2016 and the decision makers needed to know how resilient the water supply system was. The thresholds used in the model included: high rate of rainfall, river flowing through a semi-arid to arid part of Turkenel, dam, abstraction of water from the river and ground, reduced water table, proposal for oil production and industrial water use, nomadic use. These thresholds were used to assess the impact of climate change and variability in water demand satisfaction and groundwater depletion. A colour scale was used to present demand and risk. Importantly, other scenarios such as urban population growth and agriculture can be overlaid, but only on a shorter time scale.

Sukaina and Liz then went on to state that it was important to understand institutional gaps for enhancing receptivity to the use of climate information. There is need for institutional capacity building in cities and more relevant training, but sometimes the specifics of these needs are not known. Thereafter, Sukaina and Liz went on to introduce the Capacity Diagnosis and Development (CaDD) tool which has been applied in both a European city and developing country context. To demonstrate the functionality of the tool, participants were put into groups, and worked together to answer some questions from the tool. The links to governance and nexus work were made explicit. The tool could be helpful in understanding the capacity across institutions in cities and to identify the key areas for interventions. The tool recognizes six different response levels and the objective of the second part of the session was to explore whether co-developing the underlying questions for each response level, would make this a useful tool to be applied in certain cities.

Participants were also informed that the exercise they had undertaken was only a pathfinder exercise which shows where you are and where you need to get to. The second part of the tool is called a deep dive, which assesses what capacities are available in institutions and where the gaps may be, to then develop an action plan.

The tool can also be used online or in a participatory manner. It was stated that the CaDD tool does not replace the dialogues in FRACTAL cities but helps identify the institutional capacity gaps and ensures that the dialogue is action focused. The tool can also be applied at different times in the project implementation phase to monitor learning and changes.

Feedback from participants

- Some questions were vague. It was recommended that the tool be co-produced to make it relevant and improved.
- People wanted to know if the tool can be used offline. Clarification was that it can be done in a participatory manner and needs to be done online.
- There was no option to go to the previous page (online).
- Participants thought it was a great tool for self-assessment.
- A page for recommendations should be added to allow the users of the tool to add their action plan.
- Questions need to be co- developed to eliminate bias.
- Multiple entries were an option in one run.
- There is need for academic outputs besides the CaDD and learning exchanges.

Session 7: Reflection, wrap up and next steps

Facilitator(s): Alice McClure
Rapporteur: Ruth Butterfield (sub Alice McClure)
Main outcome: Outcomes from the day (integration of activities and work) are surfaced and participants have the opportunity to reflect.

Alice led the reflection session, which highlighted that yesterday, the team heard lots about the ongoing work, while day 2 focussed on what this work meant, and how it is being integrated in cities. She mentioned that it was great to hear how questions from the climate scientists and cities matched, and experience snapshots of ow FRACTAL is contributing to processes in cities. She mentioned that she liked the idea of co-designing a training workshop, and that the integration exercises were particularly useful. She posed a few questions to the team: i) what did they really like about the day? ii) what did they not like? People mentioned liking the climate science auction, and being exposed to the mess mapping exercise. Alice mentioned that the next day (day 3) would focus on looking forward, including academic outputs, and to start thinking about moving forward. She urged the cluster co-chairs to come armed with research questions that they are working towards answering.

DAY 3 (22 November 2017)
Session 1: Climate science reflection (therapy) session
Facilitator(s): Chris J
Rapporteur: Becca
Main outcomes: participants are provided an opportunity to engage further with the climate science, and think about taking things forward.

Introductory comments

Chris opened the climate science reflection session with some general comments: i) we're expected to have the answers and get criticized when we get it wrong; ii) we've been trying to get to grips with what's going on in the cities specifically.

Joe emphasized that it should be okay for some climate scientists to do the core science because that is useful in itself - e.g. regional climate processes.

Alessandro: there is a responsibility that comes with FRACTAL research; we cannot simply produce research outputs without explanation as to their implications.

Chris: we are looking at ways of "operationalising research"

Bruce: research must be "user-informed"; he used the metaphor of a dog to explain the attempt to reverse research roles in FRACTAL, suggesting that the tail wagging (co-production of information) should cause the dog to bark (climate research answers) instead of the other way round, which has been the norm in other projects. They are committed to looking at the Climate Cluster workplan for 2018 in detail, including where there are contradictions.

Conversation about uncertainty

Chris: UMFULA and IMPALA (two other FCFA projects) focus on decreasing uncertainty in the climate projections

Bill: what is relevant information? Uncertainty is a part of what is relevant in all decision that are made... decision-makers must surely deal with uncertainty all the time.

Richard: Climate Cluster aims to improve confidence in the research outputs we produce, which is similar to decreasing uncertainty.

Grigory: we need to know what the uncertainties are; trying to quantify uncertainties might be useful.

Alessandro: better to focus on what we know that what we don't know.

Conversations about distillation

Piotr has been writing public pieces recently around Cape Town's water crisis and he commented on the process of writing for general consumption rather than academic writing: Piotr: when there's a crisis then people listen and you can reach a wider audience. News pieces require scientists to dilute their language, but it must be more technical and fact based than journalists' normal reporting… Scientists can provide an objective view, not just a viewpoint or sensation.

Sean: putting scientists into the practitioners' space is the best place to make a difference (as has happened in Durban); as part of the city (eThekwini)… he must think about whether to sign on the dotted line of big/expensive infrastructure projects, and the climate information helps with this decision.

Bruce: in other projects, the framework has been to use known approaches to try to converge on the useful messages; they're not getting very far so we introduced the idea of "distillation" to provide a new "research frontier".
Step #1 - get rid of the extra, unnecessary information to establish a clear message
Step #2 - how do we refine our research to give an even clearer message…simple messaging isn't easy for climate scientists because they want to throw in all the caveats and nuances as they would in an academic paper

John (Windhoek): are you close to being able to contribute climate information to urban development and planning? We need to know about the 20-year outlook for precipitation.
Richard answered: Yes!
Bruce commented: seasonal and multi-year forecasting in Southern Africa is "in bad shape at the moment", but we can talk about probabilities/likelihoods and therefore make statements based on projections ('trajectories")

Lulu (Durban): more than 'dumbing down' the science for politicians/decision-makers, what needs to happen is a translation of information into a message that becomes knowledge; scientists need to be able to translate their scientific message into political jargon

Bruce commented: the dilemma is that we don't yet know what information is.

Coleen: co-production helps climate scientists by making them think out loud (more than dumbing down the science)
Bruce commented: speaking it out loud often brings clarity or exposes things.

Bettina: climate is the lowest common denominator in the cities; there is good will on all sides in FRACTAL because the answers are multi (or trans) disciplinary (more than the climate science)

Joe: there are two major areas of research in the climate cluster…
1. pursuit of new science (pure science)
2. information to serve the cities (climate services)

Session 2: Update on FRACTAL learning

Facilitator(s): Bettina K & Liz
Rapporteur: Alice
Main outcomes: Team members understand the updated learning framework and responsibilities of team members to contribute to learning

The session on FRACTAL learning provided an update of the learning process in FRACTAL, and presentation of the 2017 learning framework, which is much more succinct and digestible than the previous version. Bettina provided a brief overview and screened a film of 2016 annual meeting participants expressing their hopes and desires for the coming year (2017). Encouragingly, most of these expectations have been meet in 2017. Alice then explained that the learning framework has two

