

Adaptation signatures

Pathways of adapting well

Thomas E Downing

University of Reading

16 March 2011

Prediction Tipping points
Current climate
Crises Act-learn-then
act again
Climate-change Projection
Reasons for
concern
Lines of evidence
ADAPTATION LANDSCAPES Transformations
Adaptive capacity
Scenarios
vulnerability
Risk
Extreme events
Practice SRES Impacts
signatures

The broad range of factors that are 'in play' in mediating between climate change impacts, underlying socio-economic vulnerability and adaptation points to defining adaptation as a 'wicked' problem. The usual approach of bounding the problem, generally either as climate-impacts or efficient resource management, is at best a convenience and possibly leads to serious maladaptation.

ADAPTATION AS WICKED PROBLEM

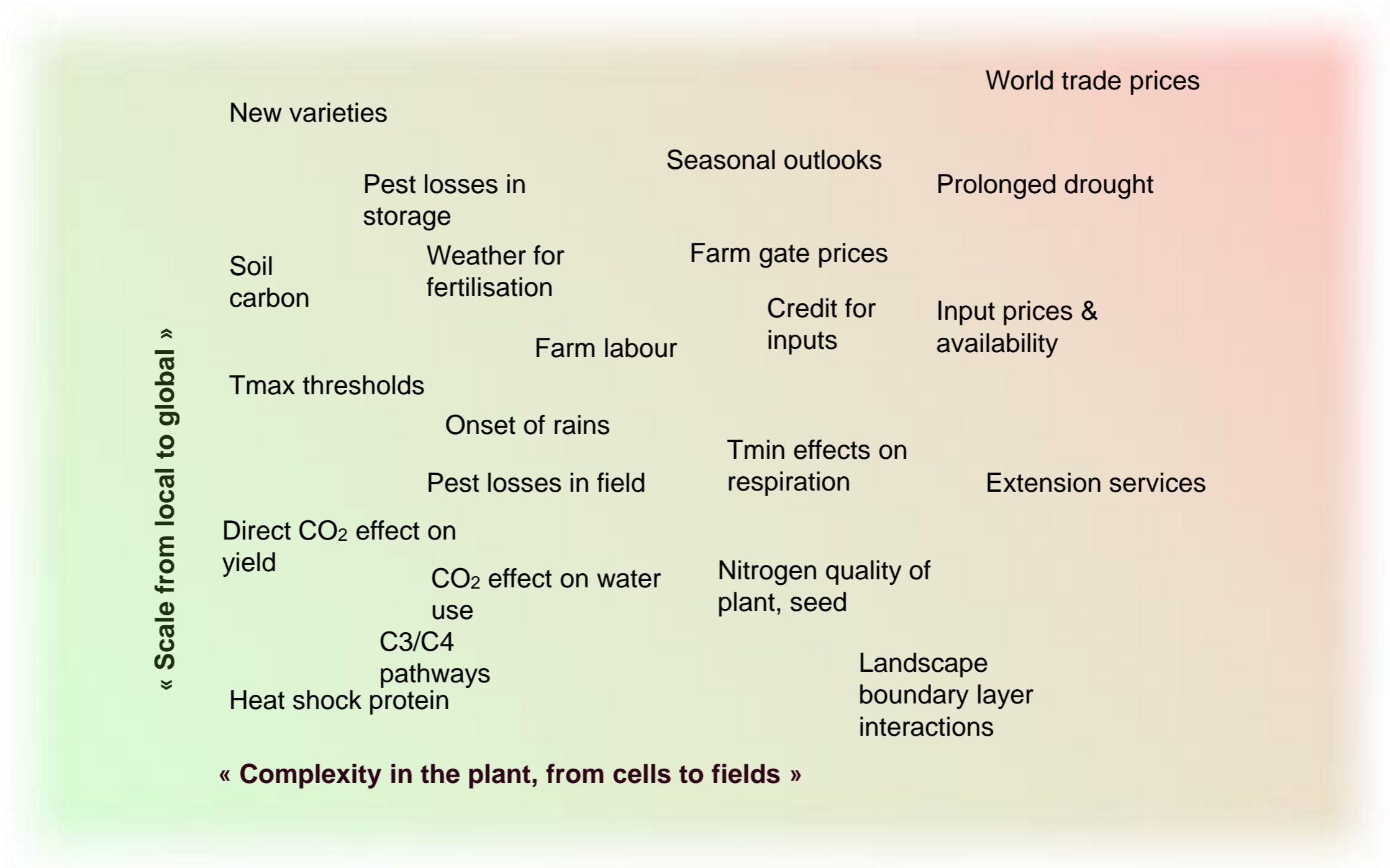
Adaptation as a wicked problem

- Wicked problems:
 - The solution depends on how the problem is framed and vice-versa (i.e. the problem definition depends on the solution)
 - Stakeholders have radically different world views and different frames for understanding the problem
 - The constraints that the problem is subject to and the resources needed to solve it change over time
 - The problem is never solved definitively
 - Super wicked problems:
 - Time is running out
 - No central authority
 - Those seeking to solve the problem are part of the cause
 - Hyperbolic discounting occurs: the long term future is valued more than expected

It is impossible (and may be undesirable) to predict all of the features of a long term future that would be required in defining an optimal adaptation measure. Although we have a good understanding of some features of global climate change, there are many areas of uncertainty. This is more so in considering potential vulnerabilities.

