Uncertainty and Impact Assessment Challenges for Adaptation Planning

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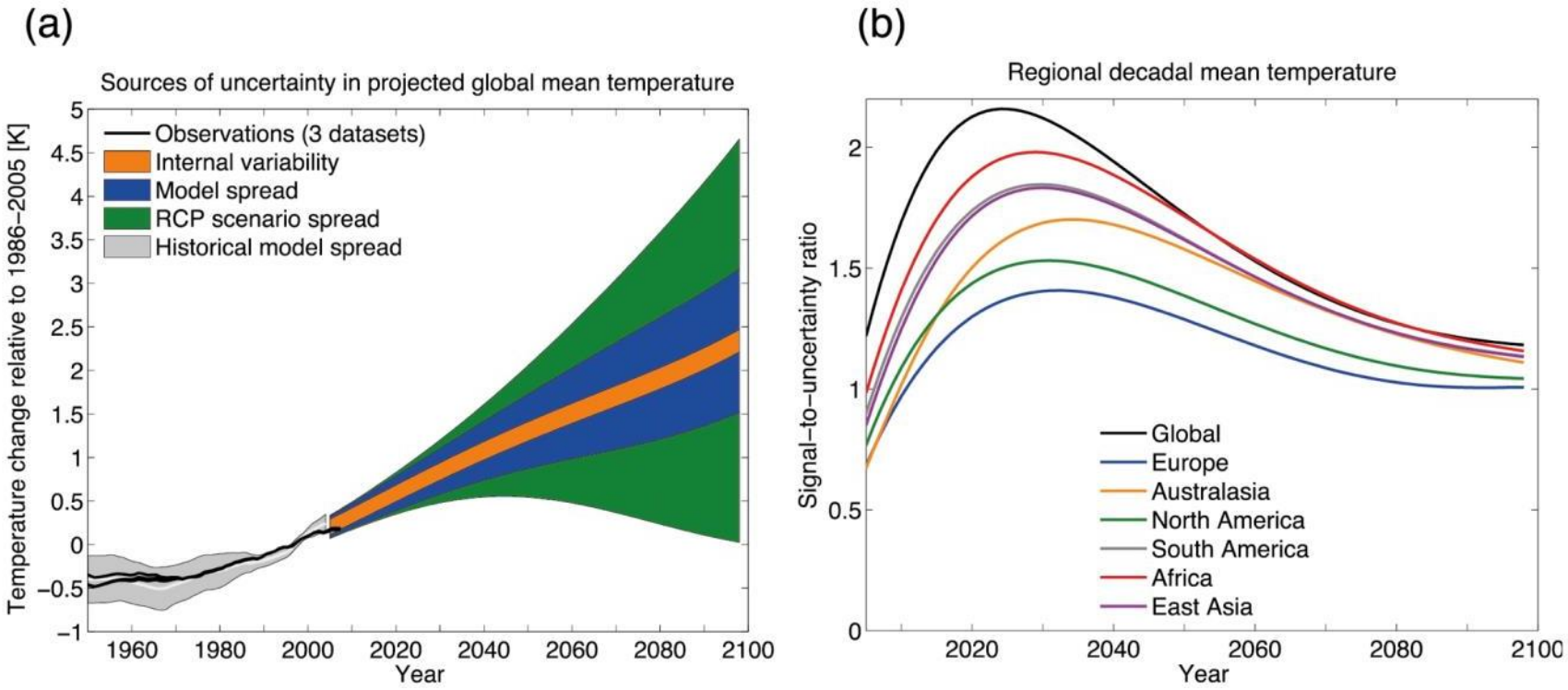
Uncertainty and Climate Adaptation