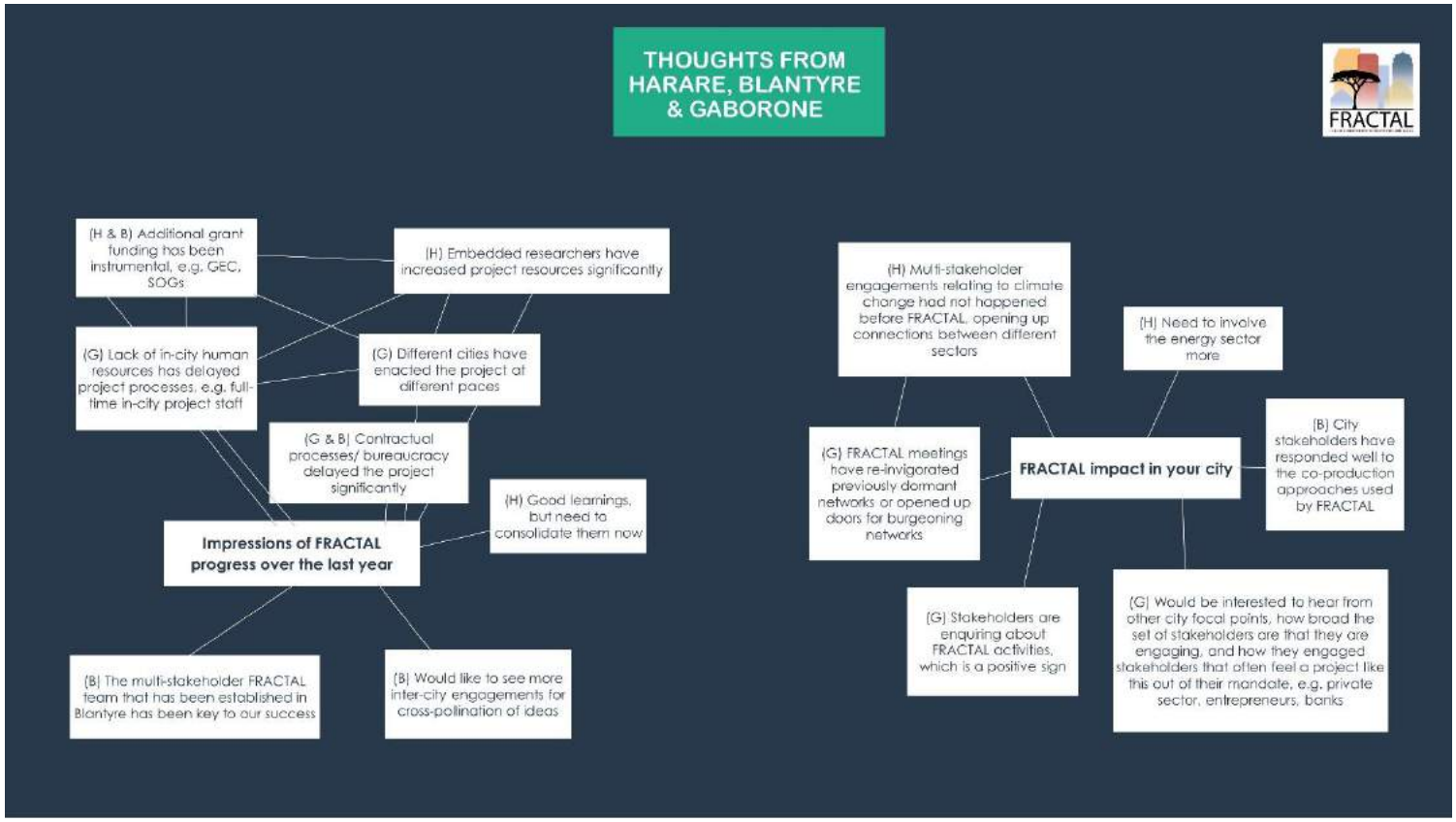
main objectives: i) to monitor (co)production of new knowledge; and ii) improve/report on "meta" processes such as co-production (i.e. learning about learning). She also explained that the learning process will enable input from all project stakeholders at frequent intervals, and that learning data will be collated and stored in dedoose for analysis so that a formal "learning" output can be developed within FRACTAL.

Session 3: Cross-city messages

Facilitator(s): Eddie & Meggan
Rapporteur: Sukaina
Main outcomes: Team members have an understanding of the key messages from the cross-city learning exercise (undertaken prior to event)

Learning from Blantyre, Gaborone and Harare

Additional grants have been fundamental to research in these cities (all cities have received grants except Gaborone. The ERs have also been really useful in the cities to understand complex city dynamics and that climate is often not a priority in the cities. Multi-stakeholder engagement has happened for the first time in some cities around climate change and this has been really useful and Blantyre has the possibility of a multi-stakeholder platform which will add value. There is a recognition of the difference sometimes between academic targets versus city ambitions - the city needs tangible outputs and flexibility is needed when dealing with city schedules. There has been a shift in perception to a co-productive approach from extractive research since the beginning of FRACTAL. The key messages for Blantyre, Gaborone and Harare were presented using an infographic, as shown below.



Lusaka, Maputo and Windhoek – more info to come from Eddie

Lusaka

- FRACTAL is known as a credible consortium that stakeholders can work with

- climate change and environment is included as part of the Strategic Plan as a result of FRACTAL

Windhoek
- Visibility of xxx has been elevated

Durban
- Increased understanding of climate information

Maputo
- more visibility and recognition by city stakeholders including World Bank

Session 4: Defining responsibilities (now we've got to...)

Facilitator(s): Bettina & Bruce
Rapporteur: Sandra
Main outcomes: People understand their responsibilities and the next few steps towards achieving these.

The session started off with an exercise that was a replay from a learning retreat held on Tuesday. The exercise involved group mates making gestures of how they feel about FRACTAL before the four clusters met to reflect on and provide feedback on their current progress, plans for moving forward and intended academic outcomes. The feedback from clusters on these topics is presented below.

City Learning Cluster – Bettina

The city learning cluster has made good progress in terms of producing academic outputs. Some papers which have been produced include but are not limited to:

1. A paper on co-exploration, coproduction and transdisciplinarity – Anna Taylor, Di and Alice

2. Synthesis paper on co-production approaches
3. Guidelines on using the Embedded Researcher approach in the making – Lulu et al
4. Trans-learning in FRACTAL – this includes two papers related to FRACTAL and other projects- Lulu and AWAKE project in Tier 2 cities.

Throughout the process, the cluster has made and will continue to make sure that:

- There is a process of validation of project outputs before publication, and city PIs have an opportunity to comment on all outputs.
- There is much focus on co-production throughout the process when publishing articles.
- The research process does not undermine other ongoing processes.
- At least, a one page policy brief is produced for each academic output to enable information dissemination beyond academic spaces. This is meant to bring out the key messages that can easily be used by decision makers and other relevant stakeholders.

Decision - Making cluster – Sukaina

The decision-making cluster has done a lot that is answering and informing original research questions. There are many opportunities for comparative analysis as a result of working in different cities with different governance structures. However, a lot of issues (that could potentially be the focus of the cluster) have been raised, and the cluster needs to prioritise those that can be addressed to avoid being caught up in a web of tangled issues. There is also a need to explore different formats in which results or key messages can be disseminated to cities and other stakeholders aside from academic papers and policy briefs. Innovative ways of disseminating information like videos etc. will be useful for wider uptake within cities and among stakeholders.

Nexus cluster – Piotr

A reflection of initial research questions from the Work Package revealed that there has been a diversion from an initial focus of mapping multi-sectoral interconnections or 'nexus'. With time, the focus was more on inter-cluster connections and working around burning questions and trying to link up cross-cluster activities which has been challenging. The nexus cluster is mandated to aid decision making in the context of many particular issues but there is still no clarity on the next steps to be followed although there will be more efforts to link up with people on the ground for more understanding. The cluster aims to develop concept notes and papers going forward. The pending **question for the cluster now is on what tangible outputs can be left to the cities** for use apart from academic outputs.

Climate Information cluster – Chris and Richard

The climate cluster has made considerable progress. There has been focus on progress made towards addressing the original research questions, reflecting on what has been addressed and what has not been addressed so far to map the way forward. Several academic papers have been produced although this has not been the main focus of the cluster. The papers produced (published and submitted) have had a focus on baselines and uncertainty, historical climate trends, process chains frameworks and indexing among other things. There has also been much progress on climate narratives work which are an informative way for scientists to present future climate information to non- climate experts. The challenges faced in providing this type of information revolve around limitations of knowing what the necessary information is that can be extracted from models to be used for dissemination. Such a question among other questions on city-specific relevant climate information has sparked discussions (*albeit scientific arguments*) throughout the process.

Questions/suggestions raised

The ER approach that is coming out of FRACTAL is key and warrants much attention such that a good academic paper on the approach can be produced

Session 5: Feedback from PAT (Bill Gutowski)

Facilitator(s): Bill G
Rapporteur: Rudo
Main outcomes: Strategic guidance for the project from PAT

The main points from the PAT representative are presented below.

- The PAT representative acknowledged participation by people from all the cities and expressed his appreciation of the creative approaches to engagements used during the meeting e.g. the auction.

