

WORKSHOP REPORT

Long Term Adaptation Scenarios (LTAS)

Interactive Planning Process, Phase 2

Climate Change Adaptation and Human Settlements, Disaster Risk Reduction and Management and Scenario Planning



Department of Environmental Affairs (DEA)

South African National Biodiversity Institute (SANBI)



**Gesellschaft für Internationale Zusammenarbeit
(GIZ)**



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WORKSHOP REPORT

LTAS Interactive Planning Process, Phase 2, on Climate Change Adaptation and Human Settlements, Disaster Risk Reduction and Management and Scenario Planning

Jointly organised by the

LTAS Project Management Team

Department of Environmental Affairs, Department of Climate Change
and Air Quality,

South African National Biodiversity Institute, Climate Change and
Adaptation Division,

And

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Executive Summary

The Long-Term Adaptation Flagship Research Programme ([LTAS](#))’s **interactive planning process** on climate change adaptation, human settlements, disaster risk reduction and management and scenario planning constituted a **3-day workshop** during which phase 2 preliminary methodologies and results were presented and discussed.

The main objective of this first LTAS workshop was to obtain recommendations on reasonable and feasible adjustments to planned methodologies, content and activities. A follow-up workshop will be held in March 2014 (12-14 March), which will be used to finalise development and adaptation scenario planning for the LTAS process.

120 participants attended the workshop in total across the three days. Days 1 and 2 comprised a number of specialist presentation and discussion sessions on climate change implications for SADC, disaster risk reduction and management and human settlements in South Africa. This included an overview of the biophysical and economic modelling that is being conducted to complement the desktop reviews and qualitative work of the LTAS process.

Day 3 of the workshop focused on the qualitative scenario planning process and aimed to engage stakeholders to generate “development narratives” and to overlay climate change impacts on these narratives in order to explore distinct development and climate change vulnerabilities. Specifically, narratives were created using four “development emphases” (a phrase developed in the workshop), namely, 1) an urbanising secondary industry and tertiary service economy, 2) a high-growth focused primary extractive economy, 3) a redistribution-focused decentralised economy, and 4) low carbon focused green economy. Each narrative elaborated the implications for human settlements and demographics, agriculture, industry and energy, and the natural environment. The effects of the LTAS climate scenarios on these development emphases were then explored.

Discussion points and recommendations from stakeholders are detailed in section 5 (workshop methodology) and section 6 (summary of discussions and recommendations per workshop session) of this workshop report. Recommendations will be used to adjust and continue the various assessments under phase 2 until completion at the end of April 2014.

The LTAS, through this and follow up workshops strives to ensure that a wide range of stakeholders are included in the process up front as well as during final adaptation scenario development. Please see the [LTAS](#) website for the workshop presentations.

1. Background to the LTAS

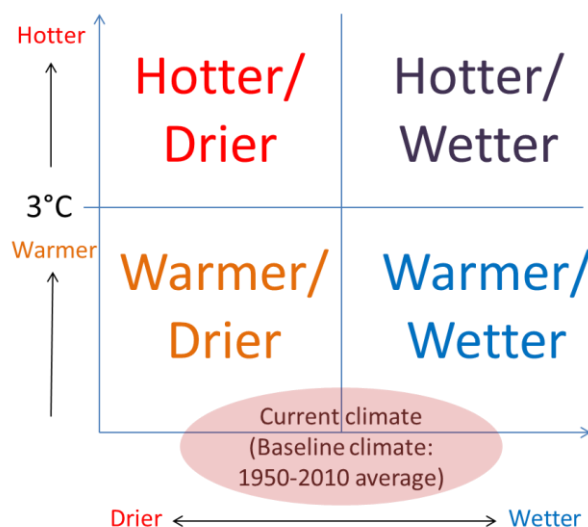
The Long-Term Adaptation Flagship Research Programme aims to respond to the South African National Climate Change Response White Paper ([White Paper, para 8.8](#)) by undertaking adaptation scenario planning for South Africa under plausible future climate conditions and development pathways. The Department of Environmental Affairs (DEA) is leading this process in collaboration with technical research partner the South African National Biodiversity Institute (SANBI) as well as technical and financial assistance from Gesellschaft für Internationale Zusammenarbeit (GIZ).

The **first phase of the LTAS**, completed in June 2013, developed and compiled impacts assessments and identified broad response options and research needs for key sectors (water, agriculture and forestry, human health, marine fisheries and biodiversity) identified by the White Paper, analysed climate trends from 1960 to 2010, and developed four fundamental climate change scenarios, namely warmer/wetter; warmer/drier; hotter/wetter; hotter/drier, that encompass a credible range of uncertainty, to describe South Africa's climate during the course of this century.

The idea behind developing broad and consensus climate futures was to provide a coherent framework within which users of climate information can position the wide range of specific climate scenarios that have been generated over the past decade and more, and whose results depend on rate of emissions and model used to generate a specific climate scenario. Very simply, warmer climate scenarios are defined by a less than 3°C average warming nationally above the 1950-2010 average, and **hotter** scenarios by a greater than 3°C average warming above the 1950-2010 average. These national-scale scenarios have also been translated into related scenarios for six hydrological zones relevant to water planning in South Africa (see LTAS Technical Report 1, [Climate Trends and Scenarios](#)).

Potential climate futures for South Africa over the next century

- **Warmer (<3°C above 1961–2000) and drier**, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.
- **Warmer (<3°C above 1961–2000) and wetter** with greater frequency of extreme rainfall events.
- **Hotter (>3°C above 1961–2000) and drier**, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.
- **Hotter (>3°C above 1961–2000) and wetter** with substantially greater frequency of extreme rainfall events.



The **second phase** of the LTAS, scheduled for completion at the end of April 2014, is developing national and sub-national adaptation scenarios for South Africa based on the four fundamental climate change scenarios described above. This is being achieved through a series of research workpackages, two major stakeholder workshops and expert group meetings as necessary. Specific **work packages** include:

- A review of climate change vulnerabilities and potential adaptation responses (including economic analysis and modelling of impacts where feasible) for the: i) human settlements sector (urban, rural and coastal); and ii) disaster risk reduction and management (DRR-M) in South Africa.
- An assessment of climate change vulnerabilities and options for integrated regional (SADC) adaptation responses.
- Final adaptation scenario planning based on phase 1 products and phase 2 workpackages above, together with quantitative modelling, where feasible, of the costs and benefits of a certain adaptation scenarios.

The **3-day interactive planning process** detailed in this workshop report was the first of the two major stakeholder workshops planned for phase 2. The **follow up workshop** will be held 12-14 **March**.