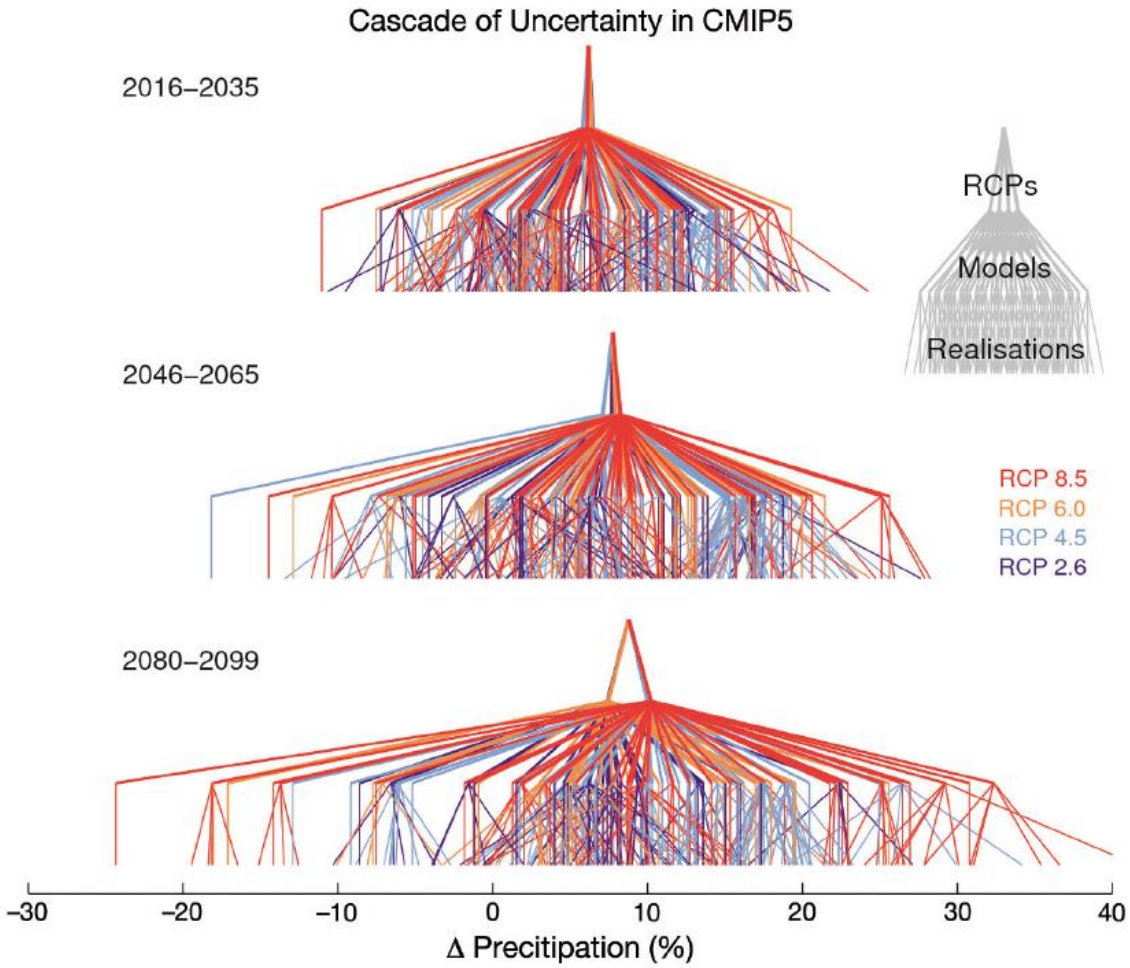
1. Uncertainty in climate data and climate modelling
2. Uncertainty in impact assessment and adaptation methods
3. Case example - deriving future IDF curves
4. Moving forward under uncertain conditions

Climate Model Uncertainty



From: IPCC (2013)

Climate Model Uncertainty

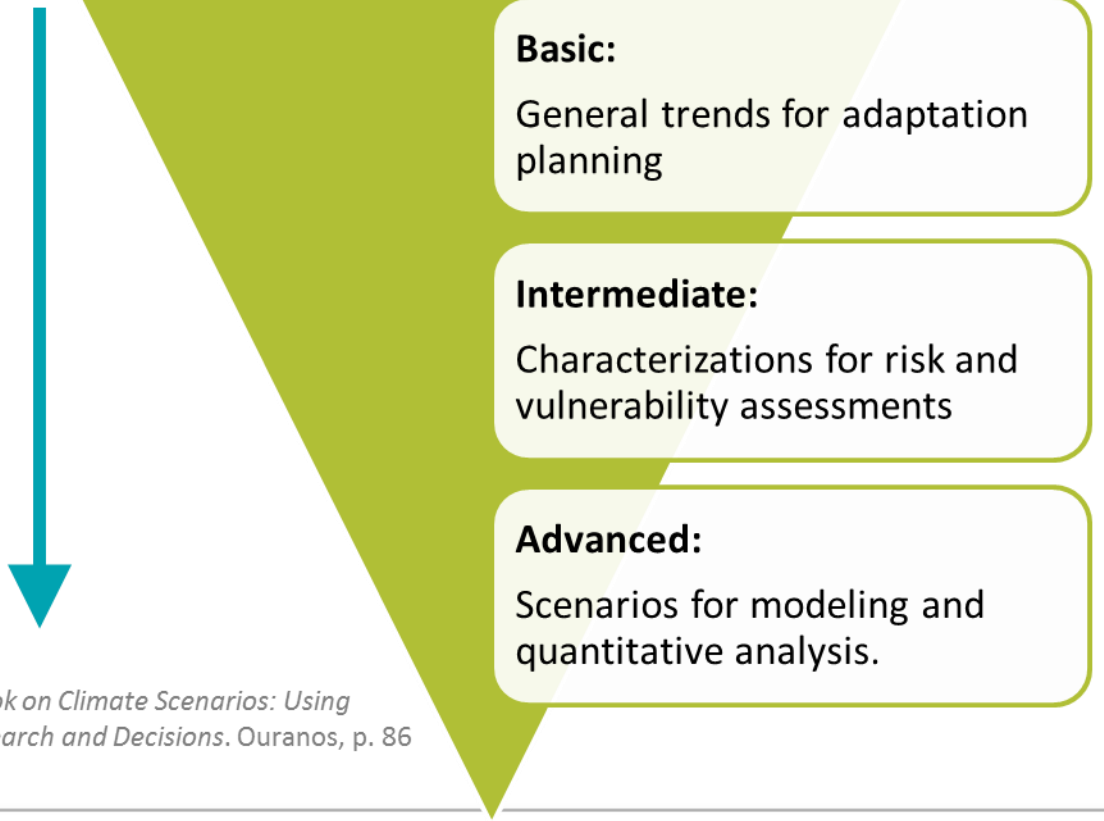


From: Wilby et al. (2014)