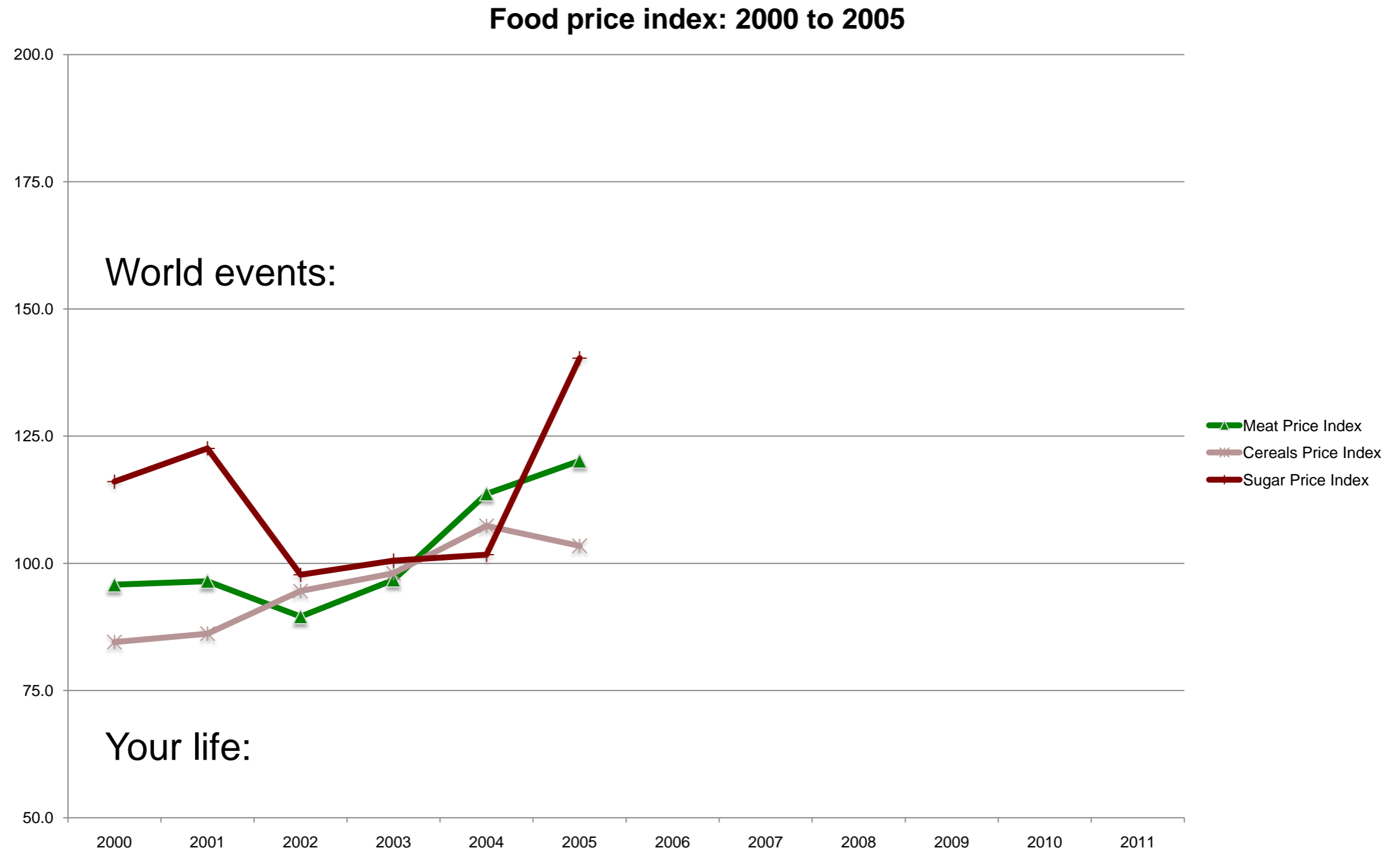
ON THE LIMITS TO PREDICTION

Factors related to climate and agriculture



What happened since 2003?

Fill in the three indices and annotate them with world events and milestones in your own lives