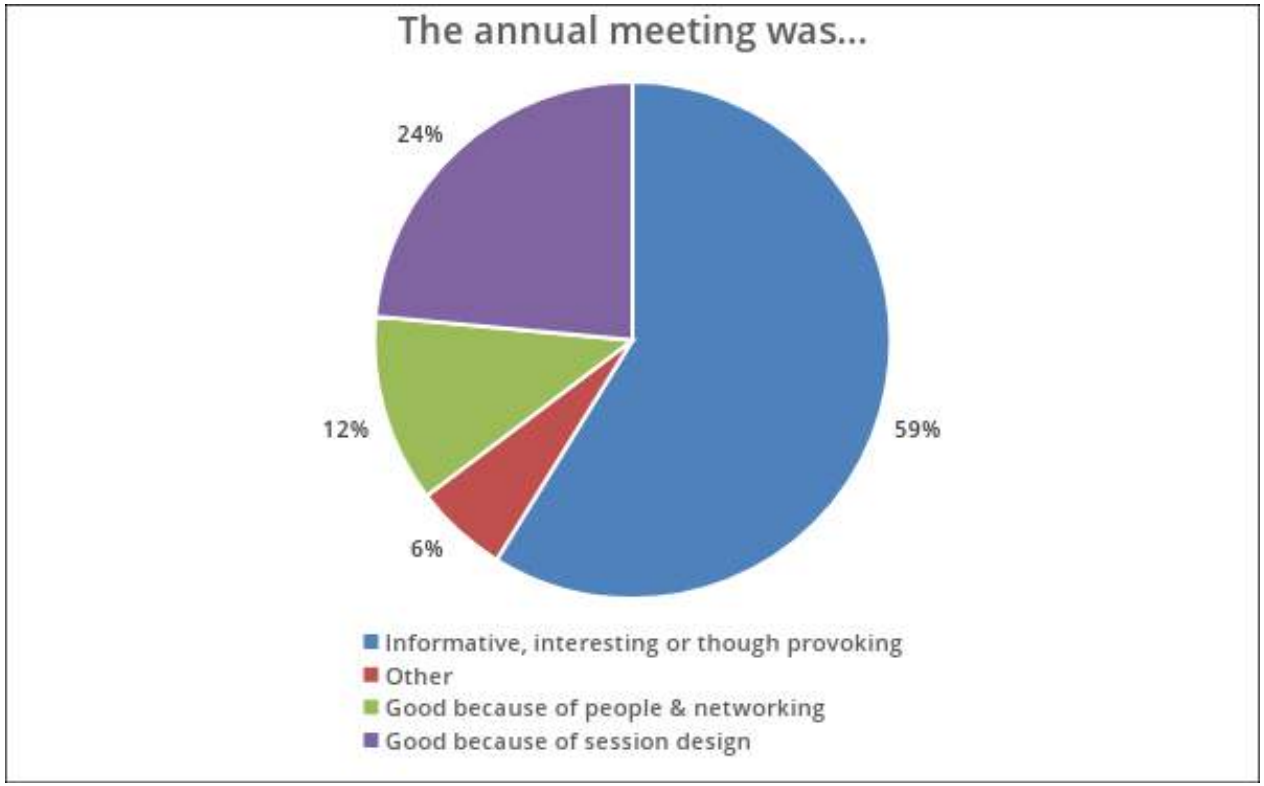
- FRACTAL offers a third space where everyone is outside their comfort zone and there has been substantial growth in sophistication.
- There is recognition of differences in cities and realization of what has worked and what has not.
- It would be nice to see cities engage on a productive way, take action and adopt action measures.
- It would be nice to see the detailed different work in all clusters.
- How much might all the clusters synthesis what they are doing? This might be the reason why the nexus cluster is facing challenges.
- There is some level of formulation stage ongoing in cities and therefore it might be too early to ascertain the nexus.
- Auction concept might be used in learning how to write proposals.
- Last year discussions were centered on academic papers but this year there is more engagement.
- As FRACTAL we need to show the rest of the world and the world will place their attention.
- There is need for a statement on what we have to pay attention to

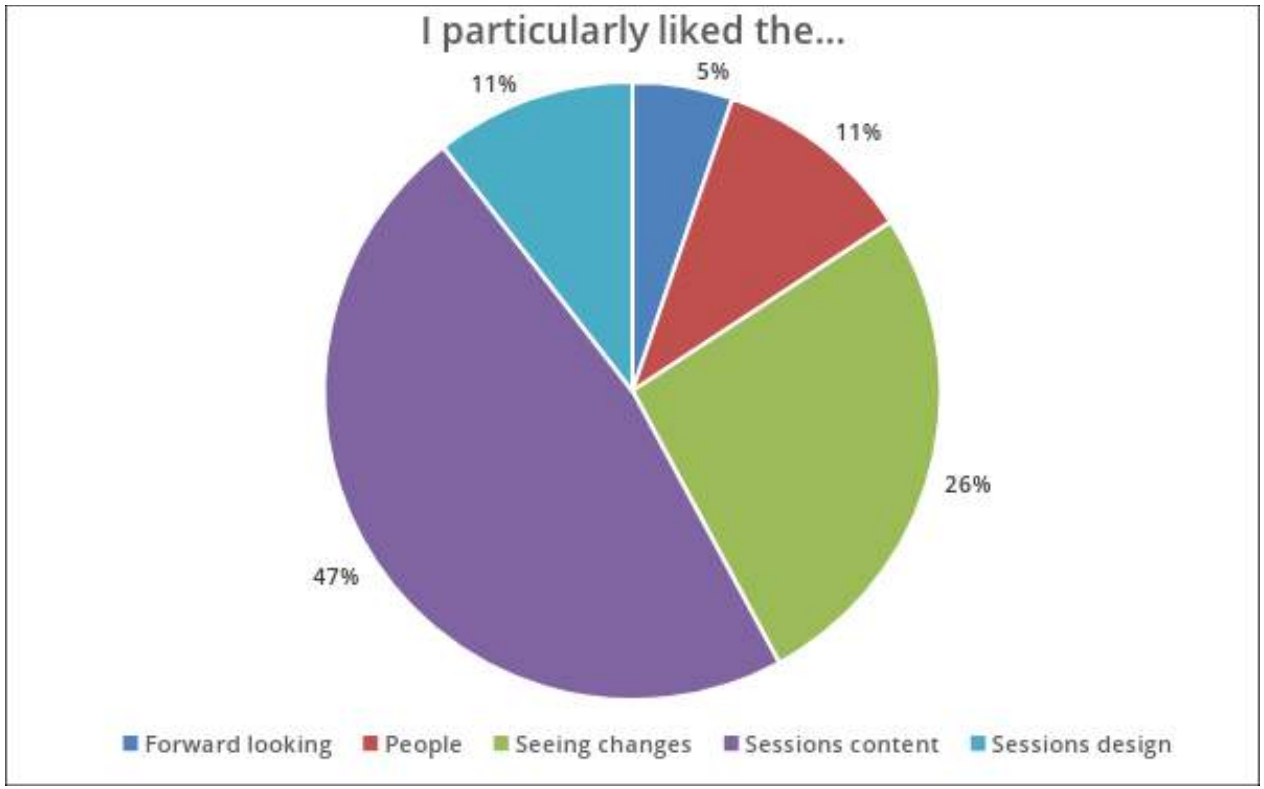
Session 6: Reflection of event

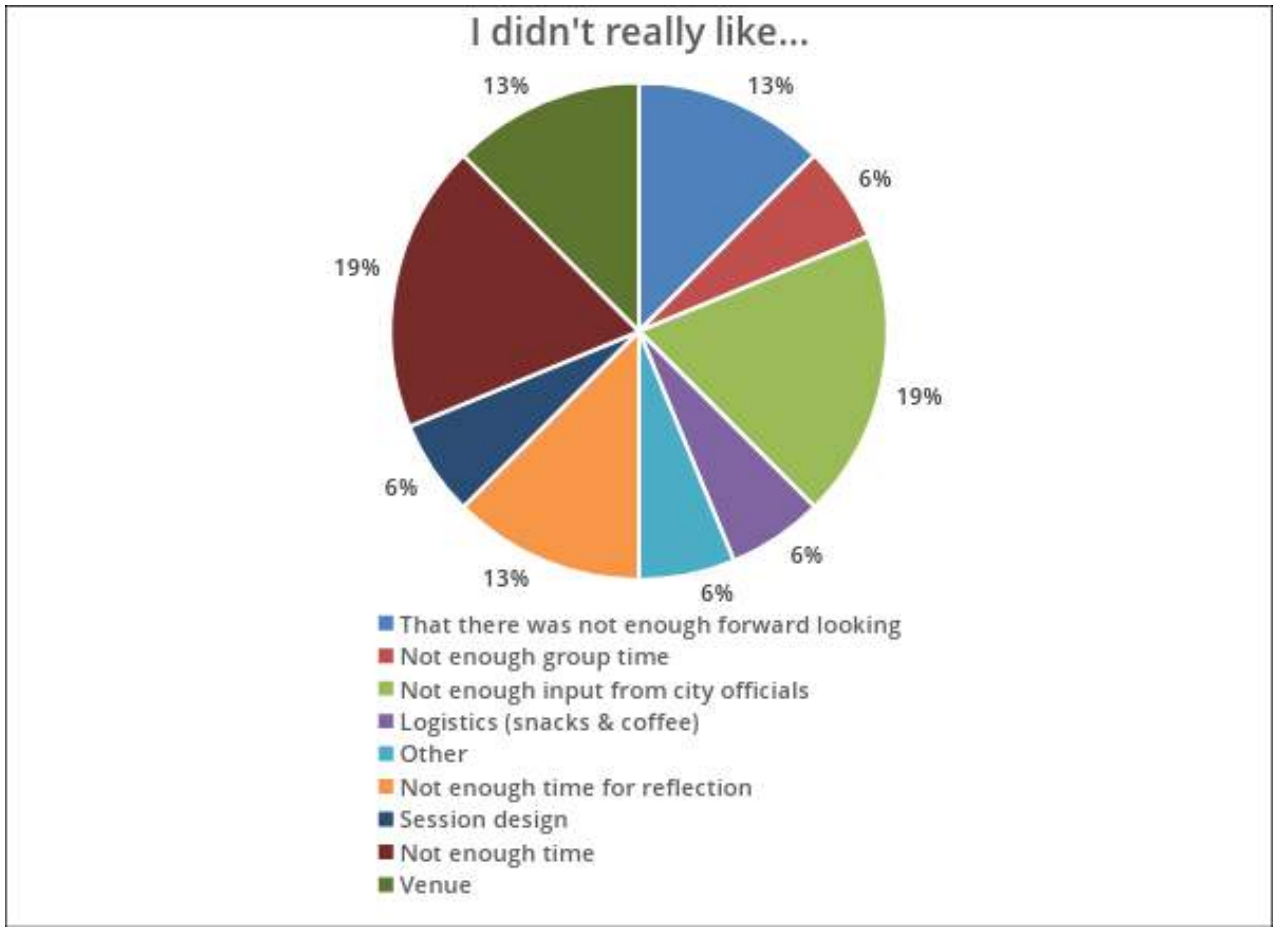
Facilitator(s): Brenda and Jess K
Rapporteur: Katinka
Main outcomes: Participants are provided an opportunity to reflect on the event