Uncertainty Increases with Complexity

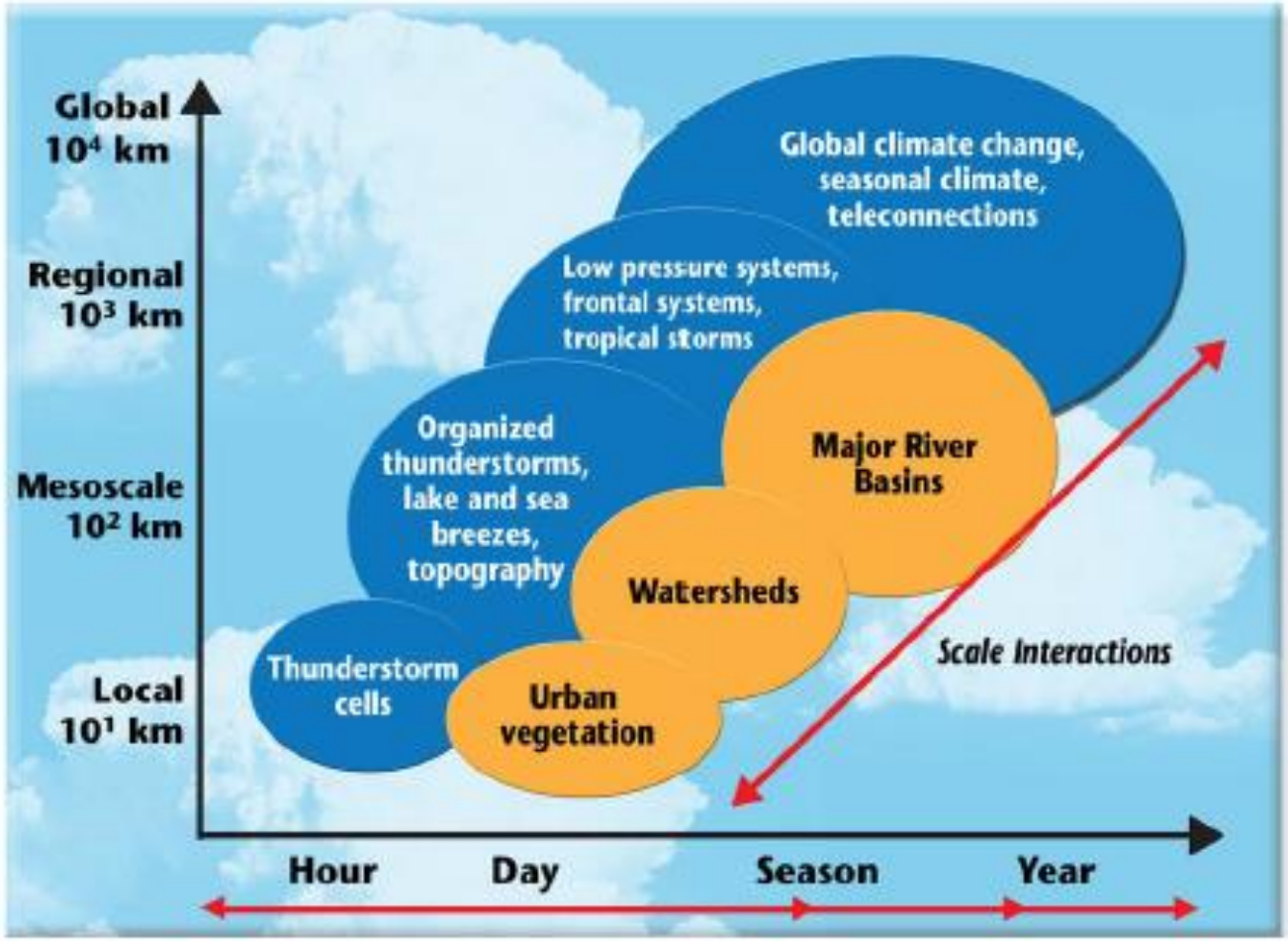
Increasing:

- Parameter complexity
- Resolution
- Specificity
- Level of effort
- Uncertainty