2. Workshop objectives

The main objective of this 3 day interactive workshop was to present phase 2 preliminary results, planned methodologies, content and activities to obtain recommendations on reasonable and feasible adjustments for the process moving forward. The workshop specifically aimed to:

- Overview the LTAS process, covering phase 1 and phase 2, and in particular the links between phase 1 and 2 research work and scenario planning.
- Distribute phase 1 technical report box sets and factsheets in hard copy to stakeholders.
- Present and discuss methodologies and timelines for LTAS phase 2, including the importance of setting realistic goals for phase 2 research work and products.
- Present preliminary scoping, proposed methodologies and findings on phase 2 research work already underway, namely: i) an assessment of climate change vulnerabilities and options for integrated regional (SADC) adaptation responses; ii) a review of climate change vulnerabilities and potential adaptation responses (including economic analysis where feasible) for the **human settlements** (urban, rural and coastal); and **disaster risk reduction and management** in South Africa; iii) the **economics of climate change adaptation** under climate futures in South Africa including quantitative modelling, where feasible, of the costs and benefits of certain adaptation scenarios; and iv) qualitative adaptation **scenario planning** methodology.
- Obtain stakeholder input and discussions on phase 2 research work and methodologies described above.
- Present and discuss steps for future adaptation work in South Africa which could include a follow-up process to LTAS.
- Provide an opportunity for networking among a range of stakeholders from different fields.

3. Expected results of the workshop

The expected result of the 3-day interactive was a consensus on proposed methodologies and material for inclusion in phase 2 research work and scenario planning. Other expected results included the following:

- Increased awareness and understanding of overall LTAS research work and products.

- Strengthened links between phase 1 and phase 2 research work and products.
- Recommendations obtained on phase 2 research work.
- Synergies developed between stakeholder groups, DEA, SANBI and GIZ for specific research work and including scenario planning under phase 2.
- A combined understanding of the scope of LTAS phase 2 based on realistic and achievable research products in the timeframes available.
- Enhanced relationships between stakeholders from different sectors and institutions, including NGOs, government and consultancies, working on climate change adaptation.

4. Participants

There were 120 participants who were invited from NGOs, civil society organisations, and technical and government (national, local and provincial) institutions, who are involved in climate change adaptation training, research, planning, implementation, management, monitoring and evaluation, and policy. Please see the full list of participants in Annex 2.

5. Methodology of the workshop

The LTAS project management team (PMT), namely DEA (Mr Shonisani Munzhedzi and Mr Vhalinavho Khavhagali); SANBI (Prof Guy Midgley; Ms Sarshen Scorgie and Ms Petra de Abreu) and GIZ (Dr Michaela Braun, and Mr Zane Abdul) jointly organized the workshop. DEA, namely Mr Shonisani Munzhedzi and Mr Vhalinavho Khavhagali, provided overall facilitation and chaired the workshop. Ms Lindiwe Ratlhagane (DEA) and Ms Rebecca Shiburi (GIZ) managed logistics for the workshop and Ms Katinka Lund Waagsaether (Adaptation Network) took notes of the discussion sessions.

Days 1 and 2 of the workshop were structured into a number of presentation and panel discussion sessions. Presentation sessions were approximately one hour each and constituted LTAS specialist expert teams presenting information on scope, methodologies and preliminary results for phase 2 research activities (see Annex 1 for the workshop programme and list of specialists and panellist contributors). Discussion sessions followed the presentation sessions and involved 2-4 panellists, selected by the LTAS PMT from the workshop participants, providing overall feedback, recommendations and general comments to the PMT, and LTAS specialist teams on the work presented. This was used to stimulate further discussions from workshop participants. Specialists/presenters as well as identified panellists were given an opportunity to respond to comments received throughout the discussion session. Generally, 4-5 comments were taken before panellists were given an opportunity to respond. The PMT assisted in particular with responding to overall LTAS process related questions during the discussion sessions, including making necessary links to the policy review and white paper.

Day 1 (22 January 2014) of the workshop began with an opening and welcome by Mr Shonisani Munzhedzi and Dr Brian Mantlana, this was followed by Prof Guy Midgley from SANBI presenting an overview of LTAS process in brief, touching on the links between phase 1 and 2 research work and the scenario planning. The overview aimed to contextualize the specialist presentation and discussion sessions within the overarching scope of the LTAS and to highlight the links to the [White Paper](#). Three sets of specialist presentation and discussion sessions then followed which focused on climate change implications for SADC, climate information and early warning systems for

supporting DRR-M, and modelling climate change impacts on floods, droughts, sedimentation and sea level rise, including qualitative review of adaptation options.

Day 2 (23 January 2014) involved three sets of specialist presentation and discussion sessions on climate change implications for the human settlements sector; the economics of climate change and modelling the biophysical and economic affects of a range of development and adaptation scenarios under future climates.

Day 3 of the workshop focused on the qualitative scenario planning process and aimed to engage stakeholders to generate “development narratives” (which distinguished four development directions referred to as “development emphases”) and to overlay climate change impacts on these narratives - as a first step in the process to develop long term adaptation scenarios. The methodology included one initial presentation and discussion session followed by two breakaway group discussions (four groups) and two report back sessions.

Prof Guy Midgley commenced day 3 with a brief presentation to remind participants of the overall scope of the LTAS process including links to DEA climate change adaptation planning, implementation and monitoring and evaluation. Pegasys (LTAS specialist team working on the qualitative scenario planning process) described the proposed approach for this initial step in the scenario planning process under the LTAS. The floor was then opened for any critical comments to highlight potential improvements in the scenario planning process methodology. Once the approach had been finalised and agreed upon, the group split into four breakaway rooms to generate narratives under each of the proposed “development emphases”, namely:

- 1) An urbanising secondary industry and tertiary service economy
- 2) A high-growth focused primary extractive economy
- 3) A redistribution-focused decentralised economy
- 4) A low carbon focused green economy

Each narrative elaborated the implications through four lenses: i) human settlements and demographics; ii) industry and energy; iii) agriculture; and iv) the natural environment. A report back session on the latter was then followed by further breakaway discussions (using the same four groups) on the effects of hotter, wetter and drier climate scenarios on the future of these development emphases with regards to the four categories. A final report back session was conducted including overall discussions on the topic. Mr Vhalinavho Khavhagali and Dr Brian Mantlana closed the workshop extending gratitude for stakeholder input received.

Please see Annex 1 for the workshop programme including details on specialist expert teams who provided presentations and facilitated discussions as well as panellists that assisted during each of the respective sessions. Important discussions per programme item including recommendations are captured under section 6 of this workshop report below.

6. Summary of discussion points and recommendations

Please refer to specialist presentations on the SANBI LTAS website [LTAS](#).

Discussion points and recommendations (DAY 1: Wednesday, 22 January)

Introduction: LTAS Phase 1 and 2 overview and policy alignment process

Presenters: Prof Guy Midgley (SANBI) and Mr Zane Abdul (GIZ)

- The LTAS climate scenarios cover 100% of the climate probability space i.e. the future scenario will be somewhat warmer and either hotter or wetter as compared to the baseline climate.
- LTAS should align closely with the national Disaster Risk Reduction and Management (DRR-M) framework.
- DRR-M should potentially not be referred to as a sector. DRR-M is cross cutting, and can be an entry point for adaptation for all sectors.
- There is a need to understand the requirements of DRR-M strategies to build resilience for future climate scenarios. Preparedness, response and recovery are all important elements of DRR-M.
- There is a need to understand and plan for worst-case climate scenarios.
- Effective adaptation will need an integrated and cross-sectoral approach and therefore LTAS should include this within the research work being conducted.

