Core Module 2

Teaching-Learning-Assessment Plan

SARUA Curriculum Innovation Network SCIN

Transdisciplinary Thinking and Skills

Core module 2 in Southern African Master's in Climate Change and Sustainable Development

This core module provides foundational training in the conceptual thinking required for transdisciplinary work. It aims to equip students with different approaches to knowledge, alternative theoretical frameworks and with practical academic research skills. Most importantly, it enables students to work in inter- and transdisciplinary teams, and to engage with academic and non-academic communities from different sectors to define and respond to complex climate and development problems in an African context.

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Important note: This TLA Plan does not provide details of the key resources. Details and guidelines are found in the Courseware Guidelines, designed as an essential complement to the TLA Plan.

Contents

Introduction to the Teaching-Learning-Assessment Plan

The Teaching-Learning-Assessment (TLA) Plan is intended as a guide to the teaching, learning and assessment activities of the module. It aims to be more than merely the syllabus or content of the module. It includes the development of knowledge, skills and competencies, guidelines on teaching methodology, formative feedback and summative assessment – all of which contribute to the learning experience and therefore outcomes of the student. However, it is not a textbook. More detailed guidelines on the use of the resources is found in the module Courseware Spreadsheet.

In order to understand the TLA Plan better, the following points should be noted before reading it:

Assessment and feedback: Assessment is an integral component of the entire teaching and learning process rather than a final adjunct to it, and for this reason, assessment tasks are spread across the module. The curriculum upholds a supportive, proactive approach to the student's continuous development and achievement of the desired outcomes through frequent formative feedback from either the lecturer or the peer group. The student's grades are compiled from the summative tasks across the module.

All assessment and feedback should be based on clear, transparent criteria, provided (or developed by the class) in advance of the assignment. Assessment tasks can be completed by the individual student or a group of students. In the latter case, guidelines for awarding individual marks are provided in the Assessment Guidelines on the ePlatform.

There are two types of assessment: formative and summative.

i) Formative assessment/ feedback:

The student should receive formative feedback, from either the lecturer or peers, ideally for every assignment. This feedback outlines strengths and weaknesses and allows for reflection on areas for improvement, thus supporting the student's progress and development. Effective feedback is prompt, frequent, specific and personalised.

ii) Summative assessment:

The goal of summative assessment is to build up marks that ultimately contribute to the student's grade for the module. Summative assessment measures student achievement by comparing it against standard criteria (i.e. the desired module outcomes). Because summative assessment is for marks, it is 'high stakes' and has a motivational effect on student engagement. To avoid contention, summative tasks should be assessed by the lecturer and an independent moderator and should

be based on clear, explicit and transparent criteria. It is recommended that summative tasks account for about 20% of the student notional hours of a module and do not place too big a burden on the lecturer. Careful consideration must be given to ensuring proactively that plagiarism is avoided.

Assessment rubrics: An assessment rubric with clear criteria should be provided (or developed by the class as a group) in advance for all student assignments to ensure that assessment is transparent and fair. The student should know, in advance, what is expected of the assignment, how the task links to the outcomes of the module and what is valued in the module. The following standard rubrics are found in the *Assessment Guidelines and Tools* on the ePlatform and can be adapted and weighted as necessary: Presentation, Report, Analytical Essay and Development of Writing Rubric. These are to be adapted to assess the desired outcomes of each task.

Additional activities: The TLA Plan provides activities for 200 student notional hours. It also provides additional activities for those universities that require additional hours in the module.

Courseware Guidelines: The TLA Plan gives only abridged references for the prescribed resources. The number in [ ] links to the associated module Courseware Guidelines, which is a spreadsheet with full references to key and additional resources (see the different tabs). The Courseware Guidelines contains further guidelines for using the resources.

Exam: Should an institution require students to write an exam at the end of the module, the time allocated for the exam would be over and above the 200 notional hours provided by the TLA Plan. It is recommended that the exam questions are broad and integrated across the module, so as to demonstrate achievement of the broader competency outcomes of the module. Examples of exam type questions are provided at the end of the TLA Plan.

Grades: Grades are calculated from summative tasks. These may be weighted according to the institution's requirements. An example of a module grade table is provided in the Overarching Resources on the ePlatform.

Group work: Group work is encouraged as this builds the essential outcome of teamwork, defined as the ability to work flexibly in teams, engage effectively with peers and successfully complete team tasks. There are several ways to award individual scores for group work (see Assessment Guidelines on the ePlatform). It

is important that the lecturer plays a key facilitating role in supporting group work to achieve the desired outcomes. We suggest that group process/ participation skills are assessed by students rather than the lecturer and therefore that the assessment of group participation skills is used formatively but not for marks, to avoid contention.

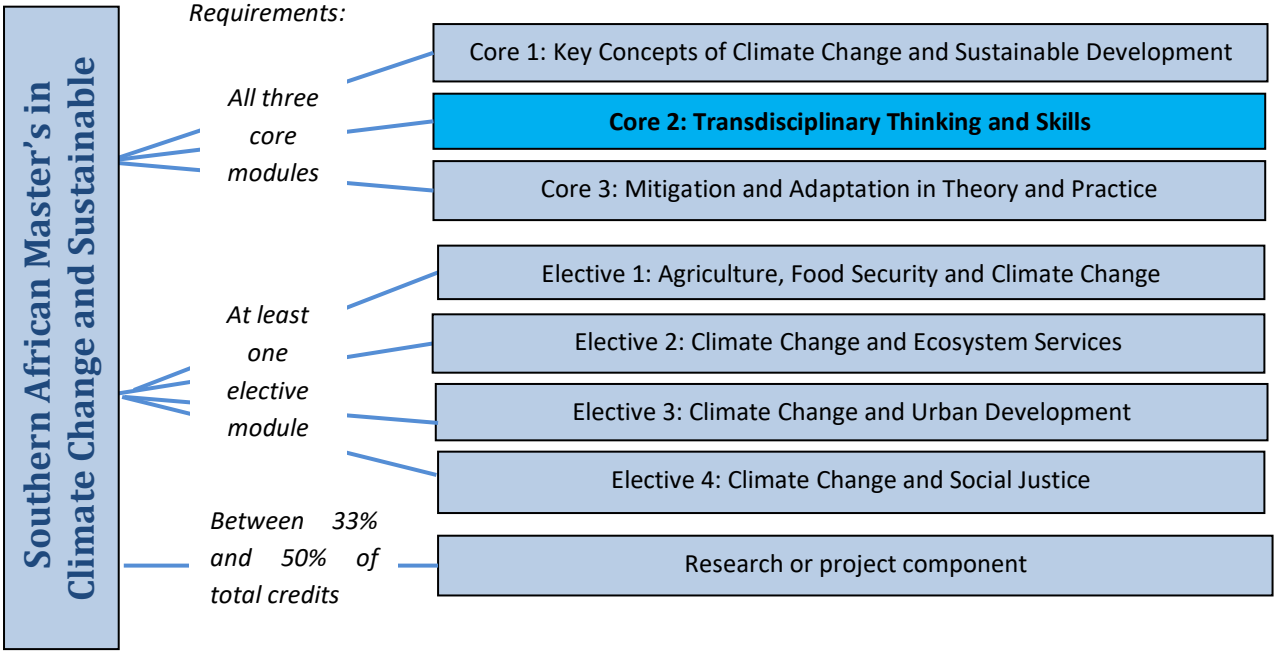
Key concepts: The key concepts detailed under some of the Learning Themes refer to concepts that the student should be familiar with before the first class in the Learning Theme. This means that if the student is not familiar with the term, s/he should undertake a simple search to get a basic understanding of the term, in advance of the class.