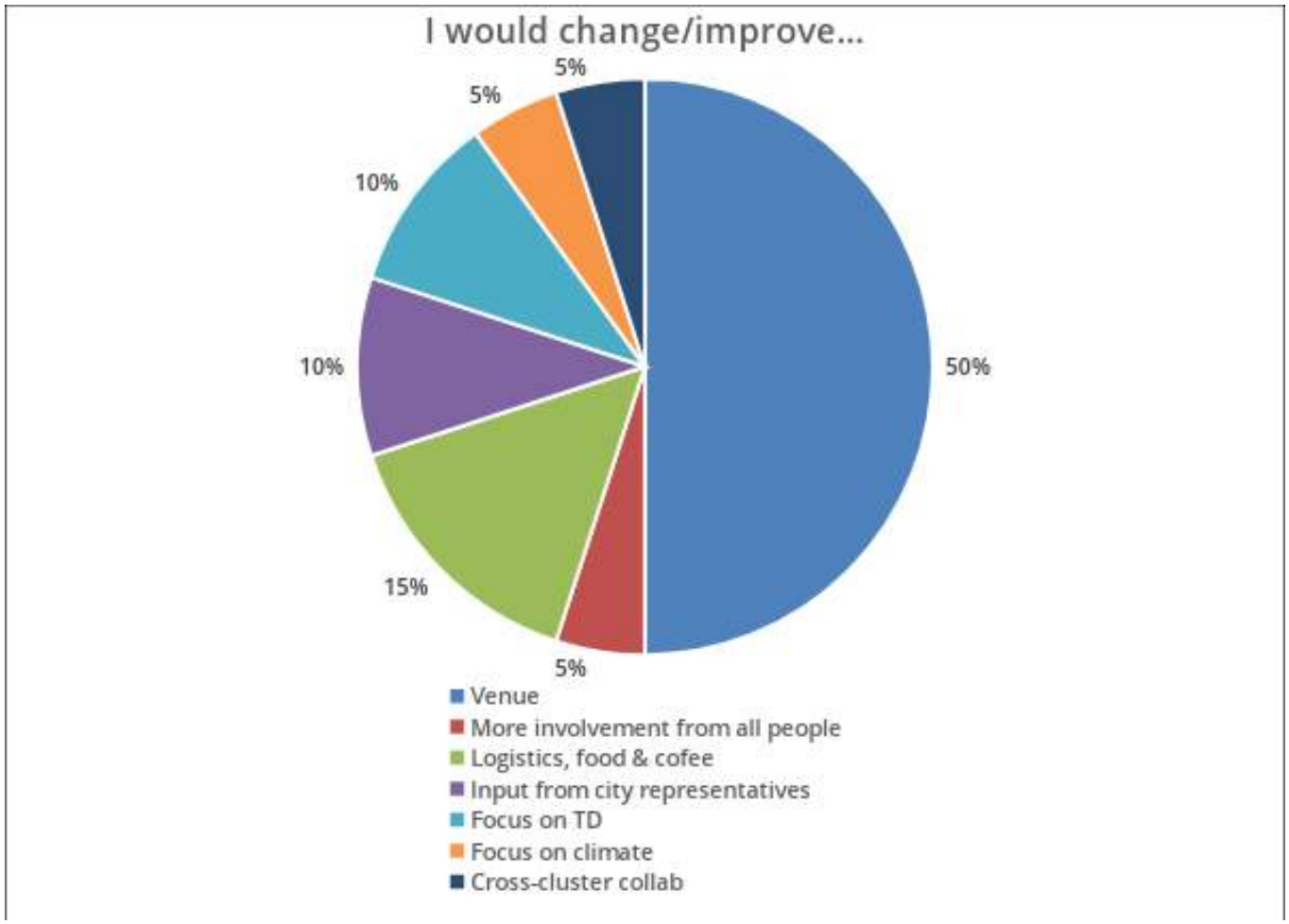
Brenda and Jess K ran an interactive reflection session, during which participants provided feedback on the event as a whole. In particular, participants were prompted with the following sentence beginnings: i) the annual event was… ii) I particularly loved… iii) But I did not think… and iv) If I organise a workshop like this again, I would…

An overview of responses in presented below. For a full list of responses, see Annex D.


The annual meeting was...
24%
12%
59%
6%
Informative, interesting or though provoking
Other
Good because of people & networking
Good because of session design


I particularly liked the...
5%
11%
26%
47%
11%
Forward looking
People
Seeing changes
Sessions content
Sessions design


I didn't really like...
13%
13%
6%
19%
19%
6%
6%
13%
6%
That there was not enough forward looking
Not enough group time
Not enough input from city officials
Logistics (snacks & coffee)
Other
Not enough time for reflection
Session design
Not enough time
Venue


I would change/improve...
5%
5%
10%
10%
50%
15%
5%
Venue
More involvement from all people
Logistics, food & cofee
Input from city representatives
Focus on TD
Focus on climate
Cross-cluster collab

Session 7: Wrap-up and overview of targeted research days

Facilitator(s): Alice & Bruce
Rapporteur: Laura B
Main outcomes: Participants feel comfortable with the key points emerging from the meeting and understand the process for the next two days

The final session of day three included a wrap-up by Bruce, as well as some logistics planning for days 4 & 5. Bruce thanked a number of people who had been involved in the planning of the event, namely James and Ashley, Mel, Sharon and Alice. Thereafter the team worked together to refine the schedule for days 4 and 5 (see Annex B).

DAY 4 (23 November 2017)
CoOrdination, Management and Integration Committee (COMIC) meeting

The FRACTAL COMIC met for the first 2017 annual event. This committee comprises all the major fundholders of the project (listed below). Key points from the topics covered are presented below.

Terms of Reference (ToRs): cross-cutting, COMIC and nexus

During the meeting, initial comments on these skeleton ToRs were offered by COMIC members, after which the ToRs were developed further (see draft ToRs here). It is expected that the cross-cutting and nexus clusters will further developed these ToRs with other cluster members.

Cross-project outputs documenting process/materials with one aim to estimate optimum project length

Jean-Pierre Roux (SSN) provided an overview of the process for developing cross-consortia FCFA outputs. These outputs were identified at the FCFA conference (September 2017) and a number of people within FRACTAL raised their hands to lead or contribute to the development of these synthesis outputs, namely: Bruce Hewitson, Richard Jones, Anna Taylor, Chris Jack, Bettina Koelle, Genito Maure, James Cullis, Anna Steynor and Alice McClure. For more information on these products, see here.

The COMIC discussed the integration of synthesis work into FRACTAL activities (so to not add another 'layer' of work). It was decided that clusters should attempt to integrate this synthesis work into the cluster workplans. These products should be discussed at the cross-cutting call, as well as other relevant cluster calls. Leads of these outputs are required to provide statement objectives and names of champions by the end of the year. For more information, contact Jean-Pierre (jean-pierre@southsouthnorth.org).

Possible project extension to Nov 2019?

A decision was taken to apply for a formal no-cost extension for FRACTAL to November 2019 (Bruce to apply). Furthermore, a concept for FRACTAL 2 will be developed near the beginning of 2018, after an evaluation of FRACTAL 1 and identification of clear leverage points. This evaluation and development of the concept for FRACTAL 2 will be undertaken by a small working group (including COMIC members), which will be led by Richard Jones.

3 FRACTAL-wide(ish) meetings in years 3/4 so one in each Tier 1 city

Several COMIC members expressed interest in convening the annual meeting in a different FRACTAL city in 2018. Furthermore, the committee decided that several other outward-facing events should take place in 2018/2019. It was decided that at least three of these meetings will be held in Lusaka, Maputo and Windhoek. A suggestion was also put forward for task teams to keep an eye out for events in target cities in which FRACTAL can facilitate, and that more conferences/showcasing of work be considered as part of the city learning processes in FRACTAL cities.

FRACTAL 2

See note on Possible project extension

Publishing strategy

Unfortunately, the time set aside for the meeting was not long enough to include a conversation on a publishing strategy. This will be carried over to the next COMIC meeting. However, two important points related to FRACTAL publishing were raised during

the FRACTAL meeting: i) the cluster teams should be looking forward with an outcomes-based approach, and should aim to balance theoretical with pragmatic outcomes; and ii) the PIs in cities should be provided ample opportunity to review FRACTAL products that pertain to the FRACTAL cities. The FRACTAL authorship policy has been updated to reflect this.