Specialist presentation and discussion session 1: *Climate change implications for SADC*

Presenters: Dr Guy Pegram and Ms Hannah Baleta (Pegasys)

Panellists: Dr Chris Moseki (Water Research Commission) and Dr Brian Mantlana (DEA)

- A common feature of the SADC region is the presence of a tangible and pressing need for development, the implications of this on resilience and vulnerability may need to be explored further.
- The existing adaptation responses and strategies in SADC countries is required in order to understand the regional context of South Africa's current and future adaptation responses. There are unequal relationships among SADC countries concerning trade and therefore there are potentially unequal relationships in the region regarding climate change preparedness/readiness.
- Technology transfer and information sharing will be important for building regional resilience to climate change. There is a need to understand the current nature of technology transfer and information sharing among SADC countries. Furthermore, South Africa needs to share its adaptation response strategies with SADC as well as learn from existing work ongoing in the sub-region.
- There is a need to look at the SADC-global interface and in particular consider the influence of other non-SADC countries on SADC as well as the role of South Africa or other countries for promoting climate change adaptation. Particular themes that would need to be addressed that have the ability to increase vulnerability within the region include land grabs (and including new generation land grabs in a green economy with links to the Chinese government) and the availability of land and other resources for implementing certain adaptation responses.
- The inclusion of the sub-regional impacts of climate change on the migration of species, especially in relation to alien invasive species should be considered in the study e.g. cross border alien invasive infestations. There is also a need to consider short-term responses for reducing the effects of short-lived climate forcing factors (e.g. ozone and aerosols) if feasible.
- A win and lose matrix could be used to investigate and/or present the climate change impacts and interactions between/among countries.
- Water quality related climate and health challenges and issues should be included in the assessment e.g. the need for water for cooling, and the downstream impacts of changes in water quality.
- There is a need to include a systems change approach to the assignment, for example the interactions between the changing climate, land and water systems.
- An important point for further research and/or discussion is the effect of regional impacts of climate change on resource allocation within South Africa.

- There is a need to investigate the objectives that drive integration in the SADC region as these can assist regionally integrated adaptation responses.
- Further insights are needed in understanding the extent to which drivers of change in South Africa are correlated (positively or negatively) to drivers further north. In particular, correlations between rainfall signal between South Africa and SADC countries in relation to El Nino effects need to be further developed. Francois Engelbrecht from CSIR can provide guidance and information on the plausible futures and correlations in a regional context.
- Key issues that need to be highlighted in this work should be ecological health, human capacity and good governance.
- The scoping nature of the assignment including timelines and budget will determine the nature to which certain issues and concerns can be addressed. Future research needs can be highlighted in the final report.
- There are many complexities that compound this work as a result of the cross cutting nature of adaptation as well as the regional context. For example DRR-M within urban areas is difficult to map or model. This should however be addressed within the SADC assessment where feasible.
- Reducing exposure to hazards, lessening vulnerability of people and property, wise management of land and the environment, and improving preparedness and early warning for adverse events are all examples of disaster risk reduction and management, and should be highlighted in the study.
- There needs to be as much consultation with stakeholders as possible in this process within timeframes to explore adaptation responses.

Specialist presentation and discussion session 2: *Climate information and early warning systems for supporting the disaster risk reduction and management sector*

Presenters: Dr Julia Mambo, Ms Miriam Murambadoro and Ms Karin Stronkhorst (CSIR)

Panellists: Dr Mxolisi Shongwe (SAWS) and Prof Coleen Vogel (UP)

- Barriers to communication and uptake of climate information/early warning systems and approaches for combining traditional and indigenous knowledge with scientific knowledge to strengthen climate information/warnings and increase community response should be included in the assignment.
- The issue of false alarms should be included, especially the need for increasing community awareness and ability to interpret climate information and warnings to increase community trust and thereby increase effective response.
- The level to which institutions that provide climate services and early warning systems collaborate and share information should be discussed and recommendations should be proposed for future collaboration mechanisms. At present competitive groups exist in the country for providing these services and the legal framework does not provide the means for local or international informal systems to feed into the framework. These are also not regulated.
- Slow-onset recurring events, in addition to extreme weather events, should be included and the assignment should include a review of climate information and early warning systems for both these chronic events as well as extreme weather events.
- There is a need to investigate, in addition to the 1 in 50 and 1 in 100 year events, high frequency events, in particular whether these are increasing in frequency and magnitude. It is often the mm of rainfall per hour and not day that can cause damages.
- Causal factors (e.g. poverty and environmental degradation amongst others) underlying the resulting effects of extreme weather events need to be considered and adequately addressed to support DRR-M under future climates. Disasters can be natural or man-made and can result in tragic events that stem from an extreme

weather event e.g. heavy rainfall and poor drainage infrastructure can lead to flooding or disease outbreak.

The links between risks, hazards, extreme weather events and resulting disasters should be clear in the assignment. In particular there is a need to understand the difference between risk and disaster. For example, the flooding on the Cape Flats that happens every year.

- The work should include both a rural and urban focus. At present, there is a rural bias. Case studies should be included more systematically throughout the assignment e.g. examples of poor and good practices at national, provincial and community level with a focus on technical capacity, information packaging and dissemination and community response. Case studies should be included within the relevant sections of the report.
- An institutional mapping could be included i.e. who are the main players and how do they link at different levels both vertically and horizontally, including civil society organisations. This could assist in highlighting gaps and areas for future collaboration.
- The impact on ecosystems should be made more explicit in the report and role of ecological infrastructure in adaptation response.
- There is scope for the information captured in Environmental Impact Assessments to inform DRR-M frameworks, as well as Integrated Development Plans. This could be included.
- Policy recommendations need to include a focus on the implementation of the Disaster Management Act.
- There is a need to be cautious when basing estimates of adaptation costs on disaster loss estimations. It would be useful for the study to include a review of proactive versus reactive funding for DRR-M and the relative costs of each. This information is critical for influencing proactive governance of DRR-M. It may be useful to conduct a DRR-M expert meeting (think tank) to assist in this process.