Outcomes: The TLA Plan provides topic-level and module-level outcomes that align with the curriculum-level outcomes. The curriculum outcome categories are derived from the South African Qualifications Authority (SAQA) National Qualifications Framework Master's level outcomes (Level 9) and the Critical Cross Field Outcomes, as these are consistent with regional requirements.

Student notional hours: The guidelines for hours in the TLA Plan refer to 'student notional hours'. A student notional hour is the estimated learning time taken by the average student to achieve an average pass rate for a specified task. Student notional hours are suggested for each activity to give an indication of the envisioned effort. The module provides for 200 student notional hours, with additional hours for institutions requiring a longer module.

Introduction to the Module

Transdisciplinary Thinking and Skills is the second core module in the Southern African Master's in Climate Change and Sustainable Development.



Module rationale

The module emphasises the development of transdisciplinary (TD) competencies (the knowledge, attitudes and skills that enable successful problem solving of complex challenges), as well as relevant disciplinary expertise (paradigms, theoretical approaches and research methods). The module provides the core conceptual understandings for engaging with academic and non-academic communities from different sectors to define and respond to specific African challenges. The module trains students in the underlying conceptual thinking of transdisciplinarity, at a paradigmatic and theoretical level, in order to be able to produce context relevant knowledge. This conceptual thinking provides capacity for understanding and researching climate change and development problems in southern Africa, as well as for contributing to the solution of these problems.

Since this module covers a range of paradigmatic and theoretical concepts, it is an abstract, theoretical module, compared with the other more applied modules. This module is foundational as it equips learners with the essential competency of understanding different knowledge systems (formal, indigenous and lay) including a *range of formal approaches to knowledge*, and important *theoretical frameworks* and *research designs skills*. Because of the need to engage with both scientists,

practitioners and communities, the module provides an understanding of knowledge production in a disciplinary, multi-; inter- and transdisciplinary context, as well as the dominant *theoretical frameworks* for understanding climate change, the social world and resilience/ sustainability frameworks for guiding transformation. In addition, to assist students in thinking about the paradigm and theoretical frameworks they will use to frame their research project, Learning Theme 2 includes an exercise where students will select a research topic and develop their preliminary research aim and objectives.

Overview of Module

The module provides the conceptual and skills foundation for understanding, researching and problem solving for researchers and professionals working in the southern African context. The module is innovative in that it is founded on the notion that transdisciplinary thinking and skills are core capacities for facilitating climate compatible development.

Module Learning Outcomes

The students will have a philosophical and conceptual understanding of transdisciplinary knowledge production and practice so that they can critically engage in and contribute in new ways in the field of climate change and sustainable development.

Knowledge Outcomes

- ***Specialist Knowledge:*** The student is able to demonstrate the ability to interrogate conventional approaches to climate change and sustainable development (LT1) and be able to argue that a range of approaches to knowledge production (*paradigms*) (LT3) and a variety of *theoretical frameworks* (LT4) are required to address the complex problems of the Anthropocene and to plot sustainable pathways into the future (LT4).
- ***Knowledge of applications***: The student is able to understand, evaluate and select appropriate approaches, paradigms, a theoretical frameworks and methods to undertake research and engagement around policy issues to understand and inform solutions to complex real world problems related to climate change and sustainable development (LT2).
- ***Knowledge Literacies:*** The student is able to:
  - Access, process and manage information related to the Anthropocene (LT1); Transdisciplinarity (LT1); knowledge paradigms (LT3); theoretical frameworks, (LT4) and research methods (LT2) for application in

climate change and sustainable development research;
  - Evaluate current processes of knowledge production, including their derivation, contestation, dissemination (LT1, LT3).
- ***Research Literacies:*** The student is able to:
  - Choose an appropriate process of enquiry for their research project on an aspect of climate change and sustainable development (LT2);
  - Conduct a review of literature on knowledge paradigms (LT3) and theoretical frameworks (LT4) for application in own research projects;
  - Use appropriate ethical, transdisciplinary research principles (LT1, LT3).

Skill Outcomes

- ***Method and procedure*****:** The student is able to evaluate and select appropriate approaches, paradigms, and the relevant associated a theoretical frameworks and methods to undertake research and engagement around policy issues to understand and inform solutions to complex real world problems related to climate change and sustainable development. (LT3, LT2) Student is able to develop the problem statement, rationale, aim and objectives of their research project, in order to be able to design and undertake independent research and practice (LT2). The student is able to apply software programme *Mendeley* in order to manage and review literature and undertake thematic analysis (LT2).
- ***Producing and communicating information****:* The student is able to summarise their learning and communicate it through written work, formal presentations and class discussions in relation to their specialist knowledge (see above) (All LTs). The student is able to write the foundational section of the research proposal for the research project through cumulative writing exercises (LT2).
- ***Accountable and independent learning:*** Student is able to demonstrate effective self-driven learning for transdisciplinary literacy and the development of own research project (LT2).

- ***Teamwork*:** The student works flexibly in teams, engages effectively with fellow students and contributes meaningfully to group projects.

Competency Outcomes

- ***Stakeholder engagement:*** The student is able to demonstrate the knowledge and tools required (of formal and indigenous, local knowledge systems and the range of knowledge paradigms, theoretical frameworks) in order to engage effectively with diverse interest groups (LT1).
- ***Problem solving*:** The student is able to demonstrate a broad, critical understanding of the *dominant theories related to climate change* and sustainable development in the social and natural sciences for working in the field of climate change and development, in order to be able to integrate and apply theories to address and frame complex theoretical and practical problems; and to understand how different framings will influence the evidence produced and the interventions possible (LT1, LT3 and LT4).
- ***Context and systems thinking:*** The student is able to demonstrate an understanding of the complexities and uncertainties of the Anthropocene and the interrelatedness of social, political and economic problems. (LT1, LT3 and LT4).
- ***Transdisciplinary thinking:*** The student is able to apply transdisciplinary thinking to interrogate the conventional relationship between science and policy, and science and society, as well as different approaches to knowledge production, theoretical frameworks and social learning processes; The student is able to demonstrate respect for and valuing of different positions within the research and civil society communities (LT1, LT3). The student understands formal and informal (indigenous, local) knowledge systems and the range of approaches to knowledge paradigms, theoretical frameworks and related methodologies and can use this understanding to work successfully in transdisciplinary teams (LT1, LT3 and LT4).