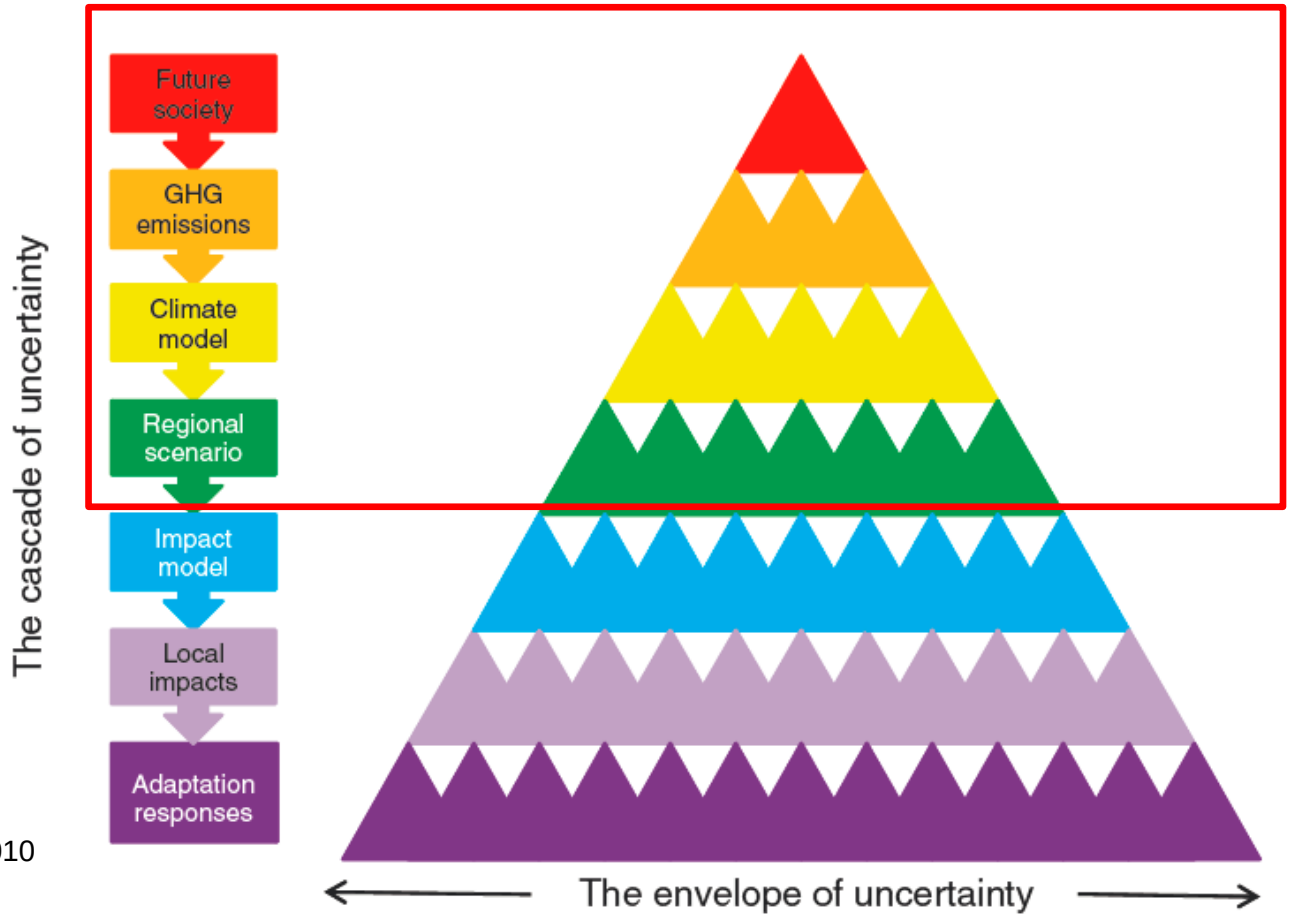


Adapted From: Charron, I. (2014). *A Guidebook on Climate Scenarios: Using Climate Information to Guide Adaptation Research and Decisions*. Ouranos, p. 86