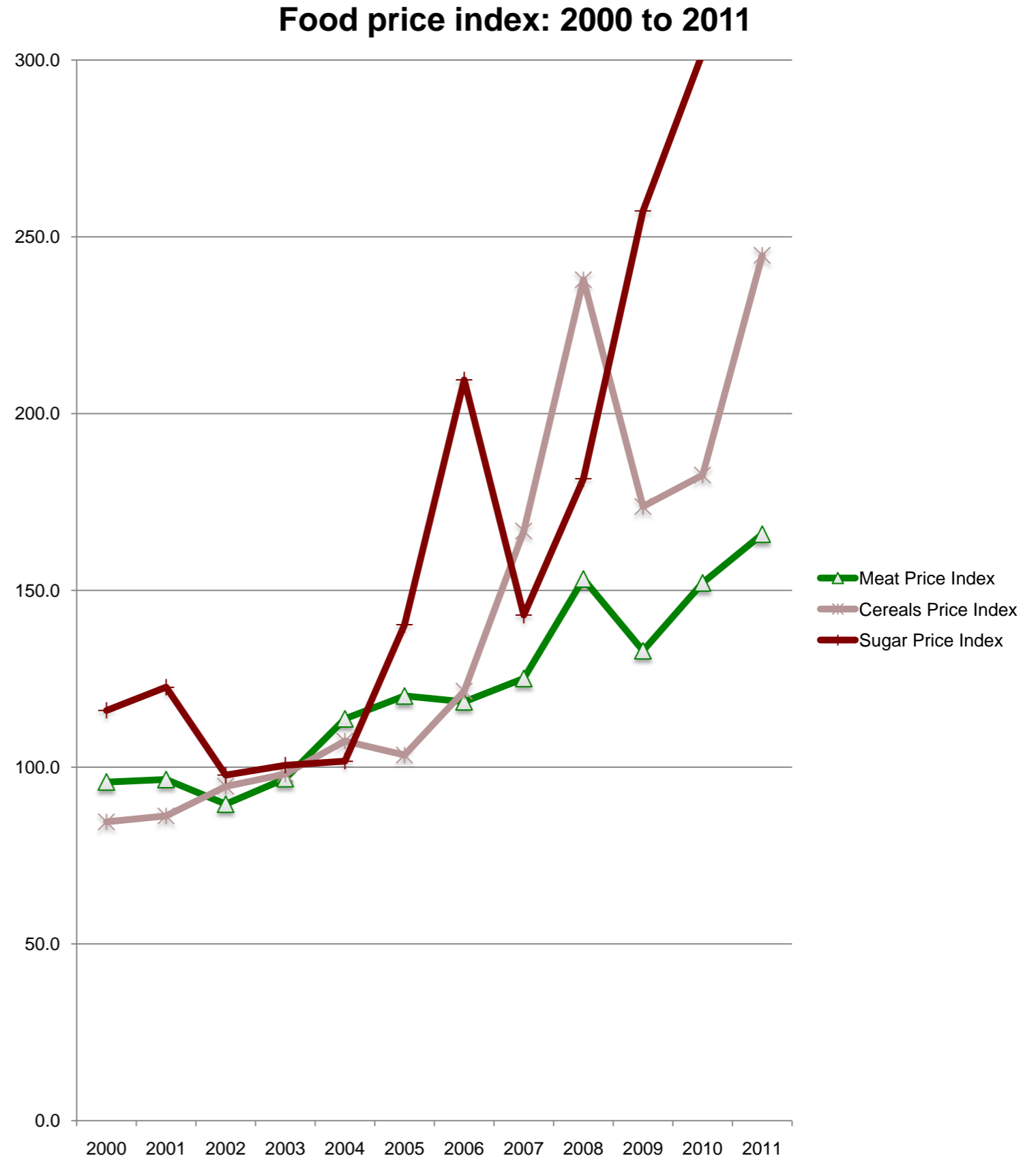


Food prices are sensitive markers in the economy and for vulnerable populations

- Which commodity is more volatile?
Sugar, why?

- What are average prices now?
Cereals price index rose from 100 in 2002-2004 (the benchmark) to 230 in 2011 (so far)

- Notable events?
 - Banking crisis and recession
 - Food crises of 2008
 - Copenhagen failure in 2009
 - Catastrophes of 2010
 - Cancun impasse of 2010
 - Middle East revolutions of 2011