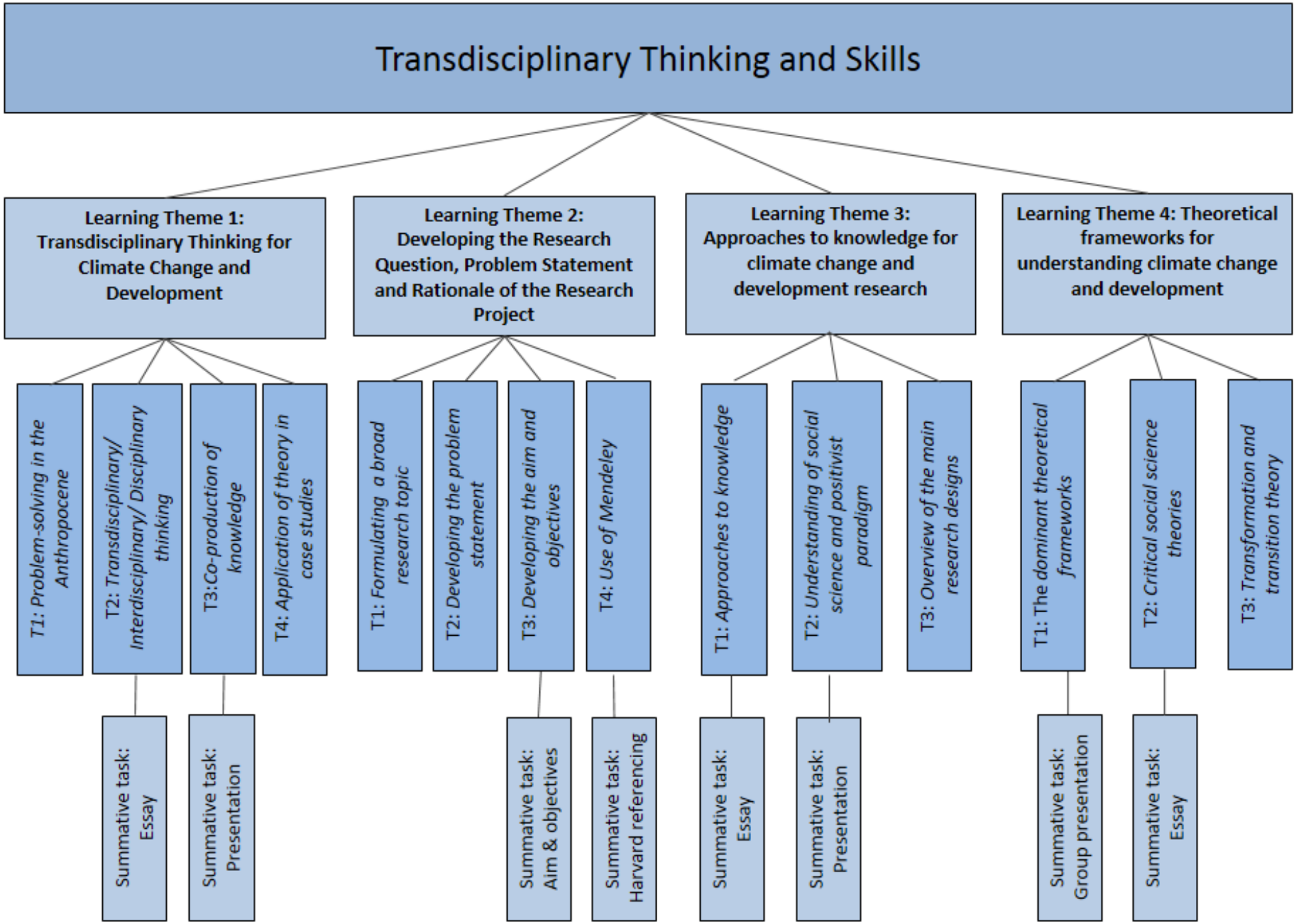
Assumptions about students' prior knowledge and skills upon module entry

Assumptions regarding students who have completed Honours degree:

- These students are not likely to have done a research methods module although some may have.
- They will have some competency in framing research within theoretical frameworks but not paradigms
- They are not likely to have critiqued theoretical frameworks or integrated them.
- They are likely to have done a research project and have some writing skills.
- They are not likely to have used qualitative data analysis software
- Most of the students are likely to have some discipline specific training, and so, thinking across diverse knowledge fields may be new to them.
- They are unlikely to have much practical experience nor have engaged with practitioners and policy makers.

Assumptions regarding students who have gained entry to the Master's course via their practical experience:

- These students are highly unlikely to have any training in research methods even if they are experienced practitioners
- They will not have done an independent piece of theoretically framed research, nor have developed critical reading skills – and it is unlikely they will understand the role of theory in research or paradigms
- They will have some writing skills but not in academic formal writing
- They are not likely to have used qualitative data analysis software
- They are more likely than the above group to have engaged with practitioners and policy makers and this knowledge should be drawn on in the module.


Transdisciplinary Thinking and Skills
Learning Theme 1: Transdisciplinary Thinking for Climate Change and Development
Learning Theme 2: Developing the Research Question, Problem Statement and Rationale of the Research Project
Learning Theme 3: Approaches to knowledge for climate change and development research
Learning Theme 4: Theoretical frameworks for understanding climate change and development
T1: Problem-solving in the Anthropocene
T2: Transdisciplinary/ Interdisciplinary/ Disciplinary thinking
T3:Co-production of knowledge
T4: Application of theory in case studies
T1: Formulating a broad research topic
T2: Developing the problem statement
T3: Developing the aim and objectives
T4: Use of Mendeley
T1: Approaches to knowledge
T2: Understanding of social science and positivist paradigm
T3: Overview of the main research designs
T1: The dominant theoretical frameworks
T2: Critical social science theories
T3: Transformation and transition theory
Summative task: Essay
Summative task: Presentation
Summative task: Aim & objectives
Summative task: Harvard referencing
Summative task: Essay
Summative task: Presentation
Summative task: Group presentation
Summative task: Essay

Learning Theme 1: Transdisciplinary Thinking in the Anthropocene

Rationale for Learning Theme

There is a dire need to develop capacity in Africa to produce and adapt climate research for decision-making in order to steer development pathways towards sustainable development. This calls for new ways of knowledge development, learning and innovation. There is a need to build capacity to this end by building competency in inter- and transdisciplinary thinking and skills, for promoting awareness, and understanding the complexity and imperatives of integrating climate change knowledge with developmental decision-making. Such understanding has been identified as a serious gap in the region, without which achieving the goals of sustainable development and supporting policy and practical responses to the risks of climate change are compromised and difficult (Dhansay et al. 2015). The literature suggests that the only way to understand and contribute to the solution of problems via research, policy making and practice is to adopt a critical and inter- and transdisciplinary mode of thinking and problem-solving. This new way points to a 'transgression' beyond previous approaches to these problems, and beyond disciplinary boundaries and the separation of science and society. This learning theme explores the shift to, the nature of, and the challenges for transdisciplinary thinking and research and its implications for the 'science-society' and 'science-policy' interface. In essence, the aim of this learning theme is for students to understand the complexities and interconnectedness of the world we live in today. The learning theme also supports the application of such an approach in the student's' own research projects.

Key words to understand prior to the activities in Learning Theme 1:
Global environmental change; climate change; complexity; linked social-ecological systems; different knowledge systems (e.g. indigenous knowledge, traditional knowledge, local knowledge); stakeholders

LT1. Topic 1: Problem-solving in the Anthropocene
Why are new methodological and conceptual frameworks needed?