Specialist presentation and discussion session 3: *Modelling climate change impacts on floods, droughts, sedimentation and sea level rise impacts and adaptation options for disaster risk reduction and management.*

Aurecon: Dr James Cullis (Aurecon)

Panellists: Dr Alan Boyd (DEA, Oceans and Coasts) and Dr Roland Schulze (UKZN)

- There is a need to include more information on impacts on the marine environment. Phase 1 products were focused on marine fisheries and terrestrial biodiversity. In particular, there is no mention of the Southern Ocean e.g. Prince Edward and Marion Island and the climate impacts in the marine Exclusive Economic Zone (EEZ).
- DEA (the oceans and coasts branch) together with CSIR are undertaking risk and vulnerability assessments of the coastal and marine environment including spatial mapping for informing development setback lines. There is a need for further work on ocean processes on the west coast and in the southern ocean in particular around processes such as ocean fertilization. The procurement of LIDAR data nationally is currently under discussion.
- Chronic longer term risks are also important and should be included in the assessment. Furthermore there is a need to consider second order effects such as knock-on health risks from flooding and impacts on sewage treatment works. Biotic vulnerability and impacts on marine microbial communities should also be included, as resulting algal blooms will have negative effects on water quality.
- It would be useful if the study could also include the impacts of climate change on estuary sedimentation. This could include both reduced sedimentation as a result of capture in dams as well as accelerated sedimentation as a result of climate impacts. This could complement the work proposed on the effects of climate change on storage capacity within dams as a result of increased sedimentation.
- Adaptation responses should consider impacts related to drought, sedimentation, flooding and sea-level rise in an integrated manner. A study undertaken by CSIR for the EThekweni area indicated that two thirds of

sediments are being trapped in dams, however increasing storage capacity by building more dams will increase coastal vulnerability. These nuances need to be captured and highlighted in the final report. For example adaptation options dealing with droughts and sedimentation should also deal with downstream implications.

- It is very simplistic to look at impacts in terms of replacement costs, which infers that the infrastructure was made to withstand the environment. A lot of infrastructure in South Africa has generally been put in the wrong place. The study could include adaptation options for relocating infrastructure.
- The study should also consider including the database of transnet rail infrastructure.
- The extent to which critical “lifeline infrastructure” (as discussed and classified in a recent UN international strategy for DRR-M) can be included in this assessment should be explored.
- It would be extremely useful to have an indication of which communities and critical “lifeline infrastructure” are most at risk in South Africa e.g. impacts on sewage lines and works. This may require a much more detailed study.
- There is a need model human settlement flood lines. South Africa needs to have an understanding of which communities and infrastructure are at risk.
- The study would benefit from including examples of impacts of sedimentation and other climate change impacts on wetland areas e.g. climate change impacts on St Lucia work/results and impact of sustainable catchment management on erosion as part of an adaptation response, could be included in the final report.
- There are many impacts not considered by the study such as salt water intrusion and its effects on corrosion of metal infrastructure, as well as ground water depletion and pollution. This could be included where feasible; alternatively, it can be included as an area for further research.
- There is scope for expanding on the pros and cons on the scale of the assignment and the importance of downscaling to obtain more locally relevant information. It would also be useful to obtain an understanding of the type of information communities require from modelling assignments. The assumptions and inputs should be further refined.
- Downscaling to the quinary catchment level will assist to provide more locally relevant information.
- The Western Cape has already modelled sea level rise for the province. This can be included in the sea-level rise component of this work.
- There is scope to undertake provisional modelling of the implementation of different adaptation options; however this will be the focus on the integrated economic analysis and will only be a start to modelling these processes.
- Political ownership of DRR-M issues needs consideration for effective planning, preparedness, response and recovery.

Discussion points and recommendations (DAY 2: Thursday 23 January)

Specialist presentation and discussion session 4: *Climate change implications for the human settlements sector*

Presenters: Matthew Gaylard and Jesse Harber (Linkd)

Panellists: Prof Coleen Vogel (UP) Dr Roland Schulze (UKZN) and Mr Enoch Mhlanga (Department of Rural Development and Land Reform)

- The research work conducted will support the CRDP and therefore is closely aligned to its overall goal which is to create sustainable rural livelihoods that are resilient to climate change. Objectives of the CRDP include: supporting development of community climate change adaptation plans, building adaptive capacity through

- supporting sustainable livelihoods (including perma-culture and eco agriculture), supporting sustainable land management that promotes climate resilience and reduces migration to urban centres, addressing past injustices including providing adequate services to communities in rural areas, protecting ecosystems services and supporting protected area expansion strategies, promoting access to climate resilient services and infrastructure (rural household infrastructure programmes, rainwater harvesting technologies and road programmes), monitoring indicators of performance of climate change adaptation measures implemented in community sites, supporting research on DRR-M and working with NDMC, ARC and WRC as well as other units.
- The study should reference existing research focused on the importance of sustainable management and conservation for enhancing and increasing the resilience of community livelihoods e.g. sustainable grazing patterns.
 - The work should draw on existing studies being undertaken by government. Some examples are given below:
 - The Coastal development and protection unit in DEA is currently doing a study to map all the coast lines to avoid inappropriate developments. This will be presented through an online map viewer - a information management system.
 - Atlas developed by the Gauteng Department of Agriculture (*Irene Taviv, Gauteng Department of Agriculture*)
 - Limpopo geospatial platform and the Vulnerability Index commissioned by Treasury (*Dr Antooneta Letsoalo, Limpopo Department of Economic Development, Environment and Tourism*). This includes an index that has been developed for 250 local municipalities. This index could be used to support case study identification.
 - The Department of land use and soil (DAFF) have been conducting work on mapping agriculture potential of land. Furthermore, task teams have been established which are involved in natural inventory assessments.
 - This work needs to engage more closely with civil society and local NGOs. There are also students that can provide support.
 - The work should use an iterative process with regards to identifying and building case studies around adaptation response.
 - The assignment should emphasise the importance of social and ecological infrastructure for building resilience as well as the need for curriculum reform including both in and out of service training. Programmes that build human solidarity, well-functioning social structures/institutions and community organisations result in strengthening resilience to climate change. Both government and civil society have a role to play.
 - The typology for distinguishing types of adaptation responses could be further reviewed. For example the study could consider hard, soft and ecological responses. The importance of using an integrated approach with regards to hard, soft and ecological adaptation responses should be highlighted e.g. building ecological infrastructure can potentially enhance the lifespan of built/hard infrastructure and provide other adaptation benefits through maintaining/enhancing other ecosystem services.
 - There is a need to understand the thresholds and resilience of ecological infrastructure and natural variability
 - The co-benefits of adaptation should be highlighted, such as mitigation co-benefits from restoring ecosystems.
 - The importance of both ecological and agro-ecological infrastructure needs to be included. Permaculture and home food gardens need higher priority for communities.
 - The study may require a more iterative approach to the selection of case studies. SALGA/local government should be included here as a key stakeholder to inform the study. SALGA are also embarking on a process to develop adaptation plans for municipalities and the LTAS will need to align with this.