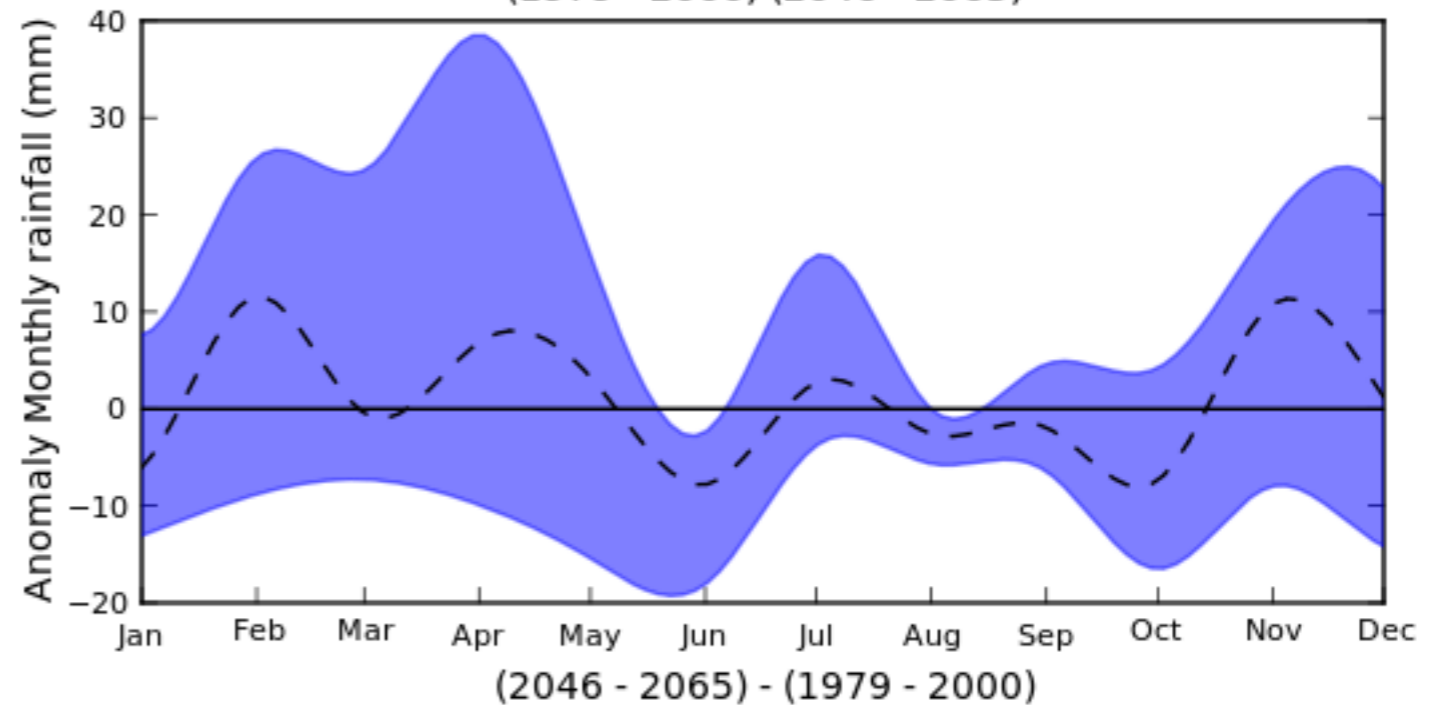
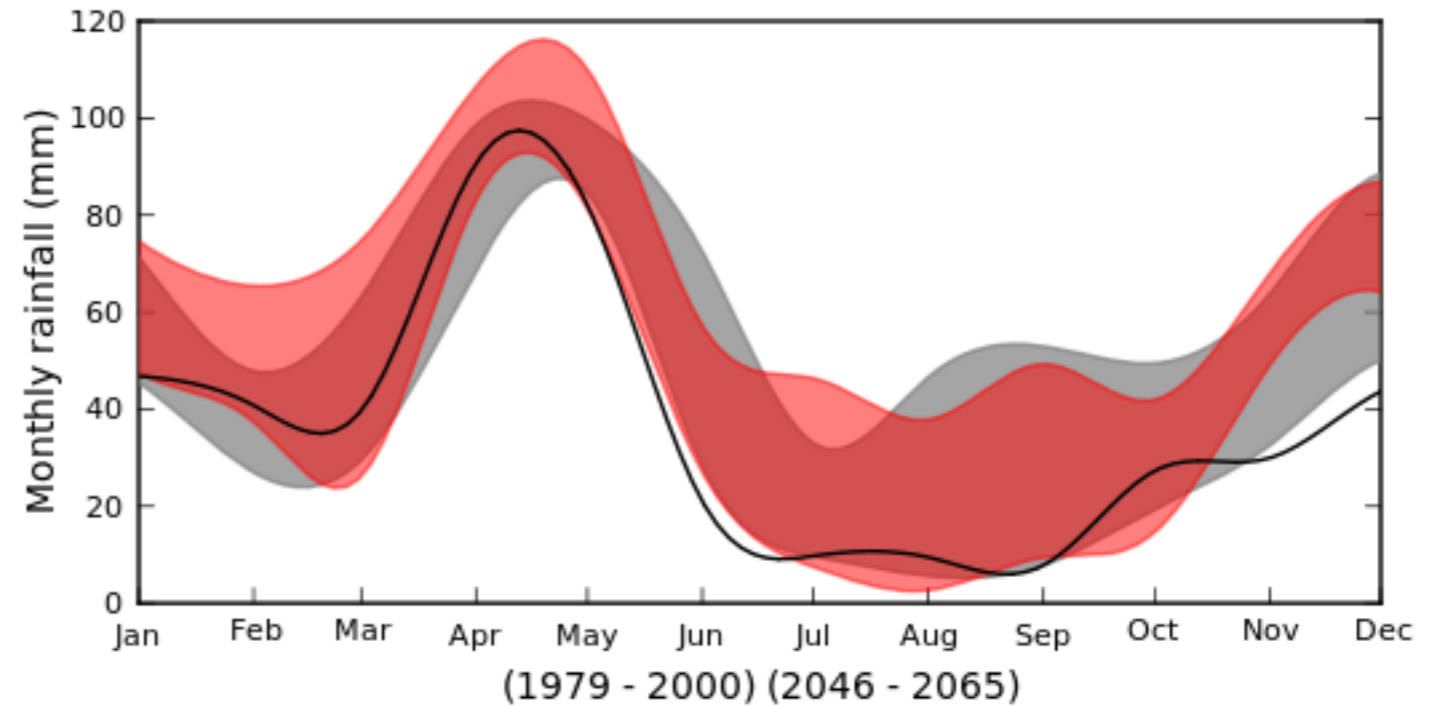
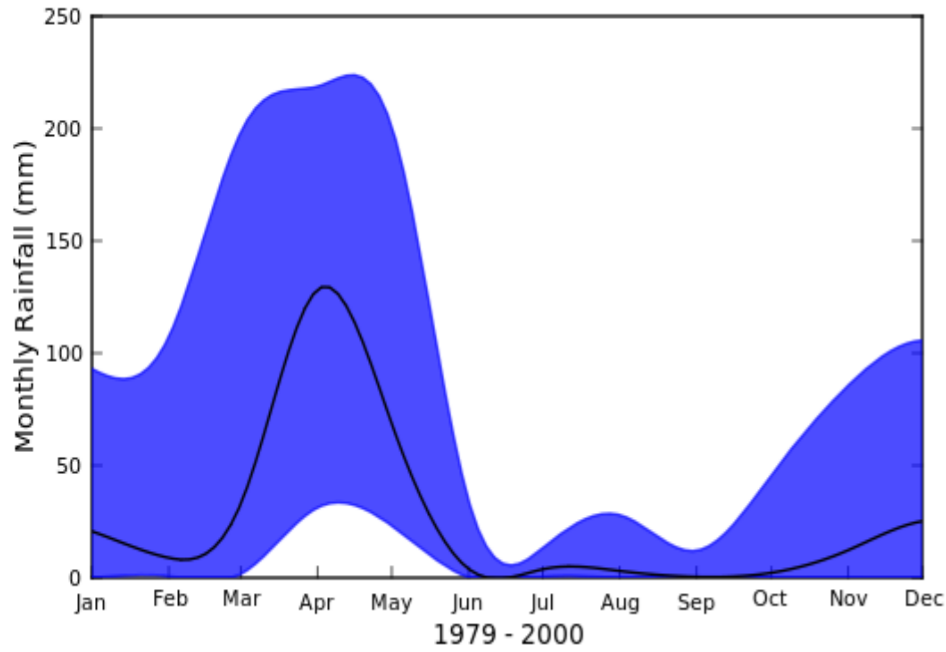