Outcomes

- ***Specialist knowledge and knowledge literacy:*** student is able to engage with different perspectives of the Anthropocene and understand why new ways of knowledge production are required to address the complex problems of the Anthropocene and to plot sustainable pathways into the future.
- ***Producing and communicating information:*** student is able to synthesise information and reproduce this visually using a mind map.
- ***Context and systems thinking*****:** student is able to demonstrate their comprehension of systems thinking through mind mapping of socio-ecological challenges and their application in the local context

LT1	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T1.1	**Students: Preparatory readings and videos on the Anthropocene**. Students read the prescribed material and view the videos in preparation for the class discussion.	4.5	*Readings:* [28] Raworth (2012) [30] Rockström et al. (2009) [8] Biermann et al. (2015) *Videos* [57] Lorimer J. (2014) Wildlife in the Anthropocene [58] Leach M. (2015): Planetary boundaries and the Anthropocene
T1.2	**Class discussion: Why are new methodological and conceptual frameworks needed?** Based on the readings, the lecturer facilitates a class discussion around the characteristics of the Anthropocene and why this leads to the need for more integrated, transdisciplinary approaches to solving contemporary global challenges. Students start thinking about the links between challenges and drivers in preparation for their assessment activity.	1.5	
T1.3	**Students: Mind map and free writing** Students produce an annotated mind map demonstrating the linkages between the drivers and outcomes of the major challenges of the Anthropocene. Students accompany the mind map with at least one page of free writing that highlights the social-ecological challenges and changes in their local environment. Criteria to be developed by class Feedback given by peers	4	

LT1. Topic 2: Transdisciplinary/ Interdisciplinary/Disciplinary thinking

What is it all about? Sustainability science and Mode 1 and 2 knowledge systems or 'post-normal science'

Outcome

- ***Specialist knowledge***: students have deepened their knowledge and engagement with the concept of transdisciplinary. This will include content on sustainability science and mode 1 and 2 knowledge systems or 'post-normal science'.
- ***Producing and communicating information:*** student is able to synthesise a range of literature into an argument; development of essay writing structure
- ***Stakeholder engagement***: students demonstrate the knowledge and skills to engage with relevant stakeholders.

LT1	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T2.1	**Class activity: Lecture: Introduction to Transdisciplinary/ Interdisciplinary/ disciplinary thinking and discussion of key concepts and principles**	1	*Readings:* [38] Wickson (2006) [32] Steelman et al. (2015) [18] Lang et al. (2012) *Videos:* [45] Fischer J. (2014) What is transdisciplinarity? [44] Pohl C. (2014) Heuristics of Transdisciplinary Research
T2.2	**Students: Preparatory reading and self-learning** Students read the prescribed papers and the watch videos on inter- and transdisciplinary approaches to knowledge production/co-production and some of the challenges associated with applying it.	5	
T2.3	**Class activity: Discussion** In a discussion facilitated by the lecturer, students share their learning from the readings and videos and together the class comes up with suitable definitions of the major concepts.	2	

T2.4	**Student: Summative assessment task: Essay** Student uses the prescribed readings and class discussion as background to write a 3000 word essay that: a) draws out the main characteristics of transdisciplinary research b) highlights the key principles that underlie such an approach c) identifies the critical challenges for transdisciplinary research Student is encouraged to find additional readings. Hand in draft essay for formative feedback (4 hours). Redraft essay taking into consideration feedback (6 hours). Assessment by lecturer Criteria: Essay rubric.	10	

LT1. Topic 3: Co-production of knowledge

Including the importance of citizen, local and indigenous knowledge and science

Outcome

- ***Specialist knowledge:*** student is able to demonstrate an understanding of the basis and value of different knowledge systems and appreciation of the necessity for incorporating a wide range of views and perspectives into problem-solving processes**.**
- ***Knowledge of application:*** student is able to apply theoretical concepts to their own local context and understand how transdisciplinary research has implications for the use of knowledge in policy making and practice.
- ***Knowledge literacy:*** student is able access, review and evaluate literature on different knowledge systems and their combination.
- ***Producing and communicating information***: student is able to produce, communicate (orally and in writing) substantive concepts related to knowledge systems and co-production of new knowledge.
- ***Independent learning*****:** student is able to independently engage with the literature and develop their own body of understanding via reading and summarizing the main concepts.
- ***Teamwork****:* students demonstrate ability to work in groups.

LT1	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T3.1	**Class activity: Lecture on appreciation of different types of knowledge systems and the importance of this in co-production of knowledge**	1	*Readings:* [11] Folke (2004) [46] Corburn (2009) [26] Polk (2015) [37] Whatmore (2009) [11] Lane et al. (2011) *Social Learning Readings:* 47] Blackmore (2014) [49] Cundill et al. (2014) [50] Collins & Ison (2009) *Video:* [59] UNU (2012) Land Use, Climate Change
T3.2	**Student: Preparatory readings and self-learning** ● Each student reads the prescribed paper and watches the video on Traditional Knowledge (Folke, 2004). This provides students with an appreciation of different knowledge systems. ● For the second set of readings, on negotiating the science-policy, science-public interface, the class is divided into two groups. Each group will read one of the papers on 'knowledge controversies' (Whatmore, 2009; Lane et al. 2011) and discuss this in their groups, thinking about the following questions: What are the issues identified in the literature around the 'science-policy	2 3	

	interface'? What is a' knowledge controversy'? What is an example of a knowledge controversy from the papers? How can transdisciplinary knowledge production reduce knowledge controversies?		Adaptation and Indigenous Peoples
T3.3	**Class activity: Discussion** Following the self-learning, each group will share their analysis of their 'knowledge controversy' paper with the rest of the class through a sharing approach of their choice (e.g. presentation, oral, etc.). Peer feedback Criteria: presentation rubric, ability to respond to questions	2	
T3.4	**Student: Preparation of presentation on different knowledge systems** Student prepares a 5-10 minute presentation on the basis and value of different knowledge systems; on local, civic or indigenous knowledge systems arguing their relevance for transdisciplinary research. Student should draw on own context to illustrate arguments as well as find some additional readings.	2	
T3.5	**Class activity: Delivery of presentations** Each student delivers presentation. **Summative assessment** by the lecturer using standard presentation rubric.	1	
T3.6	**Students: Preparatory reading** Students read at least two of the readings on social learning.	4	
T3.7	**Class activity: Guest lecture by a climate change practitioner (government or NGO)** The lecturer invites a suitable climate change practitioner to address the class regarding knowledge requirements for their work and ideas for co-production of knowledge with researchers. This is followed by a general discussion.	2	

T3.8	**Students: Poster on social learning as a form of stakeholder engagement and knowledge co-production** Students prepare an A3 poster on what social learning is and how they might see it applied in a climate change adaptation project in their home area. They should explain how social learning can facilitate knowledge co-production. Peer assessment of posters. Marking rubric to be developed in advance by class.	4	