Uncertainty and Scale Mismatch

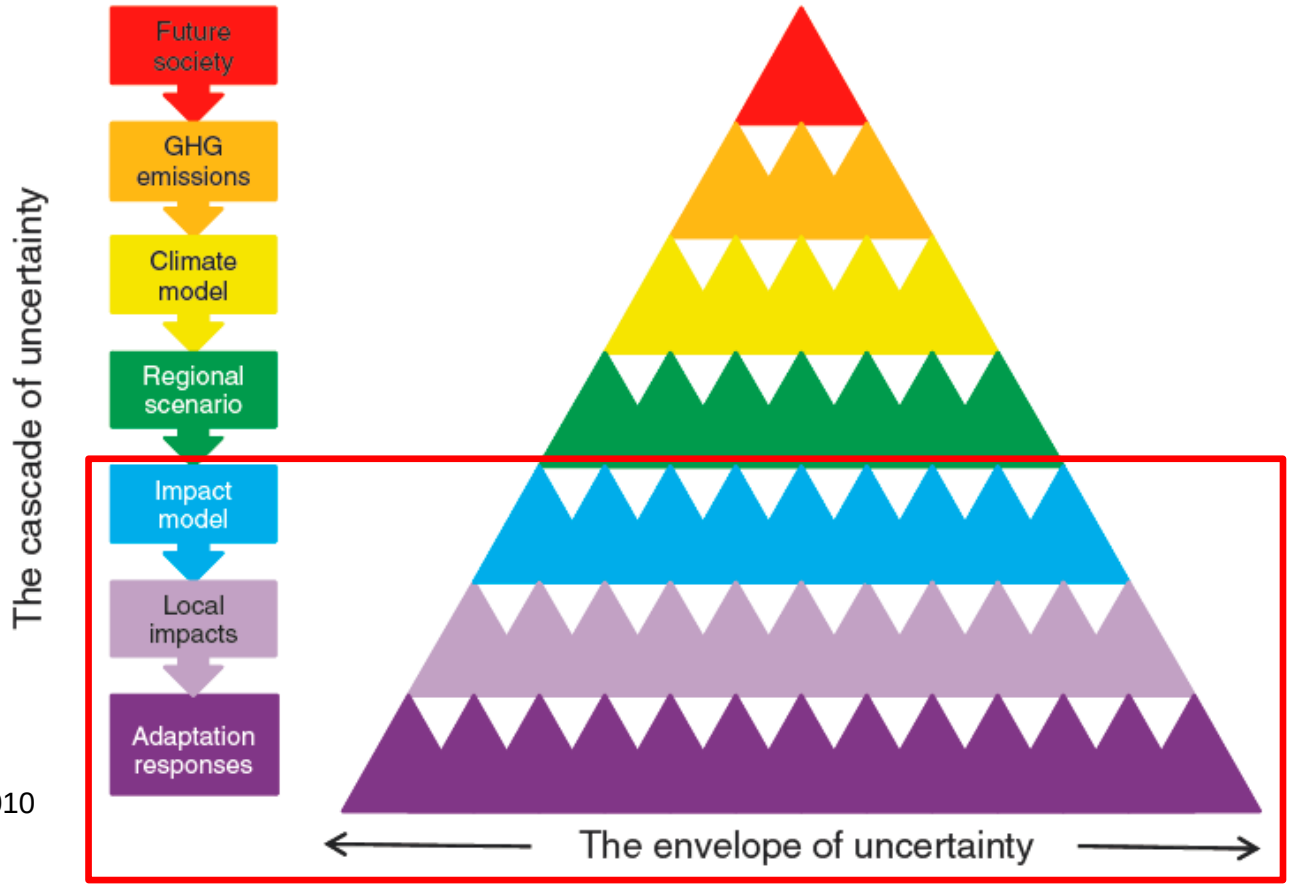


Uncertainty Beyond Modelling



From: Wilby and Desai, 2010

Uncertainty Beyond Modelling



From: Wilby and Desai, 2010

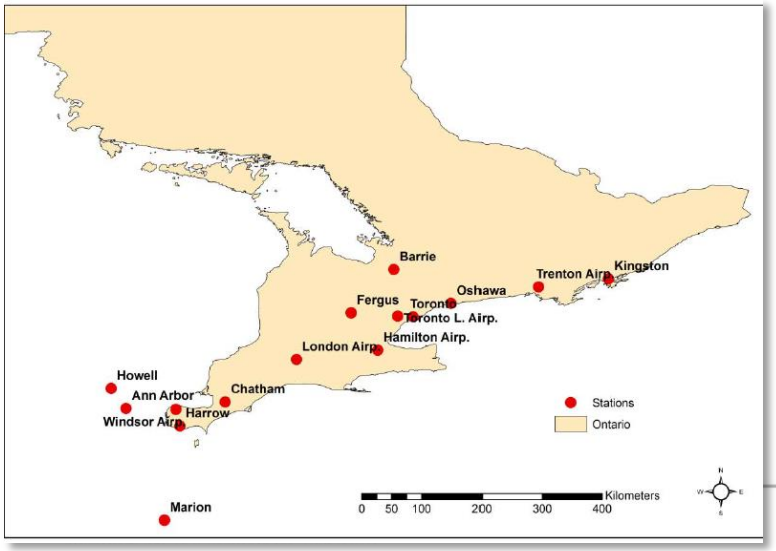
Uncertainty and IDF Curves

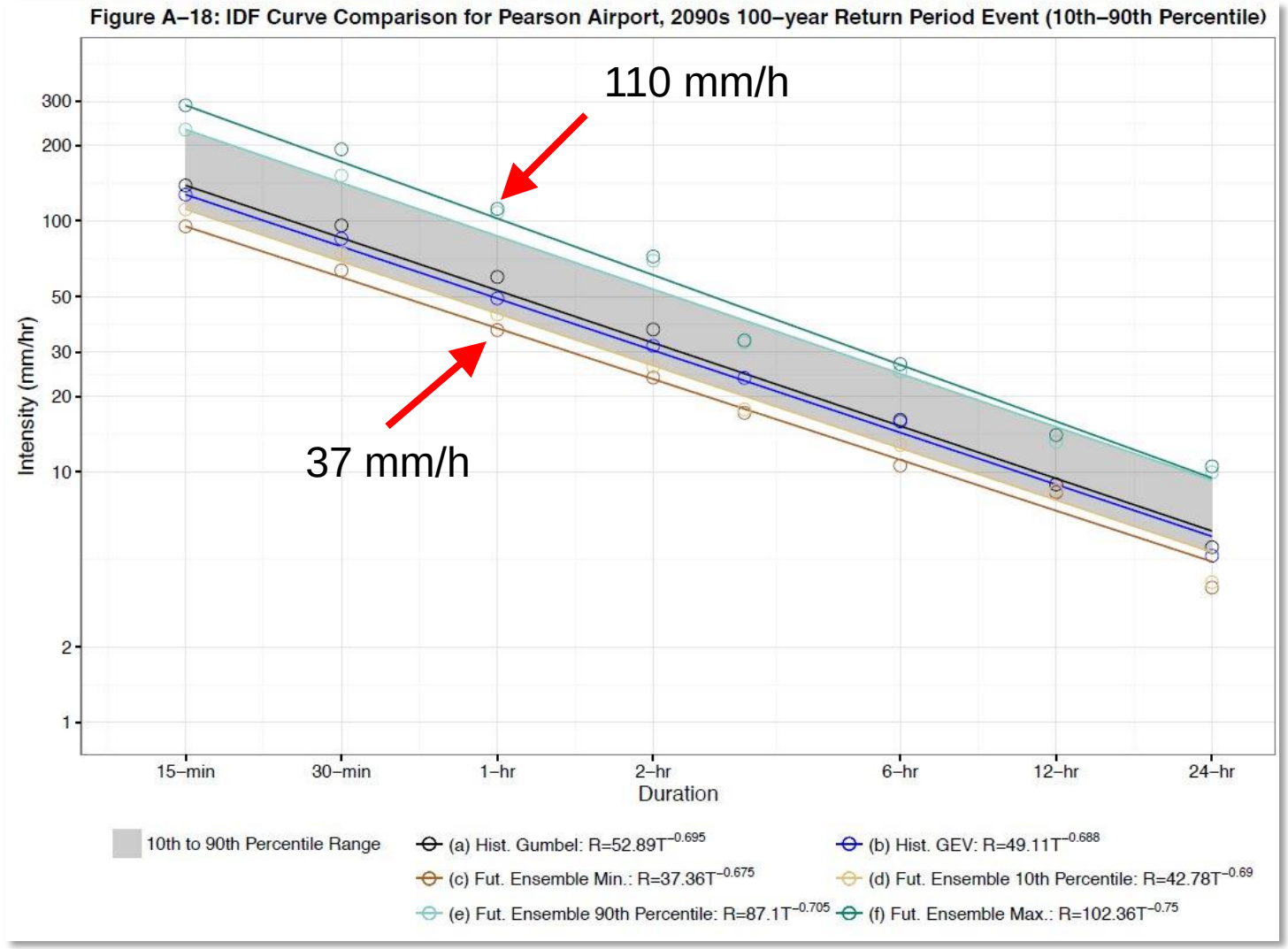
5
Climate Models

1-2
Emissions Scenarios

2
Downscaling Methods

16
Permutations





Report Available Online at:

http://climateconnections.ca/our-work

IDF Uncertainty – Climate Data

- Climate model and emissions scenario selection has a profound effect on calculated IDF curves
- Range for short durations and large return periods at a single station can exceed 100%