Days 4 & 5 (23 & 25 November): Targeted research days

The last two days of the annual meeting were set aside for targeted research in smaller groups. Sessions were hosted in parallel (see Annex B). The main points/outcomes from these sessions are presented below. For more information, contact points (i.e. session leads) have been named.

Climate science

Contact points: Chris J and Richard J

- The climate cluster reflected extensively on the 3-day annual meeting days and in particular the climate auction process
  - The positive side of the climate auction was seen in the interest of the process and the dynamics of auctioning potential information, selling ideas, etc.
  - The negative side was that it wasn't a robust method to determine actual climate questions to commit real resources to. There may have been some misunderstanding about this that manifested in comments later in the programme including during the climate scientist "support group" discussion.

It was felt that many of the questions raised are already being or have been addressed so perhaps communication of the results is the key learning here. In more detail:

Questions pitched by cities:

1. **Harare and Gaborone**: Can the climate scientists give Harare/ Gaborone nearer term projections re rainfall? 30 years or less. *Response: The climate narrative process in these cities will provide information on medium term projected changes in rainfall.*

2. **Maputo**: What are the predicted changes in intensity and frequency of heavy rainfall events in Maputo City by 2030? *Response: The Maputo narratives and supporting evidence provide information on projected changes in heavy rainfall events by the 2040s. These will be interrogated further as engagement in Maputo unfolds.*
3. **Cape Town**: What is the likely change in the return period of a similar drought (as is occurring now) in the future? / and / Can we identify what the thresholds for action are, based on climate data? *Response: Return period analysis has already been done though further work is ongoing. The thresholds for action question is interesting but would depend on deep engagement with city decision makers around what these actions and thresholds might be.*
4. **Durban**: …Withdrawn post scientists spending most of their beads on the Cape Town question. *Response 1 (Chris): The fact that Durban withdrew because of the lack of beads was a strong example of why the process was not designed to determine real questions. Response 2 (Richard): a reflection on the design of the bidding process not being optimal and that the levels of energy meant that things got a little out of hand. I think that all of the other questions are very real questions and when I requested a specific city/climate cluster session this is what I was hoping to get from it. And I am hoping, as discussed in the city/dm cross-cluster call today, to continue discussing/refining and then working on (some of) these questions.*
5. **Blantyre**: How will the Lake Malawi levels be affected by climate change in the next 20 years? (Hydrological cycle). *Response: This feels like it is outside of the scope of FRACTAL climate science as it rests strongly in hydrology, there exists prior work looking at this question and perhaps that should be explored further.*
6. **Windhoek**: What will the rainfall pattern be in the next 15/ 20 years in Khomas (water source for Windhoek)? / and / What will the rainfall and runoff pattern and distribution be in Khomas in the next 20 years (frequency of below normal and above normal)? *Response: To some extent this has already been looked at through the climate risk narrative work in Windhoek and planned work in Windhoek will specifically look at the water resource risk which presumably is underlying this question.*

Questions from scientists:

1. What were the climate conditions in your city that led to recent flooding/ drought and how will these change (relationships) in the future? *Response: This question needs further interrogation.*
2. What information (from the range of observations and climate models) should the city use and how should they choose? *Response: This should perhaps be a new task within the climate cluster*

3. What is the changing likelihood, frequency and duration of multi-year drought (or wet), in the city/ cities, within the context of observed variability. *Response: This question is readily addressed and initial analysis for Lusaka was done during the 3rd Learning Lab. A new climate cluster task looking at this question will be created*

- Further discussion revolved around demonstrating the climate science processes transparently and the value this brings to engagement with decision makers. Mechanisms to enable this were discussed ranging from targeted webinars as well as sessions embedded in the city learning lab process. This has already subsequently been explored during the 3rd Lusaka LL where informal climate science "fireside" chats were trialed and found to be highly appreciated by participants.
- Finally RJ introduced and the climate cluster task teams and their mapping onto specific climate cluster tasks. (RJ to provide final teams and mappings)

Team	Members (Lead)	Tasks	Notes
1	CSAG, MOHC (Chris)	3.2.1, 3.2.2	For 3.2.2 include ERs in the team
2	CSAG, SMHI (Victor, Grigory)	3.4, 3.5.2	Leads: Victor – 3.4; Grigory – 3.5.2
3	MOHC, CSAG, CSIR (Joe/Izidine)	3.5.1, 3.5.4	
4	SMHI, CSIR, CSAG, MOHC, JRC (Chris/Grigory)	3.6.1, 3.6.2	
5	JRC, SMHI, CSAG, CSIR, MOHC (Alessandro)	3.6.3	
6	MOHC, SMHI, CSAG, JRC (Richard)	3.6.5	

Team	Members (Lead)	Tasks	Notes
7	Bettina	Therapy	

Embedded researchers

Contact point: Anna T

As a team (including ERs plus a few other interested colleagues) we each shared reflections on the week thus far in the format of:

- 1 thing I feel good about;
- 1 thing i am worried about; and
- 1 question I have.

The key themes that emerged from our round of reflections were:

- appreciating and valuing the opportunity to get together face-to-face with the wider FRACTAL team to share experiences and insights and showcase the work that is being done in all of the cities and the clusters (especially hearing the cities presented on the panel show and hearing more about the nexus cluster)
- appreciating and valuing the diversity of the people and activities in FRACTAL
- concern that the cities are not using climate information and questions about how we can get them to use it
- concern that the climate science information is not adequately being translated and transmitted back to the cities (e.g. content on FCFA conference posters)
- concern around whether certain outputs are really helpful to city officials and whether they will be used / read (e.g. apps, decision making tools, lab reports) and questions about how else can we better present and communicate FRACTAL information that is really suitable each each key target 'audience' / user (recognizing that many officials still have poor and limited internet access)

- concern that city PIs and officials are not involved in some key outputs (like papers) and that city officials
- if co-writing papers doesn't work for city officials then how else can we engage them (beyond the Learning Labs) because they are a key source of knowledge and of influence
- concern over what will be left after the project, whether outputs and information will still be accessed and used after the project is finished, whether the city people will have gained value from FRACTAL and whether climate change will remain on the real decision making agenda (the ERs feel this concern quite acutely because they are the frontline of the project in the cities with the government and other stakeholders, so if the project doesn't deliver adequately in the eyes of the city stakeholders then the ERs will face the discontent and risk being discredited)
- training is seen as a potentially valuable way of giving back to city people who have been asked for inputs and information
- concern that the focus on the water-energy-food nexus is being lost as the nexus becomes the nexus of the clusters

Many of these issues were taken up and discussed further in the joint City Learning and Decision Making Cluster meeting that took place in the afternoon.

We had hoped to have time to talk about the content analysis pilot and next steps, as well as the ER approach paper we are co-producing, but time was against us, so this will be picked up in our next monthly call.

NAP analysis

Contact points: Shaban

City-learning and decision making

Contact points: Sukaina B, Mzime M, Anna T and Bettina K

Details on this joint session can be found here.

Nexus

Contact points: Piotr

ICLEI meetings

Contact points: Jess K and Meggan

- **Work plans**: The 2018 work plans were finalised and edited with all Tier 2 cities. During discussions around activities a few process concerns related to the narrative were identified by the city focal points. These have been clarified.
- **AWAKE**: The preliminary findings of the research were presented back to the cities. Discussions and a way forward was then facilitated.

App session

Contact points: Anna S and Kate K

- **Feedback from consultation with the Tier 2 cities:** The feedback from the tier 2 cities was presented to the group. The feedback was mixed with regard to appetite for a FRACTAL app. At least one respondent in each city said they did not see the use of an app for their city. In addition, ICLEI relayed evidence from their experience which showed that, even their user-requested app, had little uptake.
- **Decision on way forward with the app:** In response to the feedback received from the tier 2 cities, as well as the emerging need for training in FRACTAL, it was decided to focus the app activity on development of training material for dissemination via a whatsapp broadcast group. It is anticipated that the concept will be tested through a prototype course. If the prototype course is well received the follow-on courses will be developed on a needs basis. The prototype module will be based on the following format:
  - A whatsapp broadcast group will be set up with participants opting-in. Broadcast groups minimise spam as reply messages only go back to the administrator of the group.

- Each week a theme based, simple, very short, interactive module will be sent via WhatsApp (1 per week) to those who sign up to the broadcast whatsapp group
- Each module will contain a short description in the body of the whatsapp text and a link to the longer module online. The longer module will take no more than 5 minutes to complete

- **Way forward**: Kate K to generate a concept note for distribution to the team. First module envisaged for mid next year with a focus on adaptation inspiration examples from each of the cities.