LT1. Topic 4: Application of theory in case studies

Outcome

- ***Specialist knowledge***: student is able to demonstrate their specialist knowledge on transdisciplinarity through its application.
- ***Knowledge of applications:*** student is able to extend their content learning on transdisciplinarity through the application of theory to cases.
- ***Research literacy:*** student is able to capture, collate, manage and draw conclusions from theory and research data from engaging with case studies.
- ***Teamwork:*** students show strengthened ability to work in teams.
- ***Producing and communicating information:*** student is able to readily transfer what they have learned to written form through free writing.
- ***Stakeholder engagement:*** student is able to represent and engage effectively with alternative viewpoints

LT1	***Teaching-Learning-Assessment Activity***	***Hrs***	***Prescribed resources***
T4.1	**Students: Group work** In groups, students consider and consolidate their theoretical understanding/ learning in the context of the three prescribed case studies – one case study per group with a spread across groups. Students discuss these cases together. All students should ultimately read all 3 cases	3	*Readings:* [25] Pohl et al. (2010) [19] Lemos & Morehouse (2005) [33] Swilling (2014)

T4.2	**Student: Individual, informal write-up of the key learnings from any one of the studies in terms of applying transdisciplinary approaches** This can be a piece of free writing (2000 words). Students should: a) identify the problem being studied/ and the aim of the study; b) outline the methodology employed; and c) summarise what they learnt in terms of applying TD principles and specifically the role of the researcher/professional in the process. These short pieces can be formatively assessed by other members of their group in a peer learning process. Criteria: To be developed by class	4	
T4.3	**Student: Research and preparation for role play exercise** Students examine a local case study where different stakeholders have different needs in dealing with the problem of flooding/ storm in their area (or any other climate related problem)	2	Class to find resources
T4.4	**Class activity: Role play** In class, with lecturer facilitation, students role play stakeholders discussing how best to deal with the problem (2 hours). Feedback from lecturer and peers (1 hour) Class to develop criteria, including, ability to represent someone else's viewpoint effectively and to hear and consider other viewpoints	3	

Learning Theme 2: Developing the Research Question

Problem Statement and Rationale of the Research Project

Rationale for Learning Theme

In response to the lack of capacity in climate change research, the rationale for this Learning Theme is to build capacity for undertaking independent research and to develop research and writing skills in sub-Saharan Africa. The rationale for including this theme in the first half of the module is to commence work on the student's research project, which is a large component of the Master's degree. By formulating the problem statement, rationale (purpose) of the project, and the aim and objectives (research question and sub-questions); and undertaking preliminary reading and reviews of literature related to the project, the subsequent themes in this module can be related to the student's own research and become meaningful and valuable.

Key words to understand prior to the activities in Learning Theme 2:

Research topic; aim, objectives; research rationale; motivation for research; basic and applied research; literature review

LT2. Topic 1: Formulating a broad research topic

Outcome

- ***Knowledge literacies:*** student is able to investigate topic via literature and internet
- ***Accountability and independent learning*:** student is able to select their own research topic through literature investigation.
- **Teamwork:** student is able to constructively discuss topics in pairs and in class.

LT2	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T1.1	**Students: Pre-research reading:** Students to read up on a potential topic – the course readings can provide a useful starter. Search online for other readings and watch the 3 videos listed in the resources.	3	Use Google Scholar and Google search engines, and Africa Portal to access the sources of information (academic, policy and news literature) on the topic of interest and read them to inform the selection of the topic. Institutional research component requirements *Videos:* [42] How to develop a good research topic
T1.2	**Class activity: Lecture:** Introduction to the institution's requirements for the research project (length, etc.) noting that the topic needs to fall within the area of climate change and sustainable development.	1	
T1.3	**Class activity: Discussion of topics:** Each student to present their potential topic (why it interests them, why it is creative, and why relevant) – interactive class session.	2	
T1.4	**Students:** Using the videos, students to narrow down topic by adding historical, geographical and biological/social context (as discussed in video). Present this updated topic overview to each other in pairs for feedback	2	
T1.5	**Class activity:** Lecturer presents some examples to the class with discussion.	1	

LT2. Topic 2: Developing the problem statement and the rationale

Outcome

- ***Knowledge of application***: student is able to read literature to compose a problem statement showing what needs to be researched and why. Relating their topic to the problem in the real world, and what its purpose would be.
- ***Knowledge literacy*****:** student is able to process literature to commence a process of enquiry and motivate for a worthwhile and relevant research topic
- ***Research literacy:*** student is able to draw conclusions from literature to inform a research process.
- ***Producing and communicating information:*** student is able to write up a problem statement and motivation in a logical and clear manner.
- **Teamwork:** student is able to work with teams and in class to promote learning and clarify problem statements and motivations for research.

LT2	***Teaching-Learning-Assessment Activity***	***Hrs***	***Prescribed resources***
T2.1	**Students: Pre-class discussion and reading** Read both readings required for this topic & revisit videos. What was Sharp et al.'s (2011) motivation for doing their study?	4	Readings: [14] Hernon & Schwartz (2007) [31] Sharp et al. (2011)
T2.2	**Class activity: Discussion** Class to discuss the motivation of Sharp et al for doing their research.	1	
T2.3	**Class activity: Lecture and problem statement development** Lecturer to introduce the need for a *problem statement* using the 4 components of a problem statement shown by Hernon and Schwartz. The need for a *rationale/motivation* is also presented. In class, students to write their problem statement, share it with their neighbour for comments.	2	
T2.4	Students: Students to write a rationale/motivation for their proposed research. Why is it worthwhile studying? Is there an applied, empirical, theoretical rationale/motivation?	1	
T2.5	Class activity: Each student to present their problem statement and rationale/motivation. Class discussion. [This is not final; it can be changed]	2	

LT2. Topic 3: Developing the aim and objectives of the research project

Outcome

- ***Method and procedure***: student is able to compose a research aim and research question, relating to the real world, and what needs to be known.
- ***Knowledge literacy*****:** student is able to process literature in order to commence a process of enquiry by formulating an aim and objectives. Able to draw conclusions from literature to inform a research question.
- ***Producing and communicating information:*** student is able to write up a problem statement and motivation linked to an aim and objectives in a logical and clear manner
- ***Teamwork:*** student is able to work with teams and in class to promote learning and clarify each other's aim and objectives.