- The National treasury recently commissioned work on developing a vulnerability index for ~250 municipalities (referred to above). The work rated municipalities on a scale from one to five in terms of their vulnerability and highlighted ~twenty most vulnerable municipalities in the country. The case studies chosen for this LTAS research could consider some of these most vulnerable municipalities. Seven out of the twenty most vulnerable municipalities are in Limpopo.
- Climate proofing for future development should be addressed with reference to South Africa's new growth path framework and National Development Plan. The assignment could consider identifying key infrastructure that South Africa should work towards protecting or climate proofing.
- The dominant development strategy generally aims to integrate people into the market (job creation). Self-sufficiency may run against most of these dominant development strategies. It would be useful to include discussions around this.
- Certain links to the insurance sector should be made within the study, including the systematic consideration of climatic risk in the insurance industry's rate setting practices especially with regards to high and low severity events (Eden case study).
- The roles and responsibilities of the three tiers of government should be mapped. Reference should be made to governance and enforcement to increase preparedness, response and recovery, including reducing development in high risk zones.
- Regionally integrated adaptation responses will be needed to address issues of migration. This should link to the sub-regional work under LTAS. Furthermore it should be noted that land reform is strongly linked with migration issues and therefore these dynamics will need to be included.
- Traditional knowledge and practices in local communities needs to be reinstated to enable them to adapt without external assistance. If existing knowledge and practices are not considered it can lead to archaic housing and economic policies and ultimately maladaptation for communities. In many cases the assumption is that formal housing will solve development risks including climate risks, however there is emerging literature that shows poorly built formal housing can increase risks.
- The study should take cognisance of the difference between indigenous knowledge and traditional knowledge. Indigenous knowledge is a narrow set of information that came from the original occupants of this land.
- An analysis of current housing strategies in relation to climate change risks should be incorporated into the study. Recommendations for housing strategies for increasing resilience to climate change based on this analysis should be included. For example, formality may not be the solution for certain communities. Informal upgrades specifically designed for increasing climate resilience could be more effective at reducing vulnerability.
- The framing of human settlements as provided in the National Climate Change Response White Paper should be used for this study i.e. rural, urban and coastal.
- The issue of GDP versus social dimensions needs to be included.
- The study is strongly integrated with the Department of Rural Development and Land Reform's climate change adaptation plan for rural human settlements. It will therefore include the Comprehensive Rural Development Programme (CRDP)'s sites as case studies for the LTAS work. The degree to which these sites overlap with the municipalities rated as most vulnerable by the vulnerability index developed by National Treasury will be investigated and the possibility of including additional sites based on the NT's vulnerability index will be considered. It has been highlighted that the NT method for conducting risk and vulnerability assessments will be conducted in the CRDP sites.

- Climate change adaptation for human settlements needs to be community specific. This work must be driven strongly from a social science perspective as opposed to a biophysical modelling perspective. This is because each community is unique and therefore adaptation for different communities is case specific.
- Geospatial modelling to inform local development planning should be considered. The issues of how to construct models of risk and vulnerability and the type of resolution that could be achieved could be discussed.
- The ability and/or inability of local authorities to engage with citizens around the social development issues needs to be incorporated into the work and the need for productive channels for communication and solving issues should be discussed.

Specialist presentation and discussion session 5: *The economics of climate change*

Aurecon: Dr James Cullis (Aurecon) and Prof Channing Arndt (UNU-wider)

- The integrated assessment-modelling framework being used includes South African specific models as well as information. As with any modelling assignment, the assumptions will need to be clearly outlined up front in the methodology.
- The assignment could better include the insurance element in the model. It is not as “in and out” as implied by the modelling framework.
- Additional impact channels can be included in the model if these can be translated into input parameters. For example the health impact channel would entail the capital costs of the reduction of productivity as a result of increasing temperatures and what this means in terms of the GDP.
- It is acknowledged that the type of work includes a limited amount of existing impact channels. It is assumed that these are the main impact channels. Flooding and other extreme events such as hail cannot be included at present (the water resources model is a monthly model i.e. looks at water resources issues and not flooding). However, additional impact channels can be included as the data and parameters become available and/or the modelling framework and individual models are enhanced (e.g. livestock impact channel which may not have noticeable impacts on GDP however will result in serious implications on community livelihoods). The model is strongly focused on impacts on GDP; it is advised that the social implications also be considered even if it is qualitatively inferred from model results.
- The model is focused on the adaptation deficit and therefore distinguishes/captures the difference between business-as-usual and the adaptation costs. The information on the cost of adaptation versus the cost of no adaptation to the national GDP is extremely useful for both administrative and political negotiations. However there is a need to highlight that GDP does not capture the impacts on ecosystem services (e.g. green accounting) as well as social implications (e.g. welfare, Gini coefficient/ratio/index).
- The study should consider ways to include results that are specifically tailored for the private and business sector.
- South Africa is the second most vulnerable country in terms of distance from markets and also a very high carbon economy. These trade exposure issues should be reflected in the assignment.
- It would be useful to include an energy model that includes more than just hydropower effects.
- The marginal impacts on businesses (e.g. 2% for the steel industry could in effect shut down the industry with multiple knock effects) should try to be incorporated into the model or if not the assumptions and methodology will need to clearly outline how and the extent to which the knock-on effects are incorporated in the modelling framework.
- The extent to which direct, indirect and cumulative impacts are captured in the modelling framework need to be clear.

Specialist presentation and discussion session 6: *Modelling the biophysical and economic effects of a range of development and adaptation scenarios under future climates*

Aurecon: Dr James Cullis and Prof Channing Arndt (UNU-wider)

Panellist: Mr Gerald De Jager (AECOM)

- The question of scale should be addressed. This will influence the uncertainty of the results. For example the further you disaggregate i.e. Water Management Area versus national level results, the greater the confidence intervals become and thus the uncertainty in the results. Every study will need to determine the level at which results are required and the level of uncertainty that is acceptable. The more you downscale the greater information you need at the local level i.e. for a case study you will need to zoom in and refine and include additional information and data. The level and scale of the assignment should be clear in the methodology.
- There is scope for addressing inter-annual variability in the model.
- The issues around calibration for now versus the future should be noted in the assumptions.
- The work may consider pulling in the triple bottom line discussion, including structures around employment, happiness and distributional effects.
- The model produces a fairly consistent world price series in the sense that the prices that are used in the South African model are similar to the world prices that are driving the Global Circulation Models.
- There is an element of social implications and welfare in the model for example there are 95 households modelled for each Water Management Area. It is therefore possible to do a detailed distributional analysis depending on the time available.
- Employment is very important in the South African context and is represented by price in the model. However the assumption that if individuals loose employment in one sector will just be replaced by another sector should seriously be reconsidered.
- CO₂ fertilisation is not taken into account in the modelling framework. Additional local research is required to quantify this at a finer scale in order for it to be incorporated for future modelling work.
- The results from this modelling exercise provide a comparative analysis of the potential relative climate change impacts going forward and serve to complement the more qualitative scenario planning under the LTAS. This initial step can serve to highlight areas of particular concern to downscale in future. For example, there is an indication for increasing benefits for irrigated agriculture in the Inkomati WMA. This is also consistent with the DWA climate change water strategy. The assumption is that climate change could offset water stresses. This would need finer scale modelling and further discussion. Furthermore, results are indicating that the Olifants-Doorn WMA may be more at risk to climate change water stress issues and could benefit from increase storage capacity and other adaptation measures. This would again require further detailed modelling – some of which is already underway.
- The study should highlight winners and losers in terms of WMAs under future climates. This can then be used for future modeling and finer scale localised work.
- If flooding and health impact channels were adequately represented in the model, it is possible that some of the increase in water availability in certain areas could be offset by flooding and health challenges. This should be discussed in the final report.
- At present the modelling framework is only focused on crop yield and irrigation requirements. Rangeland and livestock systems are too complex to include into the current modelling framework as it is set up. This will need to be highlighted in the final report. The livestock impact channel needs far greater focus.
- There may be scope to update the census data used, which was 2002 census data, to the 2012 census data.