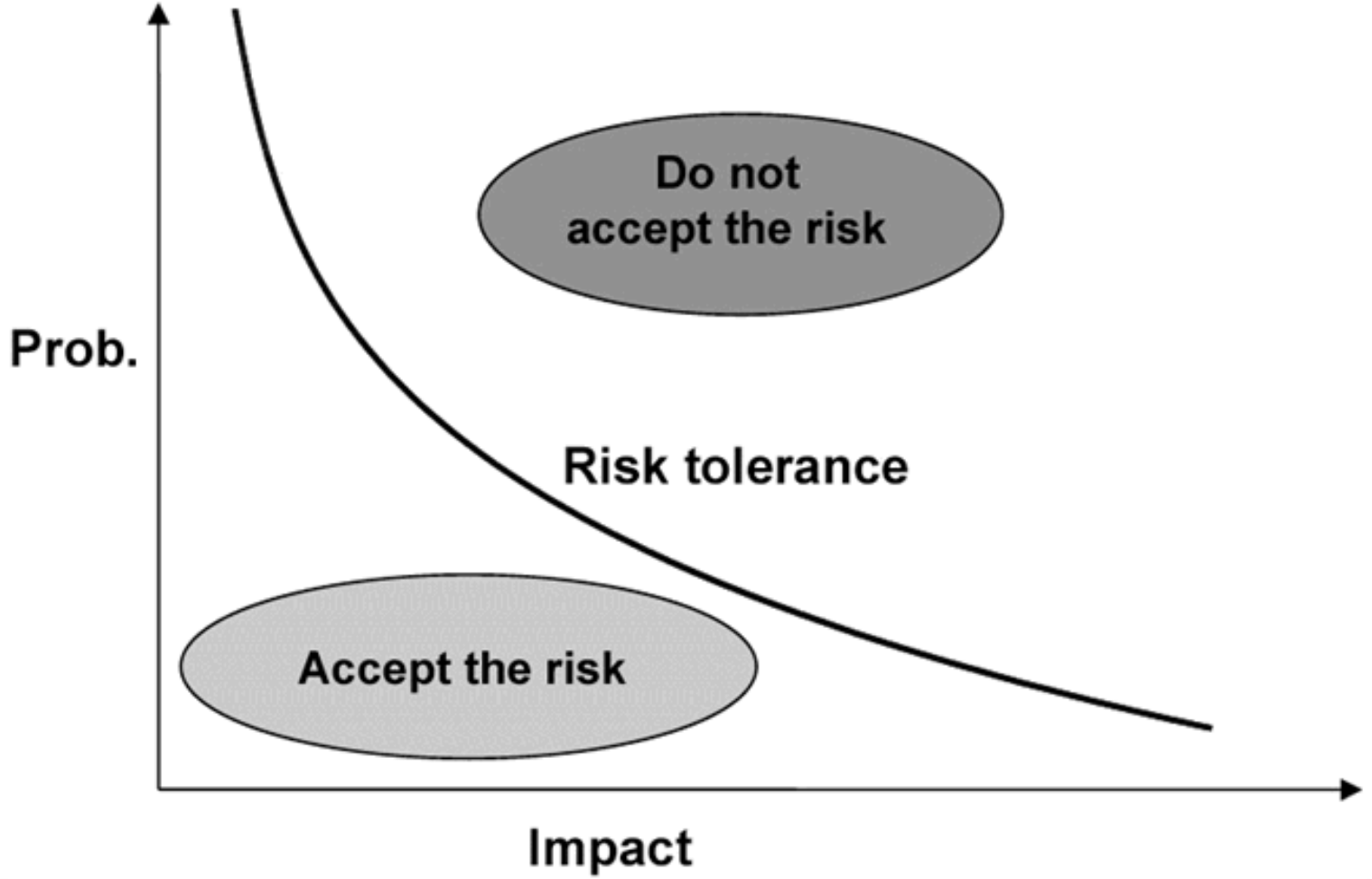
IDF Uncertainty – Methodology

- IDF statistics vary widely between stations in the same area: selection of climate **station** also has a profound effect on calculated IDF
- Methodological decisions for downscaling and future IDF curve derivation also have a profound effect
- There is significant uncertainty in **existing** IDF curves
- The ways in which IDF statistics are applied in engineering design also introduce uncertainty

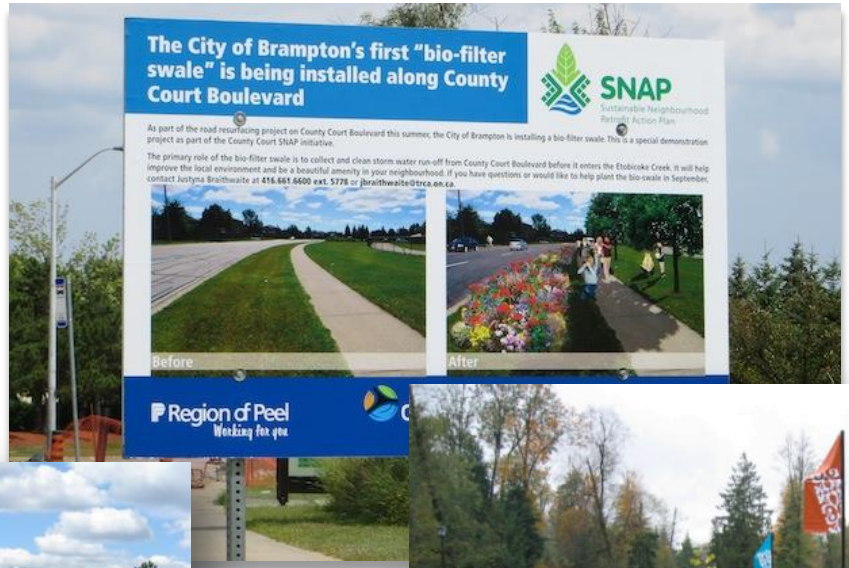
Moving Forward on IDF

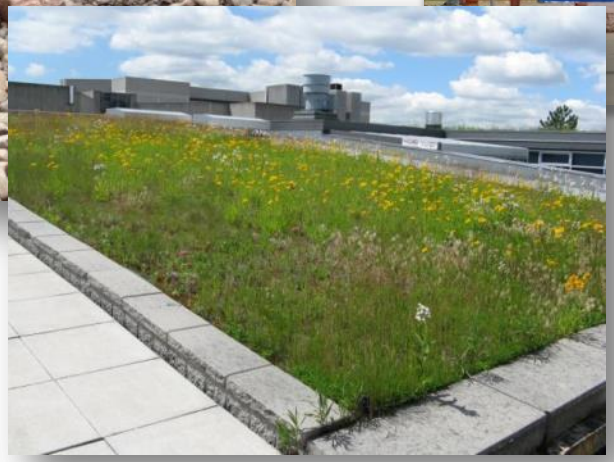
- We need regional, not point-based IDF curves
- Study of additional methodological permutations can help further quantify uncertainty, but ultimately uncertainty cannot be eliminated
- Shift focus away from the derivation of a single, definitive set of future IDF curves to a probability based approach
- Revisit the sources of uncertainty in the use of IDF statistics in the engineering design process