LT2	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T3.1	**Students: Pre-reading and preparation** Read Sharp et al. (2011)	1	[31] Sharp et al. (2011) *Video:* [40] Developing a research question
T3.2	**Class activity: Lecture and discussion** • Introduction to the need for research to have an Aim (Research Question) and Objectives (sub-questions). • Lecturer to introduce the 'funnelling example' to show how to develop the aim to be more specific and therefore feasible.	1	
T3.3	**Students: Writing** • Write 400 words on the different aims of the positivist and post-positivist work packages in the WaND project (in Sharpe, 2011). • In 2 tables, list the 'concepts' used by each of the 2 perspectives and their definitions	2	
T3.4	**Class activity:** Students use the notes prepared to critically discuss: • the different aims of the 2 perspectives presented in Sharp et al. (2011) and • the concepts of water used by each perspective and why they differ.	2	
T3.5	Class activity: In class, each student writes own Aim/Research Question and discusses it with another student • Each student to present their 'Aim' to the class, noting the verb/s they use.	2	

	● Lecturer reintroduces the 'funnelling example' to show how to develop the aim to be more specific and therefore feasible. ● Students to present their aim a second time showing how they have made it more specific. Students to peer assess the success in funnelling down the aim statement that their classmates have presented. Rubric to be developed by class. ● Lecturer to discuss in Class activity: a) the VERBS that students have used and the importance of choosing the right verb and b) To what extent the aim and objectives need to reflect interdisciplinary or transdisciplinary research being planned.	1
T3.6	**Student: Summative assessment task:** Development of research project Student develops 3 or 4 objectives (sub-questions) to 'unpack' the main aim. Hand in problem statement, the rationale, the aim and objectives for summative assessment. Summative assessment by lecturer Criteria: Structure: problem statement, rationale, aim and objectives	3

LT2. Topic 4: Use of Mendeley Open Access Referencing Management Software

Outcome

- ***Knowledge literacy:*** student is able to manage and access relevant literature for their research project
- ***Method and procedure:*** student can use referencing management software; use of Harvard Referencing style; use of search engines for own research
- ***Producing and communicating knowledge:*** student is able to produce information on knowledge sources and motivate for their choice

LT2	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T4.1	**Students: In** pairs or small groups: • Download and install *Mendeley* (open access) and use the YouTube tutorial to understand how to use this software to manage your references. Students need to be able to understand how one can produce different styles of referencing in the programme. • Once able to use the programme, each student is to upload the three pieces of literature *(secondary sources - peer reviewed)* accessed in Activity 2.1 and 3.11 and those used in Activity 1.1 which were used to determine a research topic (6 references). • The student will access a reference relevant to their research via Google Scholar. Under the title and description of the reference, they will click on the 'cite' function and copy the Harvard style of the citation for that reference. This style through this Module and is recommended for the thesis • Having uploaded 6 secondary sources, upload the following documents of different sources: i) Upload a relevant document for your research into Mendeley that is *'grey literature'* (i.e. *not peer-reviewed*) ii) Upload a newspaper article; press release related to the issue you will be studying *(primary source - data that is not analysed)*	2 1 1 2	*Video:* [50] How to use Mendeley

	iii) Upload 1 other *primary source (meeting minutes, reports, policy documents)* relevant to your topic. Use videos as learning tools to do this		
T4.2	**Students:** Summative assessment task: Harvard style referencing Student to submit: Reference list, table, motivation for inclusion Criteria: a)Reference list printed out in Harvard style (9 references) b) A table with 3 columns indicating the author, date and type of source (primary, secondary, or grey literature. c) A motivation as to why these sources have been selected for your thesis, linking this to aim and objectives (150 words) **Summative assessment by lecturer**	2	

Learning Theme 3: Approaches to knowledge

Knowledge frameworks for engaging in climate change and development research

Rationale for Learning Theme

This theme provides foundational training in the underlying conceptual thinking for the production of knowledge for addressing climate change and development problems in southern Africa. The student will develop the competency to work in inter- and transdisciplinary knowledge and policy production teams with other disciplines. This theme is critical for all postgraduate students as it provides the underlying assumptions of knowledge production. This provides the basis for answering the questions of 'how can I know the world?' and 'what is the world (reality) I can know?' as well as 'What methods can I use to know this world?' In this theme, the main approaches to the production of formal knowledge in the natural and social sciences are presented, focusing on the assumptions of each approach which are often left implicit. This will provide the competency to frame climate change and development research and policy so that students can explicitly 'position' themselves, and those who they work with within a range of paradigms. This is the first step in understanding that there are a range of approaches to knowledge and there are policy and practical implications in their application. This is a prerequisite for any attempt to work in an interdisciplinary or transdisciplinary manner. Since there is a tendency for climate change research and policy-making to adopt a set of positivist assumptions, students are challenged to undergo a paradigm shift in this theme.

Key words to understand prior to the activities in Learning Theme 2:
Epistemology, ontology, methodology, paradigm, positivist, post-positivist, social constructivist, interpretive, critical theory, participatory action research, social science, natural science

Cross-cutting reading for Learning Theme (3 hours):

Sharp et al (2011): The case study describes a research project related to water demand and the contributions of positivist and post-positivist work packages using the case study of the WaND project in the UK. The article concludes with a discussion on the respective roles played by science from the two traditions in relation to water demand and its management. This module will focus on the description of the WaND project in the section titled 'Water demand management in England: research context for WaND' (Pg. 5-7). Here the rationale, purpose and aim and objectives of the WaND project are described and can be used an example of how a research project presents its aim and purpose.

LT3. Topic 1: Approaches to knowledge in the natural, social sciences and humanities

Positivist; Post positivist; Social constructivist (interpretive); Critical; Participatory; African worldview

Outcome

- ***Specialist knowledge***: student understands: Positivist; Post positivist; Social constructivist (interpretive); Critical; Participatory; African worldview
- ***Knowledge of applications***: student is able to understand the methods that are relevant to each paradigm.
- ***Knowledge literacy*****:** student is able to evaluate the different paradigms in relation to each other and position their research in relation to them.
- ***Research literacy:*** student is able to choose an appropriate paradigm for their research and understand the difference between this paradigm and other approaches to knowledge
- **Independent learning:** student is able to engage with the approaches to knowledge literature and provide an argument for the relation between the paradigms (essay).
- **Problem *solving*:** student is able to identify a method of enquiry relevant to their research question for their thesis
- ***Transdisciplinary thinking*:** student is able to understand different knowledge systems, in this case the difference between Western paradigms and postcolonial Africa worldviews.

LT3	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T1.1	**Student: Pre-reading** to understand the assumptions of the main approaches to knowledge. (Questions to guide reading: What are the epistemological, ontological and methodological assumptions of each paradigm? How does the African worldview differ from the Western set of paradigms ?	7	*Readings:* [21] Lincoln et al. (2011) [27] Ravenek & Rudman (2013) [20] Lincoln & González (2008) [16] Knudson (2015) [22] Lotz-Sisitka et al. (2015) [10] Chilisa (2005) *Video:* [60] Research paradigms
T1.2	**Class activity: Lectures** Three interactive lectures and videos will be given to present: the six main paradigms; basic and applied research; and what is theory.	6	
T1.3	**Class activity: Discussion** Students positioning their research in one or more of the paradigms.	1	
T1.4	**Student: Summative assessment Essay:** Provide an argument for why some paradigms cannot be integrated with others and some can in transdisciplinary research. Draft essay (2 hours) Draft essay assessed by peer Final essay (3 hours): Summative assessment by lecturer Criteria: 2000 words; Standard essay rubric	5	

LT3. Topic 2: Understanding of social science paradigms including critique of the dominant positivist paradigm

Outcome

- ***Specialist knowledge*:** student is able to demonstrate specialist knowledge of paradigms and the ability to engage with and critique the paradigms in relation to each other, specifically in relation to the dominant positivist paradigm.
- ***Knowledge literacy*:** student is able to evaluate the different paradigms in relation to each other and position their research in relation to them - especially via a critique of positivism
- ***Research literacy*:** student is able to choose an appropriate paradigm for their research and understand the difference of the positivist paradigm with other approaches to knowledge
- ***Independent learning*:** student is able to engage with the approaches to knowledge literature and provide an argument for the relation between the paradigms (presentation of paradigm via a video)