- The Ecological Reserve is a priority in the model. Furthermore, the Ecological Reserve is not modelled as a fixed release the model tries to mimic the natural system and varies according to the natural flow in the catchment being modelled. Increased evaporation on dams is also accounted for in the model.
- The study is focused on the impacts of GDP as it would be difficult to meet development objectives in South Africa without looking at GDP. However, additional indices such as the Gini coefficient/ratio/index should be considered in other studies to complement this approach. Certain inferences from the results could be made regarding happiness, and social welfare.
- It is important to realise that the overall GDP growth message could be potentially dangerous, particularly given the job displacement assumptions set up in the model. It is not acceptable to assume that in the South African economy that job displacement from one sector will simply move into the next sector.
- There is a recent Water Research Commission Study on water balance accounting that may provide additional inputs for this modelling assignment.
- ESKOM have been investigating options for climate based insurance. The study should consider these efforts.
- The study should try to incorporate distributional analysis in relation to employment and in terms of surplus available.
- The assumption that there will be no increase in irrigated areas should be reconsidered. South Africa is planning huge increases in irrigated areas and this should be included in the model.
- The impacts on fisheries and tourism should be included even if it is not explicitly modelled. These could just be inferred based on the impact results. The relative tourism impacts across the globe and links to South Africa could be included in the final assignment to contextualise the results.

Discussion points and recommendations (DAY 3: Friday 24 January)

Scenario planning session: *Long term development and adaptation scenarios under future climates in South Africa (2030, 2050 and 2100)*

Presenter: Dr Guy Pegram and Ms Hannah Baleta (Pegasys)

- Four potential development emphases will be explored in terms of human settlements and demographics, agriculture, industry and energy and the natural environment. These include an:
 - urbanising service economy;
 - high-growth primary economy;
 - low carbon green economy; and
 - redistributive decentralised economy.
- DRR-M will be considered in all development emphases and resulting adaptation scenarios with regards to human settlements and demographics, agriculture, industry and energy and the natural environment.
- The work could potentially align better with other similar work for the African continent such as the AU vision for 2063.
- The final adaptation scenarios should strongly emphasise the importance of productivity and include responses to increase and/or maintain productivity under future climates.
- The study should consider including an extremely low growth scenario i.e. a pessimistic view on development.
- There is a need to better explain the axes and the interactions between the difference scenarios across the axes.
- There should be some type of effort to quantify these emphases based on available data for the sectors and themes under consideration.

First feedback from groupwork session:

“Human settlements, agriculture, industry and energy, and the natural environment under the four development emphases”

Group 1: Urbanizing service economy (Facilitator: Ms Hannah Baleta)

- 1) *Human settlements and demographics:* There are massive urban centres, people living in unsafe areas, and immense inequality. An advanced economy requires people with skills and therefore there is a large drive for skills development. However many cannot access the skills development opportunities. On demographics, the population is aging and therefore require greater basic services.
- 2) *Agriculture:* There is a strong drive towards efficiency and increased mechanisation and growth in number of processing facilities. This potentially leads to decreased resilience of the agricultural system. It is uncertain as to whether urban agriculture will increase. There is inequality with regards to access to food. People living in rural areas without jobs struggle to access food.
- 3) *Industry and energy:* There is an increase in bulk industry to supply the growing urban areas, with a potential decrease or increase in risk. With regards to markets these are linked to the global market, but it is possible that these linkages with global markets increase and diversify. There may be a natural drive towards renewable energy as a result of the need for energy efficiency.
- 4) *Natural environment:* This will strongly link to outcomes under the agriculture category. For example, the increase in the use of chemicals has negative effects on the natural environment. Furthermore, the urban population may need to access the natural environment and land prices may increase. In the peri-urban areas there is loss of biodiversity and greater stress on the natural environment. It is probable that there are more opportunities for recycling water and waste.

Group 2: High growth extractive primary economy (Facilitator: Prof Guy Midgley)

- 1) *Human settlements and demographics:* There is a polarizing economy and growing inequality. The resulting infrastructure determines patterns of urbanization.
- 2) *Agriculture:* Agricultural processes become more industrialised, with large and high intensity farms. This results in the shedding of jobs in the agriculture sector, and people move back to towns to find employment. The towns are not able to provide services for the growing population. There is growth in high value agriculture, and therefore in order to deliver food to communities, local supermarkets play a far larger role than local markets.
- 3) *Industry and energy:* There is fracking in the Karoo, increase in nuclear power generation, an increase in mining in the Northern Cape and an increase in the use of solar energy. There is more coal and coal-to-liquids in the Waterberg area. Prior to 2030 there is a lot of focus on fracking, coal and nuclear. Global negotiations however result in implications for this strategy and therefore there is a decrease post 2030. There are infrastructure requirements as required by an extractive economy. Certain transport corridors are developed e.g. to northern Mozambique.
- 4) *Natural environment:* There is a lot of pollution and water degradation, generally a gloomy picture. There are also areas that are left fallow.

Group 3: Redistributive decentralized economy (Facilitated Ms Petra de Abreu)

This is a significant scenario, as other development scenarios will be judged in their ability to redistribute growth. It is possible that this could either work very well or very badly as a strategy, the group ended up focusing on the positive version of the development emphasis. The group considered drivers of success and failure to assist in developing narratives for the four categories.

- 1) *Human settlements and demographics*: There is a slowing/reverse in urbanization, and thereby a reduction in the costs of unplanned urbanization. However there is a higher requirement for input into service delivery in rural areas which may be more expensive.
- 2) *Agriculture*: There is a shift to small-scale farming and a move towards self-reliance (e.g. food gardens).
- 3) *Industry and energy*: There is less monopoly power, a shift from global to local markets and a shift from luxury goods to basic needs. Mineral extraction is strongly linked to community development.
- 4) *Natural environment*: Small-scale farming is beneficial for the environment, and there is a significant improvement to the natural environment. However, there is a need to consider the impacts on the environment of the increase in rural settlements.

Group 4: Low carbon “green: economy (Facilitated by Ms Sarshen Scorgie)

The group discussion brought about some questions on the terms, green economy versus green growth and low carbon. For example the group discussed what “green” really is, highlighting that carbon capture for example is not necessarily green and timber production not as green as it is said to be. The group found it important to consider the life cycle of carbon, and considered questions such as are solar panels really better than non-renewables. There were also questions around whether it is truly possible to have a green economy when development is centred on GDP growth. The group decided to be utopian, and consider a truly green economy under this emphasis. The group highlighted concern around carbon foot printing i.e. in South Africa nearly everything has a high carbon footprint. Under this development emphasis there is a need for stronger communities, sustainable procurement practices and self-employment and to address the entire life cycle of green house gasses- cradle to cradle.