Day 5 (24 November): Targeted research day 2
Parallel sessions

Maputo Task team
Contact points: Genito/Hecralito

- Maputo training and LL to take place in the first week of March 2018, and the Dialogue to take place separately, in February.
- The Training will be for municipal technical officers from urban planning, transport, infrastructure and environment, and take place at a municipal venue. A small survey will be conducted amongst prospective participants to narrow down the scope and focus of the training.
- If budget and capacity allows, a second training may be held for new councillors, after they are inaugurated in October 2018.
- The Dialogue will focus on creating a common understanding of the water sector in the context of a changing climate. It comes in response to Davison's finding that there is a lack of communication among actors in the water sector, and will focus on bringing together people in the sector and centre around validating/unpacking some of Davison's findings.
- The next LL will need to link back to the initial one, and the burning issues and questions that arose there. It will also be important to focus on how the focus and activities of the second lab is to be taken forward from there.
- Ideas for activities, processes and sessions during training or LLs included: What institutional arrangements can best enable implementation of the Climate Change Action Plan (working closely with plan content and how roles and responsibilities

have been allocated, and linking to Davison's governance work); Sharing/exploration/co-development of Climate Narratives; participants quickly presenting what their work entails, but as they picture it to be in 2040; 'speed-dating' process for participants to share what they do.

- Some Climate Narratives content already exists, based on work for the USAID health project and some work that Tammy has done. It was suggested that without having seen what has been developed to date a few city stakeholders will be asked to develop short narratives before the next LL. A process for this will need to be developed.
- The next Maputo TT meeting scheduled for 14 December at 2pm – please diarise!

Action points:

*Compile around three questions for small survey to be circulated among prospective training participants (Anna and Katinka) – asap
*Translate small survey to Portuguese (Genito and Hecralito)
*Circulate small survey among prospective training participants (Raul)
*Draft aim and process outline for Dialogue (Davison and Hecralito) – by the end of Friday 1 Dec
*Develop a process for city stakeholders to develop their own short narratives before the next LL (Katinka, Anna and Hecralito) – by the end of Friday 1 Dec
*Initiate individual narrative development process with city stakeholders (Raul)
*Check when the next Water Forum takes place (Genito)

Innovation fund think tanks

Contact points: Alice McClure

- **Facilitation**: the group feels that it would be better for the experienced researcher or someone else from the university to facilitate the think tanks, given their familiarity with the context and issue at hand (i.e. decision). In this case, an objective observer would carefully "manage" the discussion and take notes, which would later be analysed. The conversation would be guided by milestones. The project teams involved in the research are objective – they have not been integrally involved in the decision-making process.

- **Pre-think tank meetings/interviews**: to build enough knowledge of the context and create an atmosphere that facilitates trust, project teams note that it will be necessary to undertake interviews with stakeholders leading up to the think tanks. We would need to think about survey design – would these be done within each university? With the core team members checking for consistency across cities?
- **Thinking around perceptions and values:** understanding should be informed by the parallel research process that is occurring on how perceptions and values influence interpretation of climate information (a database of literature is being built up for this research and will be shared with the team). To spark thinking about perceptions and values, two anecdotal "stories" will be developed and shared by the end of this week (**by 1 December**), along with the database of literature.
- **Ethical issues**: we need to consider ethical issues in these research processes. FRACTAL has been cleared by the ethics committee at UCT and an ethical clearance certificate is being developed for the think tank process. This will be submitted to UCT ethical clearance **by 1 December**. It is expected that the ethics committee will provide guidance for these think tanks. Similar processes should be followed for ethical clearance processes of partner universities. An ethics protocol will be developed alongside the fleshing out of the concept.
- **Development of project concept**: the concept that was developed for the call will be fleshed out by project partners by the end of the year (**22 December 2017**). Please review this concept here and add comments/suggestions where necessary.

A **call will be held early January** to discuss the updated concept and concretize plans for the coming think tanks.

Lusaka Task team

Contact points: Brenda and Gilbert

the Lusaka task team has been involved in driving the city learning agenda in Lusaka. since it constitution the team has held 2 learning labs, one high level breakfast and a training on climate science for decision making.
the task team has agreed on two local research questions to be investigated in the city of Lusaka in 2018.

FRACTAL narratives

Contact points: Laura B and Richard Jones

Members of the team who have had involvement in developing climate risk narratives with the cities gave brief updates on progress. Laura reported back from the Windhoek Learning Lab that the narratives idea and their purpose was shared through a chat show style interview. She also informed the group that the HyCRISTAL consortium was interested in the method and she would be sharing it with them at a meeting in Reading in the UK at the end of November. Richard updated on plans for the next Lusaka Learning Lab that the narratives would be looked at through four thematic lenses, i.e. the four components of the burning issue. These would then be linked with the systems mapping and policy briefs.

Bringing out similar societal responses in the infographics across the different narratives was thought to be an elegant way to help decision makers. Having areas of consistency across the narratives, e.g. in terms of societal responses, is thought to be really powerful. The importance of mentioning current climate extremes or events was also acknowledged.

The SECTEUR project which produced lots of climate metrics was raised and the idea of generating particular metrics or thresholds at Learning Labs and asking the climate scientists to address these as a way to include more climate info was discussed.

A lively discussion was then held around when the science becomes “good enough” and whether narratives can or should play a role in delivering actionable climate information.

Cordex/CMIP5 analysis

?

Climate process chains
Joe/Chris

CP4Africa
Richard

Appendix A: List of participants

Name	Institution/organisation & position
Alessandro Dosio	European Commission Joint Research Centre / Senior scientific officer
Alex Apotsos	Fulbright Fellow working with CSAG
Alice McClure	CSAG
Amy Davison	City of Cape Town - Head: Environmental Strategy Implementation
Anna Steynor	UCT Climate Services
Anna Taylor	UCT post doc
Becca Cullis	Communications Project Manager
Brenda Mwalukanga	UNZA/LCC
Bruce Hewitson	CSAG
Burnet O'Brien Mkandawire	University of Malawi, The Polytechnic Constituent College
Chris Jack	CSAG
Chris Lennard	CSAG-UCT
Coleen vogel	GCI University of the Witwatersrand
Daithi Stone	GCAP
Davison Muchadenyika	UCT, Post Doctoral Research Fellow
Di Scott	ACC/CSAG
Eddie Jjemba	Red Cross Climate Centre
Genito Maure	Eduardo Mondlane University - Assistant Professor & Researcher
Gilbert Siame	University of Zambia
Gina Ziervogel	ACDI

Name	Institution/organisation & position
Goabamang Lethugile	University of Botswana, Senior Lecturer
Grigory Nikulin	SMHI
Hecralito Mucavele	FRACTAL- MAPUTO- MOZAMBIQUE
Izidine Pinto	University of Cape Town
James Cullis	Aurecon
Jan Wholand	Institut für Energie- und Klimaforschung Systemforschung und Technologische Entwicklung (IEK-STE)
Jean-Pierre Roux	SouthSouthNorth Project Manager
Jess Kavonic	ICLEI Africa
Joe Daron	Met Office
Jonathan Mwanza	Lusaka City Council
Julio Araujo	South South North, Research Officer
Katinka Lund Waagsaether	CSAG
Kornelia Iipinge	University of Namibia Windhoek/City of Windhoek : Embedded Researcher
Kristen Kennedy	SouthSouthNorth
Laura Burgin	Met Office, Scientist
Liz Daniels	SEI, Research Fellow
Lulu van Rooyen	UKZN Post-Doc
Mark Tadross	CSAG
Mawanda Shaban	Red Cross Red Crescent Climate Centre
Meggan Spires	ICLEI Africa; Senior Manager
Mzime Murisa	Chinhoyi University of Technology
Olavi Makuti	City of Windhoek
Piotr Wolski	CSAG
Prof John K.E. Mfune	University of Namibia
Raul Chilaule	Maputo Municipality Council

Name	Institution/organisation & position
Rebecca Ilunga	Aurecon, Junior civil engineer
Richard Jones	Met Office Hadley Centre, Science Fellow
Rudo Mamombe	Chinhoyi University of Technology, Zimbabwe-Research Assistant
Ruth Butterfield	Stockholm Environment Institute Oxford Centre
Sandra R. Zenda	Chinhoyi University of Technology/Research Assistant
Sean O'Donohue	EThekwini Municipality
Sukaina Bharwani	SEI Oxford
Victor Indasi	CSAG - UCT
Wilma Nchito	Department of Geography and Environmental Studies, University of Zambia

Appendix B: Workshop programme (original)

Objectives of annual meeting:

Time	Session	Facilitators & rapporteurs	Structure and supporting materials	Outcomes and outputs
Day 1 (November 20): Where are we now? Stocktake of information and knowledge to date				
09h00-09h30	Welcome and introductions	F: Bruce R: Kornelia	1. Welcome (introduction to all) 2. Aims and objectives of the workshop	Participants know who's in the room and understand the objectives of the workshop
09h30-10h30	Stocktake of knowledge and processes: engaging key messages from the mid-term review Quiz, world cafe & feedback	F: Alice & Bruce R: Notes in breakaway groups	1. Short introduction to mid-term review process 2. Mid-term review quiz 3. World café style: large A1 prints of key messages 4. Feedback in plenary	Participants engage and build on the key messages from the mid-term review, especially new responsibilities & roles
10h30-11h00: Tea				
11h00-13h00	Cluster overviews: ● city learning ● climate information ● decision making ● nexus	F: Shaban M R: Jess K	Each cluster provided 30 minutes (including Q&A) to provide an overview of key messages from work they've been doing. Guided by the questions: what are the key messages? Where are we now? *Knowledge outputs and key activities captured on a timeline, which will inform the "Now I've got to..." session on day 3.*	Team members are aware of cluster-related work that's ongoing; the scene is set for thinking about how this work is/should influence city planning or the broader research community (Day 2)
13h00-14h00: Lunch				