LT3	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T2.1	**Students: Reading:** Read prescribed reading focussing on the value of an interpretive approach for climate change research.	2	*Readings:* [7] Blue (2016) Video: [61] Women of the lagoon (2015)
T2.2	**Class activity:** Discussion of questions to clarify and deepen students understanding of the critique of positivism via analysis of the pre-read critical social science paper. Short introduction to summative activity and its purpose. Divide class into six groups – one per paradigm.	3	
T2.3	**Students**: Each group finds a video on their paradigm. to critique, discuss within the group and prepare a presentation. Each group prepares a critique of a paradigm to the class with the aid of a video which they will source from the internet	5	
T2.4	**Class activity: Delivery of presentation** Presentations in class Each group presents the video and the 10 minute critique and responds to questions from the class **Summative assessment** by lecturer using presentation rubric	2	

LT3. Topic 3: Overview of the main research designs for transdisciplinary research

Outcome

- ***Specialist knowledge:*** student knows about the 3 research designs (qualitative, quantitative and mixed methods) available to use in thesis and which are applied in the paradigms
- ***Knowledge of applications****:* student is able to understand the methods that are relevant to each paradigm by examining a paper in which a research method has been applied in detail
- ***Producing and communicating information*****:** student is able to write up notes and use a table format to compare different research designs

LT3	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
	Students: Reading: Read prescribed readings and watch videos	3	*Videos:* [61] Bryman (2009) Research methods [62] Bryan (2011) Conducting mixed methods research *Readings:* [15] Kitchin &Tate (2000) [51] Sayer (1984)
T3.1	**Class activity:** Short introductory lecture on research designs	2	
T3.2	**Class activity:** discussion on link between paradigms and methods based on prescribed readings on research design and the video.	3	Empirical studies: choose ONE [77] Rinne & Nygren (2016) [80] Weissner et al. (2014) [76] Pasquini et al. (2013) [75] De Wit (2015) [74] Colenbrander et al. (2015) [78] Sango & Godwell (2015) [79] Smith & Jenkins (2015) [39] Wiid & Ziervogel (2012)
T3.3	In pairs choose one of the readings on *empirical research* (each of which applies a different research design) and answer the following questions: ● What is the author's aim and objectives? ● What research design is used to achieve the aim? ● Critically evaluate the methods they used.	3	
T3.4	In pairs: Prepare a table summarising and comparing the three different research designs. A marking rubric will be developed by the class in advance.	5	

Learning Theme 4: Theoretical frameworks

Rationale for Learning Theme

While the understanding of approaches to knowledge provides the basis for answering the question of 'how can I know the world', *theoretical frameworks* consist of logically consistent bodies of concepts for understanding substantive reality. A range of dominant theories have been used to frame climate change and development research. There is a dire need to develop capacity in Africa to produce and adapt climate research for decision-making in order to steer development pathways towards sustainable development. The rationale for this theme is the need to develop capacity-building to this end by providing underlying *theoretical frameworks* for thinking about, framing and understanding the complexity of integrating climate change knowledge and imperatives with developmental decision-making, and importantly, the need to think beyond scientific knowledge for problem-solving. The importance of integrating theoretical frameworks for transdisciplinary research/practice is a key purpose of this theme. This theme explores what these dominant theories are and what aspects of climate change research they have focused on. It also critiques the various theories and explores the intersection between theories. It also explores how many theories are aligning to focus on broader social-ecological transformation.

Key words to understand prior to the activities in Learning Theme 4: Theoretical frameworks, systems thinking, complexity theory, resilience, sustainability, sustainable development, vulnerability, structure-agency, political economy

LT4. Topic 1: Dominant theoretical frameworks in climate change research

Systems thinking; Complexity theory; Resilience; Vulnerability; Sustainability/ Sustainable development (normative)

Outcome

- ***Specialist knowledge***: student is able to gain an overview of these main bodies of theory and how they relate to climate change and development issues.
- ***Producing and communicating information***: students learn how to use presentations effectively
- ***Teamwork*****:** The student works flexibly in teams, engages effectively with fellow students and contributes meaningfully to group projects.

LT4	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T1.1	**Students: Pre-reading** The class will read all compulsory readings related to the 5 frameworks (5 papers) as preparation for this activity	10	Systems thinking, complexity theory and resilience [36] Welsh (2014) [52] Davoudi (2012) Sustainable development (normative) [4] Arias-Maldonado (2013) Vulnerability [2] Adger (2006) [53] Turner (2010)
T1.2	**Students: Group work** In order to develop a working knowledge of the first 5 theoretical conventional theoretical frameworks, the class, depending on its size can be split up so that groups of 1 - 4 people work together to discuss and interpret the key dimensions of one of the 5 theoretical frameworks. Each group find 2 – 3 additional readings on the framework they are focusing on (either supplied by lecturer or found by students) to supplement the prescribed readings.	4	
T1.3	**Students:** Preparation for group presentation Each group will develop a *presentation on* a theoretical framework. It should describe the disciplinary origins, usefulness of the paradigm in thinking about climate change and its impacts, the framing paradigm of the theoretical framework, and critiques of the theory. The presentation should end with 3 – 5 questions to facilitate a discussion	4	

T1.4	**Class activity: Delivery of presentations and discussion** **Each group presents to the class (each student has a 5-minute slot)** Summative assessment by lecturer, using presentation rubric guidance on awarding individual points for group work. **Summative assessment task**	2	

LT4. Topic 2: Understanding how critical social science theories are integrated into conventional theoretical frameworks

Structure/ agency; Political economy; Political ecology; Governance theory (urban); Development theory

Outcome

- ***Specialist knowledge***: students have a solid overview of social science frameworks
- ***Knowledge literacy:*** student is able to conduct a comprehensive review of leading and current research in one specific social science theory.
- ***Knowledge of application****:* student is able to apply concepts to their own local context - application of theoretical framework to climate change and development issues.
- ***Independent Learning*****:** student is able to independently engage with the literature and develop their own body of understanding via reading and summarizing the main concepts through an essay.

LT4	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T2.1	**Students: specific readings** Students choose a social science theory in consultation with the lecturer that is closest to their thesis topic where possible so that it can feed into their thesis literature review. If they are not using one then they need to invent a hypothetical project and chose a relevant framework. Each student will read the prescribed readings on their theoretical framework and be expected to find additional readings themselves.	10	*CHOOSE ONE FRAMEWORK* *Social science theory* 68] Castree et al. (2013) [69] Goodwin (1999) [71] McLaughlin et al. (2008) [34] Swyngedouw (2009) [67] Brosius (2009) [73] Sultana (2013)
T2.2	**Class activity: Discussion** Class to engage in critical discussion about contribution of each of the social science theoretical frameworks to the understanding of climate change and development challenges in southern Africa (contribution to discussion to be assessed) (Lecturer to facilitate discussion so as to allow all students to contribute)	4	*Governance theory* [9] Bulkeley & Castan Broto (2013) [65] Bierman et al. (2012) [66] Braun (2014 *Development theory* [72] Sen (2010) [70] Lebel et al. (2006)

T2.3	**Student: Essay** Each student to write an *essay* on the allocated social science framework, and how it allows an *alternative understanding of climate change* and development challenges. Summative assessment by lecturer, using essay rubric **Summative assessment task**	6	*Wellbeing and resilience* [64] Armitage et al. (2012)

LT4. Topic 3: The emerging focus on transformation and transition theory

Outcome

- ***Specialist knowledge*:** students have a thorough knowledge of transition and transformation concepts.
- ***Producing and communicating information***: student is able to articulating their viewpoint through debate; free writing to capture personal opinion on academic viewpoint.