- 1) *Human Settlements and demographics*: Population growth is stabilised, by providing the correct education and health care and increasing income levels. Urbanisation results in greater need for jobs and services. However it is possible that there is some rural stabilisation, as a result of the creation of livelihoods. There is a need for smaller communities, where one can have a feeling of community and solidarity. With regards to formal settlements, there was some disagreement around whether there should be re-location or not under this development emphasis. There is a need for Green urban planning and enforcements. There are mixed class settlements. Urban densification and development of the transport system will have to happen together.
- 2) *Industry and energy*: Decentralised energy production, with a focus on renewable energy. There is reduced energy use whether it is renewable or non-renewable or a mixture of both (the question of whether renewable energy is really a carbon saving was discussed). There is a change to intellectual property rights and technology transfer becomes important for building the green industry. The economy is less export orientated. There is scope for increased jobs in the green economy and opportunity for innovation.
- 3) *Agriculture*: There is a focus on, conservation focused climate smart agriculture and organic agriculture. There is a greater awareness of the importance of healthy ecosystems surrounding farming activities. Agriculture could either be i) high intensity using less land; or ii) low intensity on larger areas of land. The question of how this affects food security or food trade will need further discussion. Furthermore, the question of who will benefit from the highest quality agricultural produce is an important one, for example will it be exported or kept for local consumption? Land redistribution will be very important; however it is not certain how this will be managed.
- 4) *Natural Environment*: There is an increase in employment in ecological management. There is a strong need for innovation for systems to be sustainable. Protected Areas are a focus but there are different forms of protection and a large focus on community based management. There is a strong focus on restoring and maintaining healthy ecological infrastructure as underpinning to this narrative.

Second feedback from groupwork session: *What do these development emphases look like under the LTAS climate scenarios?*

Group 1: *Urbanizing service economy* (Facilitator: Ms Hannah Baleta)

Resilience will be built into this system, but only to a point. There will be tipping points and thresholds that will need to be considered.

- 1) *Human settlements and demographics*: There is an increase in the effect of urban heat islands, and therefore increased cooling and thus energy demands. Hazards have disastrous effects in urban areas.
- 2) *Agriculture*: As commercial agriculture will be dominant within this emphasis, it is only resilient to a certain threshold and therefore a tipping point is reached. There is a need to become more and more industrialised.
- 3) *Industry and energy*: -
- 4) *Natural environment*: There is large-scale degradation in urban and peri-urban areas, and degraded ecological infrastructure is not resilient to extreme weather events and hazards leading to an increase in risk.

Group 2: *High growth extractive primary economy* (Facilitator: Prof Guy Midgley)

There are many feedback loops. The resource base is important, including how this is used with links to productivity and job availability. Many people are living in urban areas because of technological solutions, and this makes them more vulnerable. There is governance and environmental impacts on resource base. Water is the primary challenge. A number of different pathways could be constructed under the development emphasis. For example feedback loops exist between the climate change challenge and the technological solutions.

Group 3: *Redistributive decentralized economy* (Facilitated Ms Petra de Abreu)

The aspect of the high road (it works well) versus the low road (it does not work well) becomes more important when considering the impacts of future climate change. The success version of this development emphasis can be highly resilient however the low road potentially highly vulnerable. Community driven participation in housing and urban planning will be a real source of resilience to climate change impacts. However, if there is a roll out of low quality RDP houses this will increase vulnerability. With more small-scale agriculture the risk is more widespread, but at the same time individuals are more vulnerable to financial risks. Greater land bank support and technical support may contribute to resilience under this development emphasis. Depending on the strategy if there is a more redistributive landscape across South Africa's coast, this would increase resilience to coastal impacts if effective ecological restoration and hard infrastructure approaches are used. As a whole the decentralised and redistributive system might be less vulnerable, but this may increase vulnerability of independent households. Furthermore, the impacts on travel and communication need to be considered.

Group 4: *Low carbon "green: economy* (Facilitated by Ms Sarshen Scorgie)

The green economy depends more directly on ecosystems, and as ecosystems are threatened by climate change this may increase the vulnerability of the development emphasis. However, if the development emphasis is planned and implemented in a climate resilient way which is the key focus of the green economy i.e. ecosystem based adaptation and climate smart agriculture; this will increase resilience under future climate conditions. There will be a need for developing and restoring ecological corridors using community based methods. An increase in domestically orientated food production may increase vulnerability to droughts and result in reduced crop yields. For example decentralised rural subsistence farming may be more vulnerable to climate-crop losses and failure. However if climate smart agriculture is adequately integrated into farming practices at a landscape level this vulnerability can be greatly reduced and may lead to increased resilience. Resilience may also be built both through local production and international trade. There will be a strong need for zoning protected areas into core

and buffer zones and including community based natural resource areas to increase resilience under future climates. Protected area expansion will need to consider ecological corridors as described above. There may be a need to access integrated regional/international markets to buffer these impacts. Decentralisation comes with multiple challenges and possibly many failure points depending on how the redistributive and decentralisation strategy is implemented. For example instead of an economy built on a small number of major urban areas, there are 5 000 local economies and planning for climate change could become challenging. It can however be more resilient depending on infrastructure and natural thresholds.

Overall Discussion session:

- It may be useful to include case studies from around the world that illustrate the above development emphases including the success and failure drivers and possible tipping points and thresholds e.g. Scandinavia, Norway etc. The success and failures of these case studies could be highlighted. These can be used to illustrate the possible risks and potential successes of certain development pathways for South Africa
- Most development emphases can be envisaged along a continuum whereby tipping points and thresholds will result in the need for certain adaptation measures.
- Thresholds may differ by sector and by region. The east might have flooding threshold while in central areas it might be crop and temperature related thresholds and in the west drought related thresholds.
- Risk governance will be important under all development emphases to decrease the likelihood of hazards and extreme weather events resulting in disasters.
- It is possible that the development emphases can be investigated on a high and low risk continuum. Certain adaptation responses will be required depending on the type and level of risk.

7. Follow-up action and important dates

The LTAS PMT will work with specialist expert groups using the recommendations received from this 3-day interactive planning process to:

- Finalise scope and methodologies for LTAS reviews on climate change vulnerabilities and potential adaptation responses for the human settlements sector (urban, rural and coastal) and develop a final draft report.
- Finalise scope and methodologies for the LTAS review on climate change implications for SADC and develop a final draft report.
- Finalise scope and methodologies for the LTAS review on climate information and early warning systems and develop a final draft report.
- Continue the modelling assessment on the impacts of flood, droughts, sedimentation and sea level rise and qualitative review of adaptation options for the DRR-M and develop a first draft report.
- Continue the integrated economic analyses of development emphases and certain key adaptation responses and develop a first draft report – this will be adjusted based on the results of the qualitative scenario planning process.
- Continue the qualitative assessment of development emphases under climate change and develop a proposed methodology for incorporating adaptation responses into these development emphases to present during 12-14 March in order to inform the final development of long term adaptation scenarios.

Please see table 1 for a proposed full list of products that will be available from LTAS phase 2. There will be a total of seven technical reports; including a report summarizing the overall long term adaptation scenario planning results i.e. see Technical Report number 7 in table 1.