Stainforth proposition (contested)

The most recent climate models substantially increase our knowledge about climate change, and indicate some of the high-sensitivity scenarios are implausible. However, they have not decreased the central range of uncertainty. If anything, that range has increased.

Paraphrase of a breakfast conversation with Bruce Hewitson, UCT

Climate envelope



Present rainfall range (top)

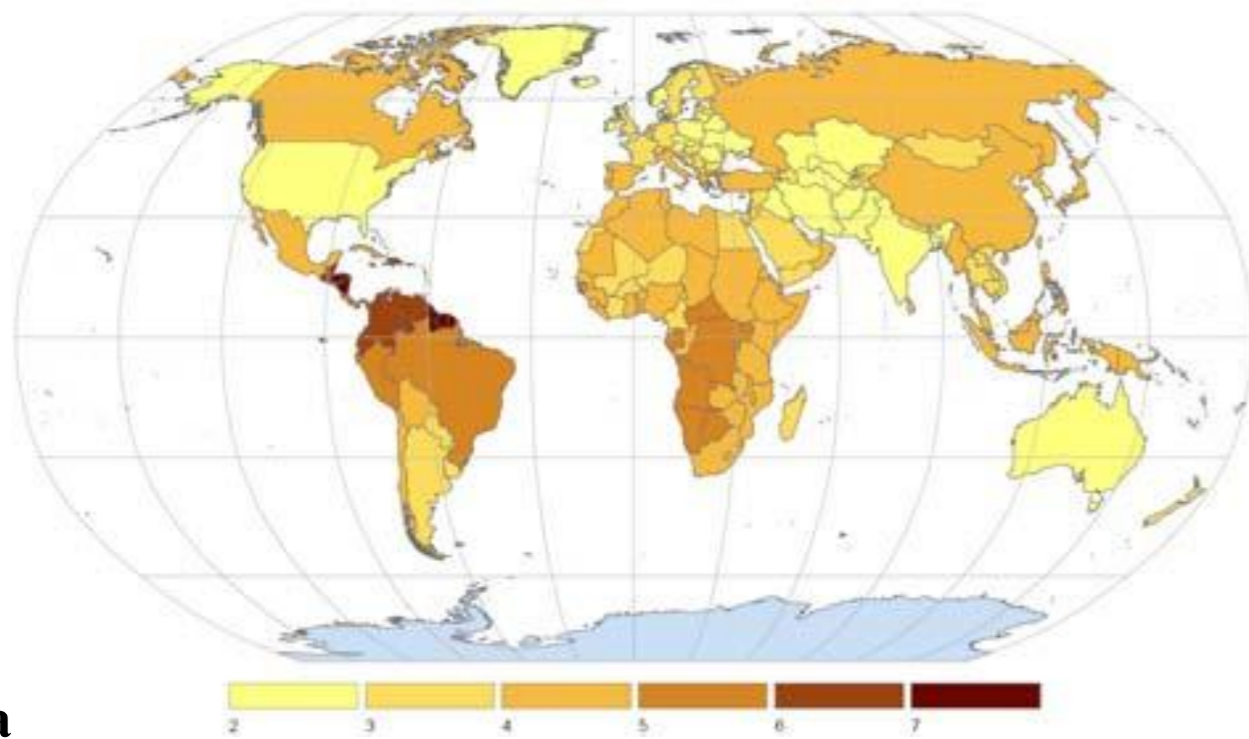
Changes in rainfall circa 2050:
top-right: scenario envelope
bottom-right: anomalies