LT4	*Teaching-Learning-Assessment Activity*	*Hrs*	*Prescribed resources*
T3.1	**Class activity: Lecture** Introductory lecture on transformation and transition theory	1	*Readings* [23] Markard et al. (2012) [12] Frantzeskaki et al. (2012)
T3.2	**Students:** Read both prescribed readings and in preparation for class debate.	3	
T3.3	**Class activity: Debate** ● Divide class into two groups. Each side to prepare the argument for a debate on the usefulness of the transformation vs. transition theory in framing climate adaptation policy in cities. ● Critically discuss the outcomes of the debate in class discussion. ● Produce a two page free writing opinion piece on your stance on future pathways considering both frameworks. A marking rubric to be developed by class for informal writing exercise.	4 2	

Summary of summative assessment in the module

The student's grades are compiled from summative individual and/ or group tasks across the module.

Summative assessment measures the student's achievement by comparing it against standard criteria (i.e. the desired module outcomes). Because summative assessment is for marks, it is 'high stakes' and has a motivational effect on student engagement. To avoid contention, it is recommended the lecturer and an independent assessor provide summative assessment, based on clear, explicit and transparent criteria. Standard rubrics are found in the *Assessment Guidelines and Tools* on the ePlatform and can be adapted and weighted as necessary. Careful proactive consideration must be given to ensuring that plagiarism is avoided.

It is recommended that summative tasks account for about 20% of the student notional hours of a module and do not place too big a burden on the lecturer.

LT	**Topic**	**Activity/Task**	**Subject**	**Hrs**
LT1	T2.4	Essay	Principles and challenges of TD research	10
	T3.4	Presentation	Knowledge systems	3
LT2	T3.6	Research Project	Aim and objectives	3
	T4.1	Referencing	Use of Harvard style	2
LT3	T1.4	Essay	Knowledge paradigms	5
	T2.4	Group presentation	Social science paradigms	5
LT4	T1.3	Presentation	A theoretical framework	6
	T2.3	Essay	Social science frameworks	6
40 hours of summative activities				

Possible exam questions

The following are suggested exam questions, if required:

Learning Theme 1:

- Explain why transdisciplinary approaches are so critical in a world undergoing rapid, global environmental change. How is transdisciplinary research different to conventional research approaches? Describe the key principles of transdisciplinary approaches and research.

Learning Theme 3:

- Provide a critical argument to explain why positivist and post-positivist paradigms or approaches to knowledge are not commensurable with the interpretive, critical, participatory and African worldview paradigms.
- Describe a mixed method methodology and critically discuss why this would be a relevant research design for transdisciplinary research in climate change and sustainable development.

Learning Theme 4:

- Choose one social science theory covered in class. Describe its characteristics and discuss how it can add value to research and practice related to climate change and development.
- Discuss the similarities and differences between the concepts transformation and transition. Choose the one you think would be most helpful in unpacking how a city in your country might frame their response to the impacts of climate change as well as economic and social inequality.

Additional hours for the module

Possible additional activities for LT2

Outcome

- ***Producing and communicating information:*** student is able to communicate the linkages between their own work and the ideas underpinning transdisciplinary research.
- ***Transdisciplinary thinking*:** student is able to make the linkages between their own work and the ideas underpinning transdisciplinary research. Student is able to apply aspects of transdisciplinary research in their own research projects.

Possible additional activities for LT2	***Hrs***	***Prescribed resources***
Discussion: Students work in pairs/ small groups to apply interdisciplinary or transdisciplinary thinking and approaches in their own research projects (2 hours). Students to share and discuss their research topics and the potential interdisciplinary or transdisciplinary nature of their research. **Reflective writing (2 hours)** Each student will then write a draft on the interdisciplinary or transdisciplinary nature of their research, including one or two references (600 words). This will form the first part of a methods section for their research proposal. This is followed by a reflection on what might have changed in terms of their thinking around their research before and after the module (300 words) [If they are not using a TD approach, then they would need to develop a hypothetical research project]. Criteria: To be developed by class	4	Student's own resources

Possible additional activities for LT4

Outcome

- **Specialist knowledge** — student is able to demonstrate specialist knowledge and to engage with and critique thinking and research in the field of climate change and sustainable development
- **Knowledge of applications** — student is able to understand, evaluate and select appropriate methods, tools, processes or technologies to understand and inform solutions to complex real-world problems
- **Knowledge literacies** — student is able to
  - access, process and manage relevant information
  - evaluate current processes of knowledge production, including their derivation, contestation, dissemination
- **Research literacies** - student is able to:
  - choose an appropriate process of enquiry for an area of study or practice
  - conduct a comprehensive review of leading and current research in an area of specialisation
  - capture, collate, manage and draw conclusions from theory and research data
  - use appropriate, ethical research principles

Possible additional activities for LT4 **Essay on the use of multiple theoretical frameworks in a case study.**	***Hrs***	***Prescribed resources***
Class activity: Class finds a case study of an urban climate change and development problem in southern Africa where two or more theoretical frameworks have been used. If possible, the case should include a combination of natural science and social science frameworks. **Student:** Individual student writes an essay that summarises and critiques the theories in terms of how they were integrated and the applied value of integration of theoretical frameworks. *Criteria for essay: (adapt Essay rubric)* – *The aim of the study* – *Description of the theoretical frameworks combined by the authors* – *Rationale provided by authors for the use of combined theoretical frameworks* – *Methodology used to operationalize the concepts embedded in the theory* – *Reflection/critique on the success of combining theoretical frameworks*	6	N/A

Note for printing:

This TLA Plan has been formatted to be printed as an A5 booklet, with a gutter margin. Ensure that you select 'Booklet' on your Printer Settings, under the 'Layout' tab.

This document is an output from a project commissioned through the Climate and Development Knowledge Network (CDKN), a programme funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. The views expressed and information contained in it are not necessarily those of or endorsed by DFID, DGIS or the entities managing the delivery of the Climate and Development Knowledge Network, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them.

The **Southern African Master's Curriculum in Climate Change and Sustainable Development** is part of the **SARUA Programme for Climate Change Capacity Development**.

The curriculum is the product of a collaborative partnership. The curriculum was developed by the University Delivery Consortium. Strategic support was provided by SARUA and HEMA. The sponsor was the Climate and Development Knowledge Network (CDKN). Academic oversight and review was provided by the Curriculum Innovation Working Group and the Peer Review Group through the SARUA Curriculum Innovation Network (SCIN).

STRATEGIC SUPPORT

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Programa para o Desenvolvimento de Capacidade para as Alterações Climáticas
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