Table 1. Envisaged LTAS Phase 2 products, including titles and timelines.

Technical Report	REPORT TITLE (Provisional)	DRAFT	FINAL	EDITING, LAYOUT AND PRINTING
1	Climate Change Implications for the Southern African Development Community (SADC)	07/03/14	30/04/14	>30/04/14
2	Climate Information and Early Warning Systems for Supporting the Disaster Risk Reduction and Management Sector in South Africa under Future Climates.	28/03/14	30/04/14	>30/04/14
3	Climate Change Implications for the Disaster Risk Reduction and Management Sector.	31/03/14	30/04/14	>30/04/14
4	Climate Change Implications for the Urban, Rural and Coastal Human Settlements in South Africa	31/03/14	30/04/14	>30/04/14
5	Climate Change Adaptation and Food Security in South Africa – <i>towards an integrated economic analysis</i>	23/04/14	30/04/14	>30/04/14
6	The Economics of Adaptation to Future Climates in South Africa (2030 and 2050) – <i>An integrated economic analysis of development and adaptation scenarios under future climates</i>	07/04/14	30/04/14	>30/04/14
7	Long-Term Development and Adaptation Scenarios under Future Climates in South Africa (2030, 2050 and 2100)	23/04/14	30/04/14	>30/04/14

8. Annex 1: Workshop Programme

 environmental affairs Department Environmental Affairs REPUBLIC OF SOUTH AFRICA	 SANBI Biodiversity for Life	 giz	On behalf of  Federal Ministry for the Environment, Nature Conservation and Nuclear Safety of the Federal Republic of Germany
Long Term Adaptation Scenarios Flagship Research Programme (LTAS) 3-day Interactive Planning Process Venue: Southern Sun Hotel (OR Tambo) Date: 22-24 January 2014		 LONG TERM ADAPTATION SCENARIOS TOGETHER DEVELOPING ADAPTATION RESPONSES FOR FUTURE CLIMATES	
Chair and overall facilitator		Mr Shonisani Munzhedzi and Mr Vhalinavho Khavhagali	

DAY 1: Wednesday, 22 January – Chair and overall facilitator Mr Shonisani Munzhedzi		
09h00	Registration, distribution of phase 1 products and tea/coffee	Ms Lindiwe Ratlhagane (DEA)
09h30	Opening and Welcome	Mr Shonisani Munzhedzi and Dr Brian Mantlana (DEA)
10h00	Presentation: LTAS Overview	Prof Guy Midgley (SANBI)
10h30	Presentation: Policy alignment process	Prof Guy Midgley (SANBI) / Mr Zane Abdul (GIZ)
10h45	Break and tea/coffee	
11h00	Presentation: Climate change implications for SADC	Ms Hannah Baleta (PEGASYS)
11h30	Discussion session: Climate change implications for SADC	Dr Guy Pegram (PEGASYS) Discussion Panelists: Dr Chris Moseki (Water Research Commission) and Dr Brian Mantlana (DEA)
12h30	Lunch	
13h30	Presentation: Climate information and early warning systems for supporting the disaster risk reduction and management sector	Dr Julia Mambo, Ms Miriam Murambadoro, Ms Karin Stronkhorst (CSIR)
14h30	Discussion session: Climate information and early warning systems for supporting the disaster risk reduction and management sector	Dr Julia Mambo, Ms Miriam Murambadoro, Ms Karin Stronkhorst (CSIR) Discussion Panelists: Dr Mxolisi Shongwe (SAWS) Prof Coleen Vogel (WITS)
15h30	Presentation: Modelling climate change impacts on floods, droughts, sedimentation and sea level rise impacts and adaptation options for disaster risk reduction and management	Dr James Cullis (AURECON)
16h30	Discussion session: Modelling climate change impacts on floods, droughts, sedimentation and sea level rise impacts and	Dr James Cullis (AURECON) Discussion Panelists:

	adaptation options for disaster risk reduction and management	Dr Alan Boyd (DEA, Oceans and Coasts) Dr Roland Schulze (UKZN)
17h30	Summary and closure for day 1	Mr Shonisani Munzhedzi (DEA)

DAY 2: Thursday, 23 January – Chair and overall facilitator Mr Vhalinavho Khavhagali		
09h00	Presentation: Climate change implications for the human settlements sector	Matthew Gaylard, Prof Roland Schulze, Dr Crispian Young, Derick Young (LINKD)
10h00	Discussion session: Climate change implications for the human settlements sector	Matthew Gaylard, Prof Roland Schulze, Dr Crispian Young, Derick Young (LINKD) Discussion Panelists: Prof Coleen Vogel (WITS) Dr Roland Schulze (UKZN) Mr Enoch Mhlanga (Department of Rural Development and Land Affairs)
11h30	Break and tea/coffee	
12h00	Presentation: The economics of climate change	Dr James Cullis (AURECON) Prof Channing Arndt (UNU-WIDER)
13h00	Lunch	
14h00	Presentation: Modelling the biophysical and economic effects of a range of development and adaptation scenarios under future climates	Dr James Cullis (AURECON)
15h00	Discussion session: Quantitative development and adaptation scenario planning using biophysical and economic modelling	Dr James Cullis (AURECON) Prof Channing Arndt (UNU-WIDER) Discussion Panelists: Mr Gerald De Jager (AECOM)
16h00	Summary and Closure for Day 2	Mr Vhalinavho Khavhagali (DEA)

DAY 3: Friday, 24 January – Chair and overall facilitator Mr Vhalinavho Khavhagali		
09h30	Presentation: LTAS recap and links to DEA planning, implementation and monitoring and evaluation.	Prof Guy Midgley (SANBI)
09h45	Presentation: Long term development and adaptation scenarios under future climates in South Africa (2030, 2050 and 2100)	Dr Guy Pegram (PEGASYS)
11h30	Break and tea	
12h00	Discussion session (four breakaway groups): Long term development and adaptation scenarios under future climates in South Africa (2030, 2050 and 2100): Developing narratives for development emphases: 1) Urbanising service economy; 2) High-growth primary economy; 3) Low carbon green economy; and 4) Redistributive decentralised economy.	Dr Guy Pegram (PEGASYS)
13h00	Lunch	
14h00	Report back: Long term development and adaptation scenarios under future climates in South Africa (2030,	Dr Guy Pegram (PEGASYS)

	2050 and 2100): Overview of narratives developed above.	
14h45	Discussion session (four breakaway groups): LTAS phase 2 research products and timeframes and links to future adaptation work. Discussing the effects of LTAS climate scenarios on development emphases.	Dr Guy Pegram (PEGASYS)
15h30	Report back: Long term development and adaptation scenarios under future climates in South Africa (2030, 2050 and 2100): Key points on climate change impacts on development emphases discussed above.	Dr Guy Pegram (PEGASYS)
16h00	Closure	Mr Vhalinavho Khavhagali & Dr Brian Mantlana (DEA)

9. Annex 2: List of Participants

Register : LTAS Workshop
 Venue : Southern Sun Hotel-Johannesburg
 Date : 22-24 January 2014

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