Time	Session	Facilitators & rapporteurs	Structure and supporting materials	Outcomes and outputs
14h00-14h30	A look into the heart of southern African cities: findings from governance research	F: Davison R: Alice	1. Presentation on key findings from the governance research in Lusaka, Maputo and Windhoek 2. Q&A time	Team members have a deep understanding of the city governance arrangements, use of climate information etc., and how these key messages can be used to direct FRACTAL activities
14h30-15h30	FRACTAL poster session	F: Izidine	1. One-minute introduction of posters 2. Time provided to view posters from FCFA conference and other posters that have been developed for the annual meeting.	Following on from cluster overviews; the team has more time to engage disciplinary work
15h30-16h00	Reflection, wrap-up and next steps	F: Chris J. R: Becca Cullis	Wrap up, questions and discussion	Outcomes from the day (disciplinary and cluster work) are surfaced and participants have a clear understanding of how these outcomes feed into the following day (making sense of these activities).
16h00-17h30: Voluntary walk up to Rhodes mem (walk will begin from UCT)				
Day 2 (November 21): Making sense of all the information and activities				
08h30-09h30	Exploring the importance of climate information in cities	F: Bettina and Richard R: Meggan	Fun insightful auction of climate information/questions to city partners or vice versa.	Participants experience a "taster" of the relevance and importance of current climate info for cities, or the importance of context for

Time	Session	Facilitators & rapporteurs	Structure and supporting materials	Outcomes and outputs
			Format to be defined by Bettina and Richard	the production of climate information.
09h30-10h30	Session 1: How is what we've learned shaping knowledge for resilience in FRACTAL cities?	F: Anna T. and Gina R: Victor	1. Introduction to exercise 2. Panel-style session during which discussants answer questions posed by talk show hosts and audience	Team members have an understanding of the FRACTAL activities that are ongoing within the cities, and how these activities are contributing to resilient development
1h030-11h00: Tea				
11h00-11h45	Session 2: How is what we've learned shaping knowledge for resilience in FRACTAL cities?	F: Anna T. and Gina R: Chris L	Panel-style session (different discussants) during which discussants answer another set of questions posed by talk show hosts and audience	Team members have an understanding of the FRACTAL activities that are ongoing within the cities, and how these activities are contributing to resilience in cities
11h45-12h30	Session 3: How is FRACTAL shaping knowledge for resilience in African cities?	F: Anna S. & Izidine R: Liz	1. Introduction to exercise 2. Break out groups for richer discussion according to themes surfaced in Sessions 1 and 2, and text development. 3. Report back in plenary	Thought piece: How is FRACTAL shaping knowledge for resilience in African cities?
12h30-14h00: Lunch				
14h00-14h50	Integration session 1: Nexus "systems mapping"	F: Di, Piotr, Katinka Genito R: Lulu	1. Presentation: city-region "system" maps and trajectory mapping 2. Exercise	Team members have a deeper understanding of the nexus "systems mapping" approach and process; as a tool for integration of different activities,

Time	Session	Facilitators & rapporteurs	Structure and supporting materials	Outcomes and outputs
				knowledge types, perspectives etc.
14h50-15h40	Integration session 2: Identifying climate sensitive decisions and contributing to decision making processes	F: Simon, Sukaina, Liz (contributions from Di) R: Brenda	1. Presentation: exploring decision processes and potential climate-sensitive decisions (linking task 2.2 and 2.3, WEAP, decision processes etc.) 2. Exercise	Team members have a deeper understanding of the approaches to identify climate-sensitive decisions, and attempts to integrate climate information into decision making.
15h40-16h00	Reflection, wrap up and next steps	F: Alice R: Ruth B	Wrap up, questions and discussion; how the outcomes from the day feed into Day 3: "What do I do now?"	Outcomes from the day (integration of activities and work) are surfaced and participants have a clear understanding of how these outcomes feed into the following day (what do I do now?).
16h00-19h00: Beach outing to Oudekraal (transport provided from UCT to beach and back to UCT) Learning mini retreat(jie)				
Day 3 (November 22): What do I do now?				
09h00-09h30	Script thief: exploring multiple versions of the current/future…	F: Alice & Gina R: N/A	Interactive play, during which team members can take responsibility of a script/skit to determine the outcome	Team members feel energised and enthused to take responsibility.
09h30-10h30	Update on FRACTAL learning	F: Bettina, Liz and Richard R: Alice	1. Feedback from learning retreat 2. Introduction to learning framework: roles responsibilities, processes etc.	Team members understand the updated learning framework and responsibilities of team

Time	Session	Facilitators & rapporteurs	Structure and supporting materials	Outcomes and outputs
				members to contribute to learning.
10h30-11h00: Tea				
11h00-11h30	Cross-city messages	F: Eddie, Meggan (& city reps?) R: Sukaina	To be defined by facilitators	Team members have an understanding of the key messages from the cross-city learning exercise (undertaken prior to event)
11h30-12h30	Defining personal responsibilities: "Now I've got to…" Individual/group work	F: Bruce & Bettina R: Sandra	To be defined by facilitators (using the timeline developed in the "cluster overview" session on day 1)	People understand their responsibilities and the next few steps towards achieving these.
12h30-14h00: Lunch				
14h00-14h45	Feedback from PAT members	F: PAT representative R: Rudo	Brief feedback from PAT reps, followed by Q&A and discussion by team members	Strategic guidance for the project from PAT
14h45-15h30	Reflection of the event	F: Gilbert/Brenda & Jess K. R: Katinka	Participants reflect: what was good, what was not so good, what can we do next time for improvement?	Participants are provided an opportunity to reflect on the event Learning data
15h30-16h00	Wrap-up and overview of targeted research days (Days 4 & 5)	F: Bruce and Alice R: Laura B	Brief wrap-up Plenary discussion of details for Days 4 & 5	Participants feel comfortable with the key points emerging from the meeting and understand the process for the next two days
16h00-21h00: Outing to Noordhoek (transport provided from UCT to Noordhoek and back to UCT): Voluntary hike and relaxed braai at Cape Point Vineyards				

Time	Session	Facilitators & rapporteurs	Structure and supporting materials	Outcomes and outputs
Day 4 (November 23) Targeted research 1				
08h00-10h00	Management committee meeting	Bruce & Alice	TBC (according to agenda)	TBC
10h00-10h30: Tea				
Parallel sessions				
Time	Session 1	Session 2	Session 3	Session 4
10h30-11h30	Climate science (climate sci co-chairs)	Embedded researchers (Anna T)	TBC	TBC
11h30-12h30	Nexus session (nexus cluster co-chairs)	App session (Anna S & Kate)		NAP analysis (Shaban)
12h30-13h30: Lunch				
13h30-14h30	Decision-making session (decision-making cluster co-chairs)	ICLEI: Blantyre, Gaborone & Harare meetings (Jess K & Meg)	CP4Africa analysis for climate and city applications (Richard J + others)	TBC
14h30-15h30	City learning session (Anna T & Bettina)	TBC	TBC	Climate process chains (Joe D, Laura B, Bruce H)
15h30-16h30	Windhoek TT (Windhoek core team)	TBC	TBC	TBC
15h30-16h00: Tea				
Day 5 (November 24): Targeted research 2				
09h00-10h00	Maputo TT (Maputo core team)	Climate narratives session (Chris J, Richard J, Laura B)	TBC	TBC
10h00-10h30: Tea				
10h30-11h30	Lusaka TT (Lusaka core team)		TBC	TBC
11h30-12h30	TBC	FRACTAL terminology session (Liz, Di, CCKE?)	Cordex/CMIP analysis and messages for southern Africa	Innovation fund “think tank” meeting
12h30-13h30: Lunch				

Appendix C: How well do you know your project? Quiz questions (session 2)

1. Which one of the following intellectual challenges was not included in the FRACTAL proposal?
   a) To understand the climate processes driving the African regional climate system's natural variability and response to global change in the recorded history and climate model simulations.
   b) To distil defensible, scale-relevant climate information, informed by and tailored to urban decision making and risk management within their regional dependencies.
   c) To use co-exploration of climate information with urban partners within the systems-thinking paradigm to integrate climate messages within real-world decisions, and enhance the resilience of development pathways.
   d) To advance knowledge frontiers across a wide range of disciplines, including those related to climate information, modern dancing, governance, resource management and urban planning.