Source: CSAG/UCT

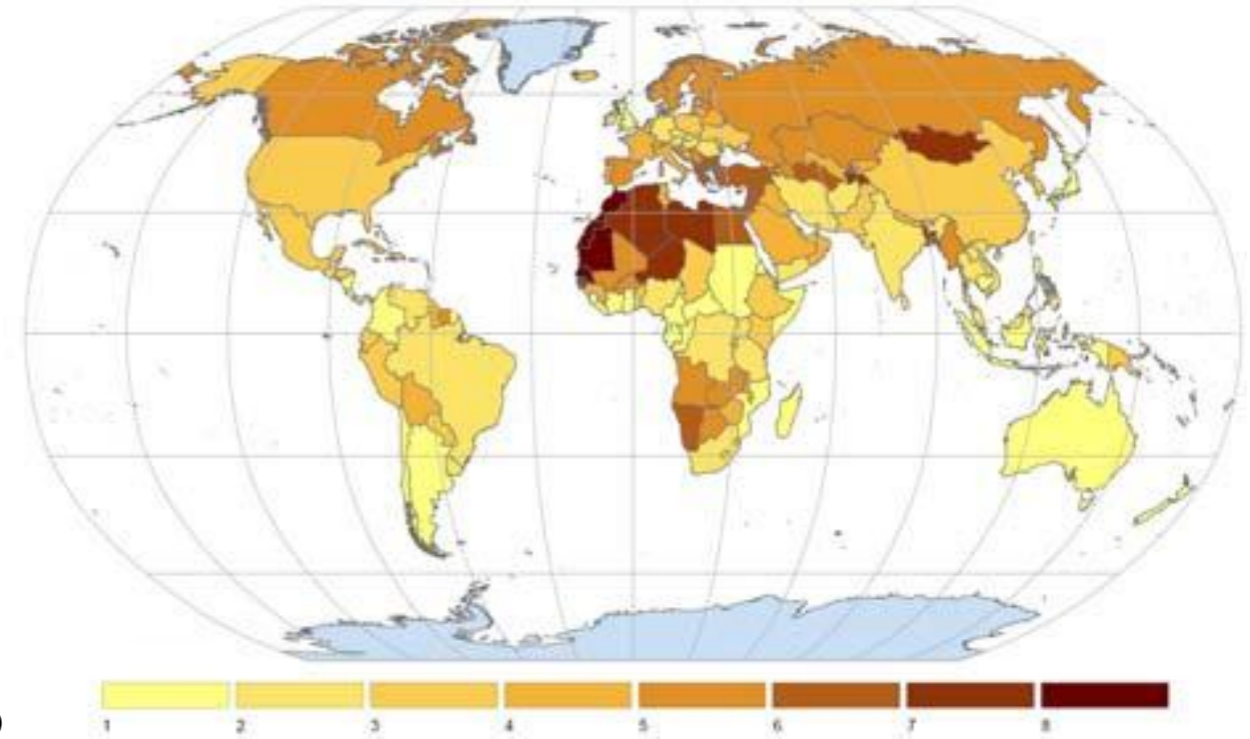
Reviewing vulnerability indexes

“All existing indices of vulnerability to climate change show substantial conceptual, methodological and empirical weaknesses including lack of focus, lack of a sound conceptual framework, methodological flaws, large sensitivity to alternative methods for data aggregation, limited data availability, and hiding of legitimate normative controversies. As a result, there is little agreement regarding the most vulnerable countries.”

Fussler, Hans-Martin. 2009. Review and quantitative analysis of indices of climate change exposure, adaptive capacity, sensitivity, and impacts. Development and Climate Change, Background Note. World Bank: Washington.



a



b

Two vulnerability indexes

a. Baettig et al. 2007; b. Diffenbaugh et al. 2007

From Fussel (2009)

Note the lack of agreement in the two maps

An actor-pathway approach to impacts-vulnerability-adaptation

SIGNATURES IN AN ADAPTATION SPACE

Signatures: archetypes of adapting well

sig·na·ture (sgn-chr) n. 1. One's name as written by oneself. 2. A distinctive mark, characteristic, or sound indicating identity: *A surprise ending is the signature of an O. Henry short story.* 3. *Medicine* The part of a physician's prescription containing directions to the patient. 4. *Music* A sign used to indicate key or tempo. 5. *Printing* A letter, number, or symbol placed at the bottom of the first page on each sheet of printed pages of a book as a guide to the proper sequence of the sheets in binding; A large sheet printed with four or a multiple of four pages that when folded becomes a section of the book.

- ✓ A marker of progress in adapting well
- ✓ Indicating effective action
- ✓ Over time in different stages

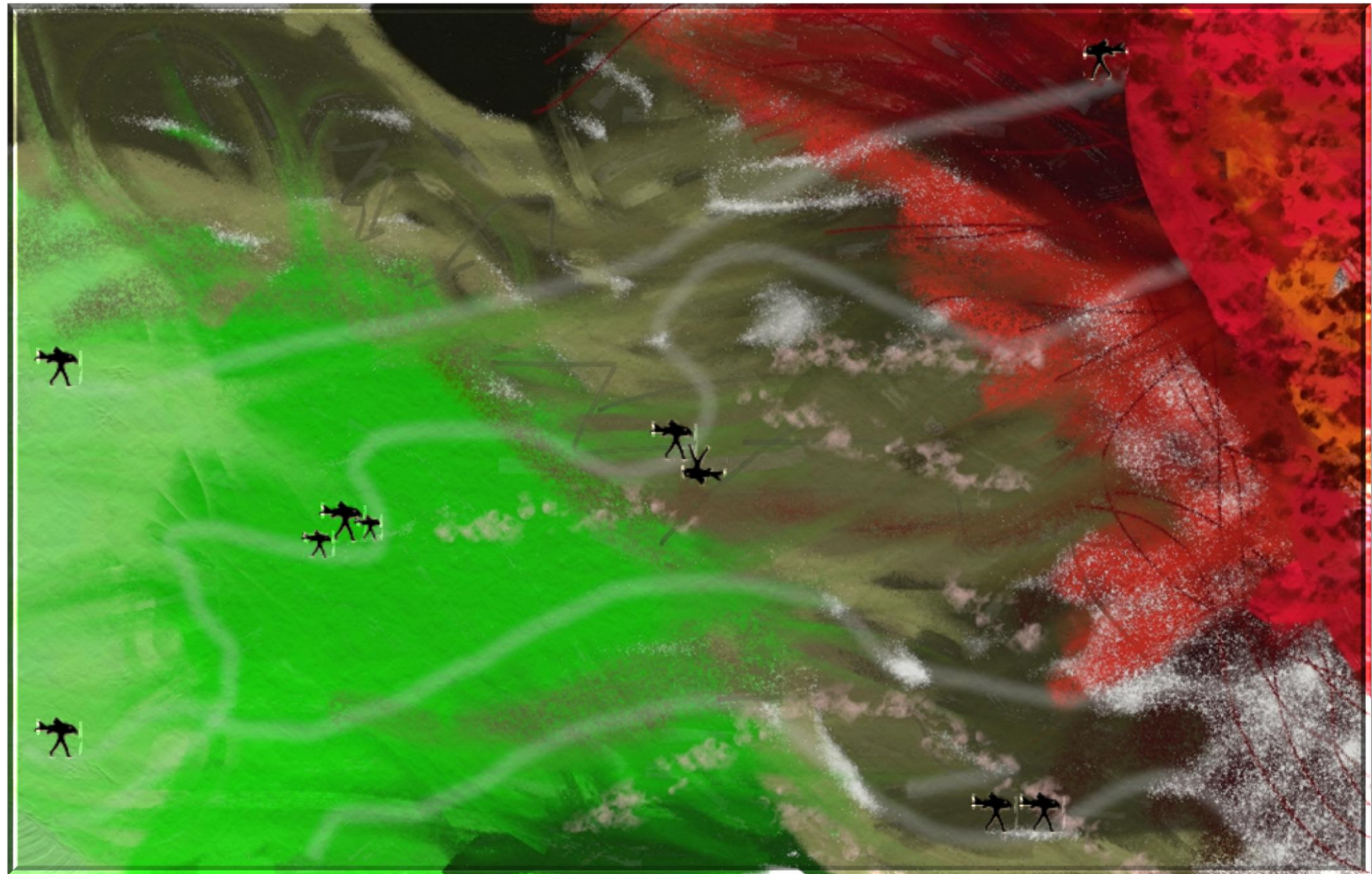
[ACTOR] [PROBLEM] [ACTION]