Moving Forward – Risk Based Design



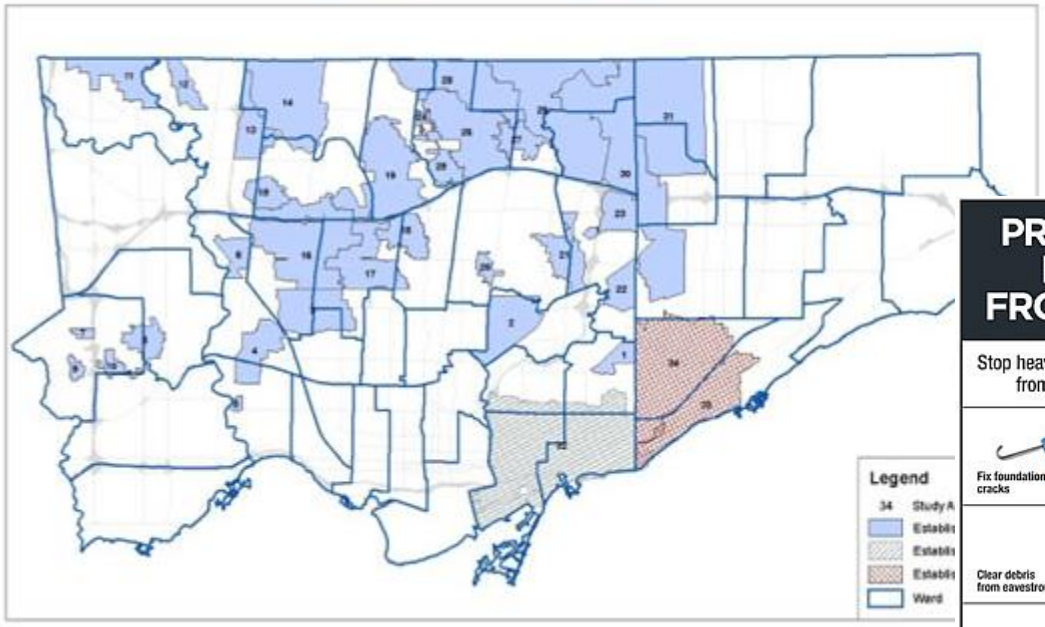
Moving Forward – Multiple Benefits



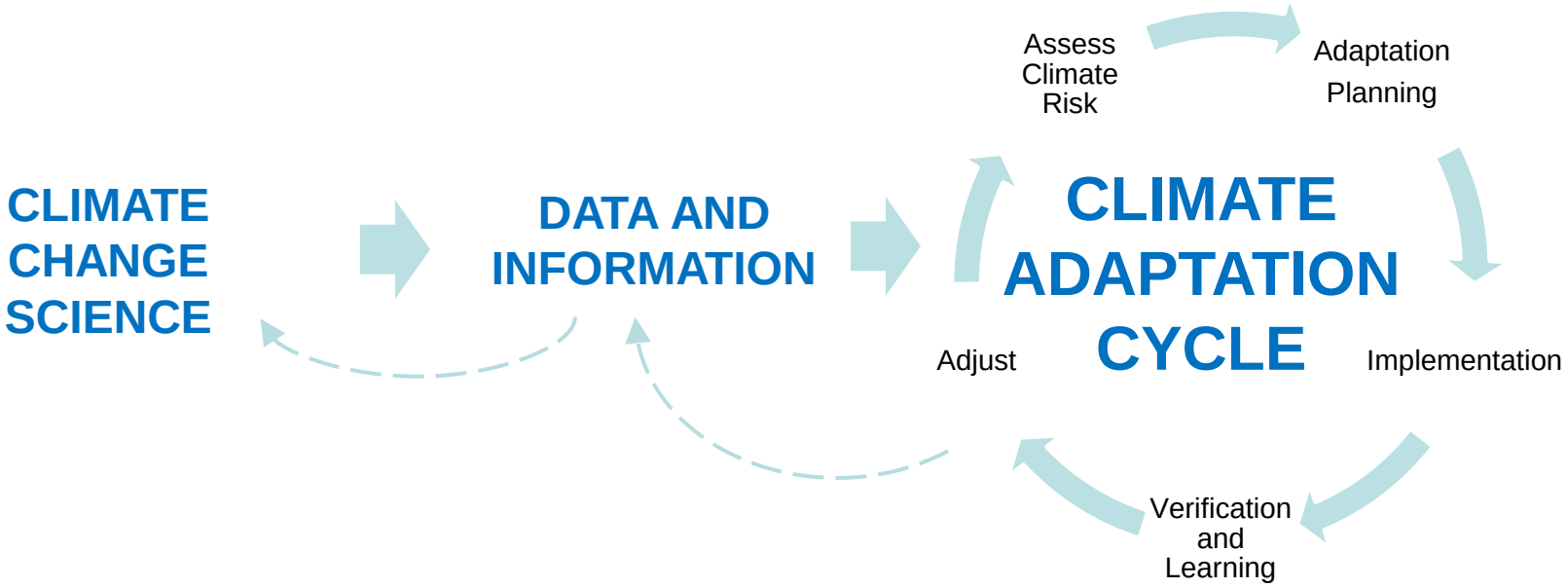


Moving Forward – Address Greatest Risks

Figure 9: Basement Flooding Study Areas



Moving Forward – Adaptive Management



Closing Thoughts

1. Uncertainty in climate impact assessment and adaptation planning is inevitable, and in many cases irreducible
2. The science could be better, but it will never be perfect or definitive
3. The uncertainty associated with impact modelling can be as great or greater than uncertainty associated with climate data and climate modelling
4. We can move forward intelligently and adaptively

Thank You

For more information, please visit:

http://climateontario.org | www.trca.on.ca