2. The objective of the mid-term review was to:
   a) take stock of what we've achieved and think about how we'd like to move forward
   b) begin a conversation between all FRACTAL partners and inform planning for Year 3
   c) assess the processes and structures for decision making within FRACTAL and decide whether they are optimal given the momentum and phase of the project
   d) a and b
   e) All of the above

3. A number of key findings related to activities and research were highlighted in the mid-term report. Which of the following messages was not included in these key findings:
   a) The climate info cluster should work had to push the frontiers of science and provide the foundation for activities related to distillation, communication etc.
   b) The city learning cluster should focus on developing training content on the quantum mechanics of co-productive processes

c) We (FRACTAL team) should better document and analyse learnings from the transdisciplinary, co-exploration and co-production processes.
d) The nexus and decision-making clusters should focus on gaining an understanding of the city system, and regional linkages.
e) The decision-making cluster should focus on identifying climate-sensitive decisions and pathways for uptake of climate information

4. Which of the following FRACTAL-related projects is included within the core budget (i.e. not an additional award):
a) The mobility fun
b) The innovation fund
c) The GEC Africa project
d) The Small Opportunity Grant (SOGs)
e) The Applied Research fund (ARF2)
f) African Water Adaptation through Knowledge Empowerment (AWAKE) project

5. Bonus question: complete the following sentence…

Engagements and research in the cities has led the climate science cluster to believe that, contrary to prior belief, uncertainty is not the most evident limiting factor to decision making in southern African cities.

6. Which of the following suggestions was presented in the Mid-Term Review as a way to meet project objectives?
a) Ask DFID for more funding
b) Hand over more responsibility to municipalities in FRACTAL cities
c) Increase the number of project-wide meetings to two each year going forward
d) Organise flash mobs in FRACTAL cities and climate science institutions to convey key messages

7. According to the mid-term survey, team members feel that enhanced understanding of research outside of their own is essential to move the project forward. Which of the following activities will be implemented to facilitate this?

a) Bi-monthly learning webinar
b) Sharing methodological papers
c) Installing secret video cameras in team members offices and launching the FRACTAL edition of "big brother" to better understand the actions of scientists across disciplines
d) a and b
e) a and c

8. Activities and engagements have ramped up considerably in each of the FRACTAL cities; processes and mechanisms have been introduced to keep track of these processes. Which of the following statements is false?

a) City task teams have been developed to drive activities and engagements, with the local PIs and embedded researchers leading these.
b) City-specific process plans have been introduced to keep track of these activities and engagements. The task teams (or other relevant people) are responsible for updating these plans on a monthly basis
c) A number of cities will be developing city-specific digests to keep stakeholders informed.
d) City-specific web pages are being integrated into the FRACTAL website
e) Only a and c are true

9. A number of project policies and frameworks have been developed and shared to guide FRACTAL processes. Which of the following frameworks has not been developed?

a) Learning framework
b) Governance framework
c) Change management framework
d) Communications and uptake framework
e) Capacity-development

f) Workplan procedures

10. Which of the following mechanisms have been introduced to facilitate more transparent administration and synthesis of the project as a whole?

a) Increased frequency of cross-cutting calls
b) A management committee
c) More diverse representation (from all clusters) on the city task teams
d) All of the above
e) Only a and c

Annex D: Reflections on event

The FRACTAL annual event was:

1. Good the way it explained what the project is, the goals they want to catch up
2. Overwhelming but fascinating, learning so much of what has been happening when not a deeply embedded member of FRACTAL
3. Thought provoking and interesting
4. Interactive and had good feedback and reflective sessions on where we are and what has been achieved.
5. Great and very interesting
6. Full of interesting and informative talks, games and presentations.
7. Interesting and very diverse with a great mix of people.
8. Interesting
9. Informative and allowed for more 'offline' conversations.
10. Very revealing and a 'lot to talk about' as there have been many outputs. Therefore – much feedback, innovative way.
11. Highly interactive.
12. Well attended.
13. Interactive and I did enjoy most part of it.
14. Very informative and gave me clarity on what the other cluster and cities are doing.
15. Interesting, reflective, informative, frightening (very little time left).
17. Great, very interesting.
18. Interested to participate of the event because is my first time at annual meeting.
19. A learning process on its own that provided learning experiences, information and insights from different projects.
20. Very productive and great fun.
21. Insightful, encouraging, inspiring and exciting.

particularly loved:

1. The sessions presented until now
2. The climate auction – working on the city tables you could see progress in front of your eyes of how these questions of climate information could be formulated by the cities
3. The participatory mode of the workshop and the comradery that has been building in the group
4. Loads of energy, innovative sessions, seeing things coming together.
5. The session of discussing next year's outputs
6. The way the cities have come to be where they are at the moment if one is to reflect back. The idea of the ER is now an actual hand on concept that is really working well.
7. How everyone was included and there were lots of different methods for allowing everyone to share their thoughts.
8. The diversity – people from various backgrounds and different cities working together.
9. The reflection times after sessions. Seeing how far everyone has come both personally and in the context of the project. Feeling as though we know more about the core of the project although we struggle to verbalise it – Also the 'ice-breaker, fun' sessions.
10. The 'conversation among climate scientists – great learning experience.
11. Talking about innovative research. The relaxed and open vibe and atmosphere.
12. Auction.
13. Talk shows and group feedbacks.
14. Mess mapping session. It opened my eyes on how complex and interlinked the challenges and influences the cities are facing.
15. The Tupopyeni Ofractal – It was a good way of knowing what was happening in the cities instead of presentations
16. Interactive sessions: auction, panel discussion (talk show)
17. I liked the interaction with all other people. I learned a little bit more to communicate to people from a different community.
18. Because I understand that FRACTAL, [?] growth in a aspect I could [?] for other cities.
19. Engagement processes and being able to reflect on where we are now and how far we have come. This enables us to shape the way forward.

20. The interactive nature of the event, the friendly and collaborative atmosphere and the excellent feedback from the city representatives.
21. Hearing from cities and climate scientists in the auction-matchmaking; city feedback generally; honesty of climate scientists when discussing their challenges; and reflection video

But did not think:

1. Coffee, I did not have salty ones
2. There was enough time to have one-on-one conversations with people between sessions – And evenings – everyone staying separately in different places
3. We did enough strategic planning/visioning. I know this is the focus of the next couple of days, but I think it would have been good to focus more time on this in the bigger group before ppl drift off. Also there is no mechanism for reporting on day 4 &5 activities.
4. We discussed going forward enough. The future-visioning was overrun by the reflection.
5. That city officials/partners have us not (?) given adequate time to prepare and to give directions (strategic) for next year.
6. That with the time given here, or say that with such a annual meeting, it would have been interesting to hear from the city officials on what they feel so far.
7. The learning retreat was so well planned. Having it somewhere warmer and having smaller groups would be better.
8. Packing activities throughout the day/sessions.
9. The parallel approach to clusters interactions and feedbacks; little conversation to greater FCFA contribution.
10. There was not enough <u>actual</u> reflection.
11. There were enough city officials present.
12. Enough time (for auction)
13. –
14. Spending so much time on reflections was necessary.
15. –
16. We had enough time to reflect on.

17. –
18. That to have more intervals for café
19. –
20. That the venue and the fact that it was within the city and not residential.
21. Venue or lack of residential setting, as it prohibited networking and valuable collaboration conversations (side discussions)

If I organize a workshop like this again I would:

1. Improve logistics
2. Could it be residential? Where all the team can stay together – more time for informal conversations.
3. Better coffee & snacks but would have less time for reflection and more time for planning. Including explicitly mentioning/planning a FRACAL2 before people start drifting off towards the end of the project.
4. Choose a different setting. More focus on visions for future, including FRACTAL spinoffs, FRACTAL legacy and activities for the last 18 months.
5. –
6. Like to have room to breath in between the presentations and talks. Be more interactive.
7. Have better coffee, host it in a different city, have all participants staying in the same place (much better for having conversations and getting to know people).
8. Host it in another city for greater inclusion.
9. Allow for more cross-cluster planning; even fewer powerpoints
10. Make sure there was [??] of how TD we have been. Are we really working in the third space as we claim to be.
11. Try and ensure more equal representation of different sectors; e.g. city officials, researchers, for more in-depth TD discussion.
12. Organised in a remote location with limited access to wifi.
13. Get more people from the City who are decision makers/policy development.
14. Choose a different venue. Hire the same catering company.

15. Organise somewhere with outside area for further discussions during coffee.
16. Invite more city practitioners and FRACTAL city partners.
17. Show more concrete examples of how the information from climate group is used by the city.
18. Like to have more involvement of all participants and have paper presentation of each cities.
19. Have people stay at the same venue whereby we can be able to interact more. Engage more of the tier 2 city partners at least have one representation.
20. Make sure it was residential and that it was in one of the other partner cities and there was more time for a structured learning retreat.
21. Make it residential; in a tier 1/tier 2 city (on the back of a LL again); allow for more feedback time from cities; ensure city partners will be present for work planning days to allow/help us to prioritise tasks.

Voting for the session they most enjoyed (1 dot per person)

Top three sessions

1. Exploring the importance of climate information in cities: 10
2. Cluster overviews/How is what we've learned shaping knowledge for resilience in FRACTAL cities? 5
3. integration session 1: Nexus "systems mapping"/Climate Scientist Q&A 3