Toward a grammar of adaptation

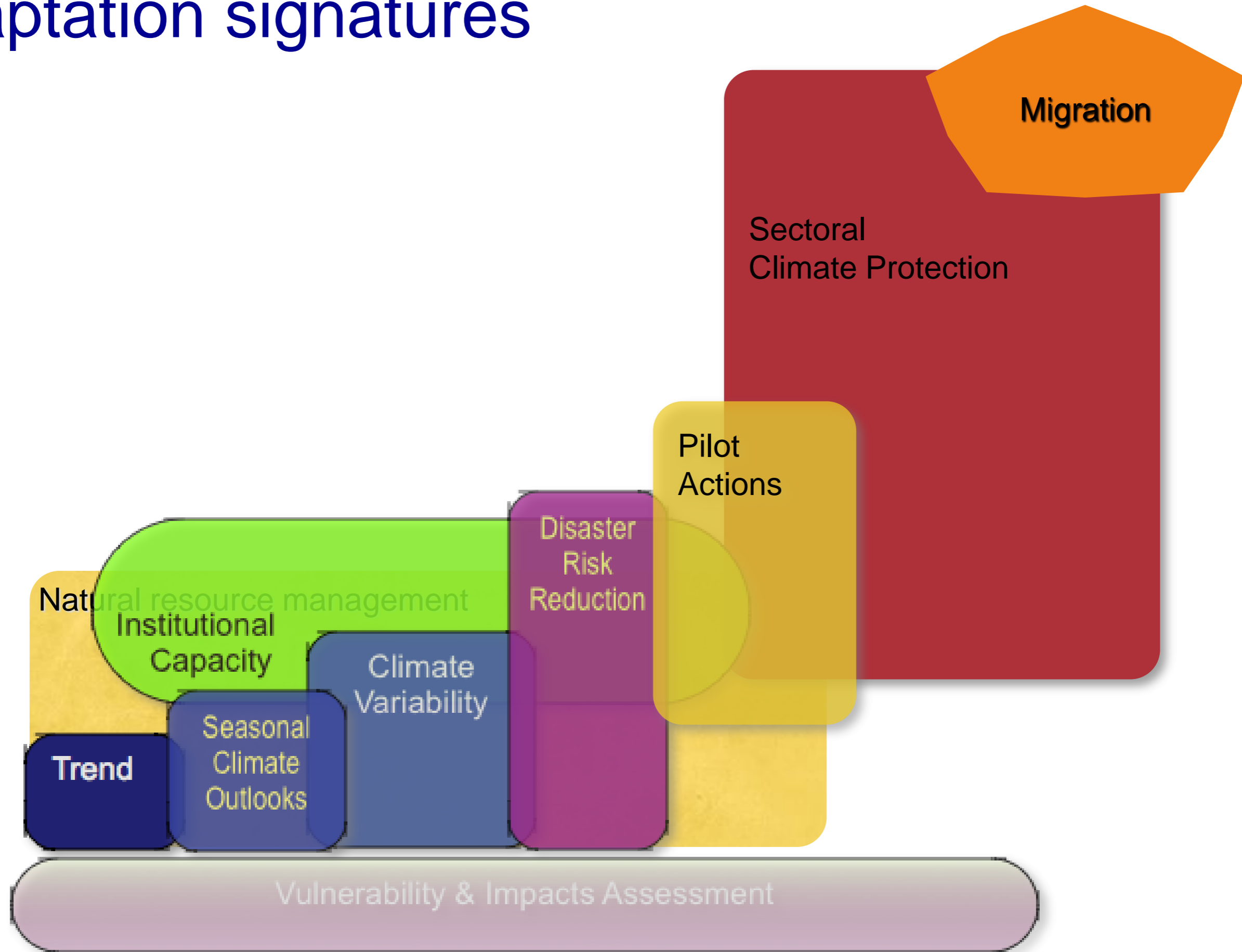
1. Who enables actors to act?
2. How do actors frame the problem?
3. What decision frameworks are used to choose actions?
4. What outcomes are expected?

A journey with actors

- Level I. Actors act.
- Level II. Mainstreaming in existing organisations.
- Level III. Transformations of institutions.
- Level IV. Crisis and failure to adapt.



Adaptation signatures



Adaptation pathways

ACTORS

- Organisational scale
- Social-knowledge networks

PROBLEM

- Sectoral-climate impacts
- Level of action required

ACTION

- Good enough/fit for purpose in rational criteria
- Multi-level action from option space to strategic targets and chosen measures

A rich toolkit



Vulnerability-exposure matrix
e.g., NAPA, Cristal

Google Earth placemarks

Google Earth maps

Indicator profiles
(radar plots)

Baseline resource maps for Africa
e.g. FAO agro-ecological zones

Adaptation projects inventory

Country indicators

Climate envelopes
for major met stations

Climate impacts scenarios: results,
confidence, interpretation

Historical climate events
catalogue of impacts

Climate scoring matrix
historical record, trend, envelopes

Climate trend detection

Categories for assessment
(three levels)

Project horizon scanning

Linked data formats
semantic web ontology

Adaptation Strategy-Action data bases

Risk-flag rating models

Sectoral standards for adaptation

Scorecards

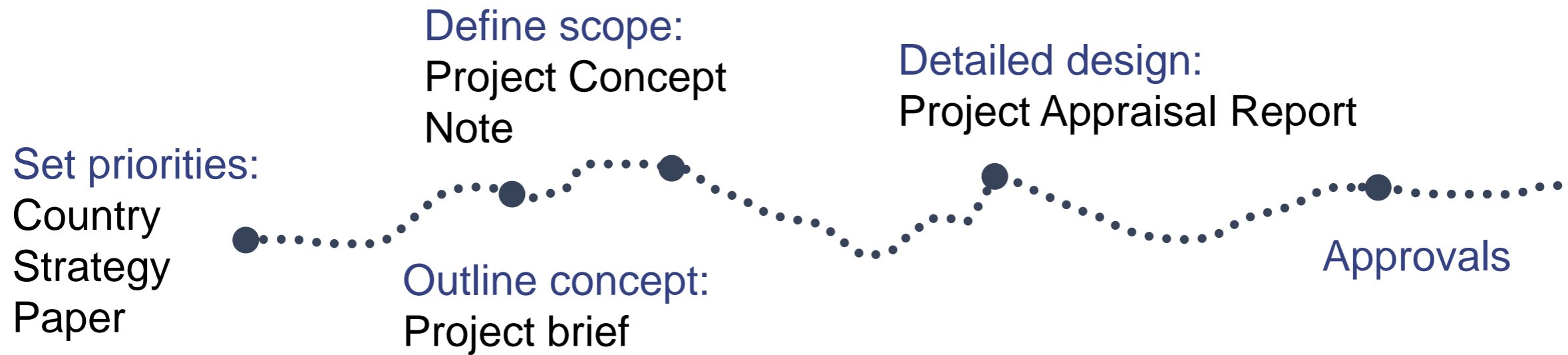
Register of experts

Templates for standard reports

Sectoral standards for rating risk

A journey with actors

Each step has different requirements



Define scope:
Project Concept
Note



Scorecards

Question	Scores
Question 1	5
Question 2	10
Question 3	10
Question 4	20
TOTAL	45

Σ Scores of selected options = Total

The scorecard interface shows four questions, each with four options. Selected options are marked with a checkmark: Question 1 (Option 1), Question 2 (Option 3), Question 3 (Option 2), and Question 4 (Option 3). The table on the right summarizes the scores for each question and the total score of 45. A formula at the bottom indicates that the sum of scores for selected options equals the total score.

Example:

Agriculture criteria

- How long is the expected lifespan of the project? Is there a commitment that locks in exposure to climate change over the coming decades?
- Is physical infrastructure part of the project? Are there significant commitments in terms of budget and land use?
- Does the project support development of new cropping technologies and systems?
- Where are the project activities expected to be located? Would the project lead to direct investment that would alter existing resources?
- To what extent is treatment of crop and animal pests and diseases part of the project investment?
- Does the project support building of capacity—human resources, institutional management, technical skills, knowledge and monitoring?
- Would the project lead to conflicts over resources and potentially significant population displacement?

Example:

Agriculture design lifespan

- Question:

How long is the expected lifespan of the project? Is there a commitment that locks in exposure to climate change over the coming decades?

- Annotation:

Projects that include major infrastructural components have design lifespans that will reach into the 2020s to 2050s when climate change impacts would become more serious.

- Options:

- Project elements are within an expected frequency of maintenance and replacement that is less than 5 years (0)

- Some components have longer lifespans (10)

- Major components are designed to last more than 20 years (20)

Project archetypes





Choosing adaptation strategies and measures

Reducing uncertainty in making a decision, not seeking to choose the best options...

- Set of adaptation actions:

$$A = \{X_1, X_2, X_3, \dots X_n\}$$

- Set of adaptation strategies:

$$S = \{A_1, A_2, A_3, \dots A_n\}$$

Frontiers in adaptation space

What climate-impacts information adds value to adaptation decisions?

How many characteristic signatures are in play?

What are decision tools that transform institutions?

The journey begins...

