Tyndall Centre for Climate Change Research

Report from the lookout – Understanding climate change impacts on shipping

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Overview

- General notes on climate change impacts (on shipping)
- SCC scenarios
- Case study I: grain imports in Egypt and Nigeria
- Case study II: stresses on ports of Alexandria and Lagos
- Making use of model results
- A plethora of future work

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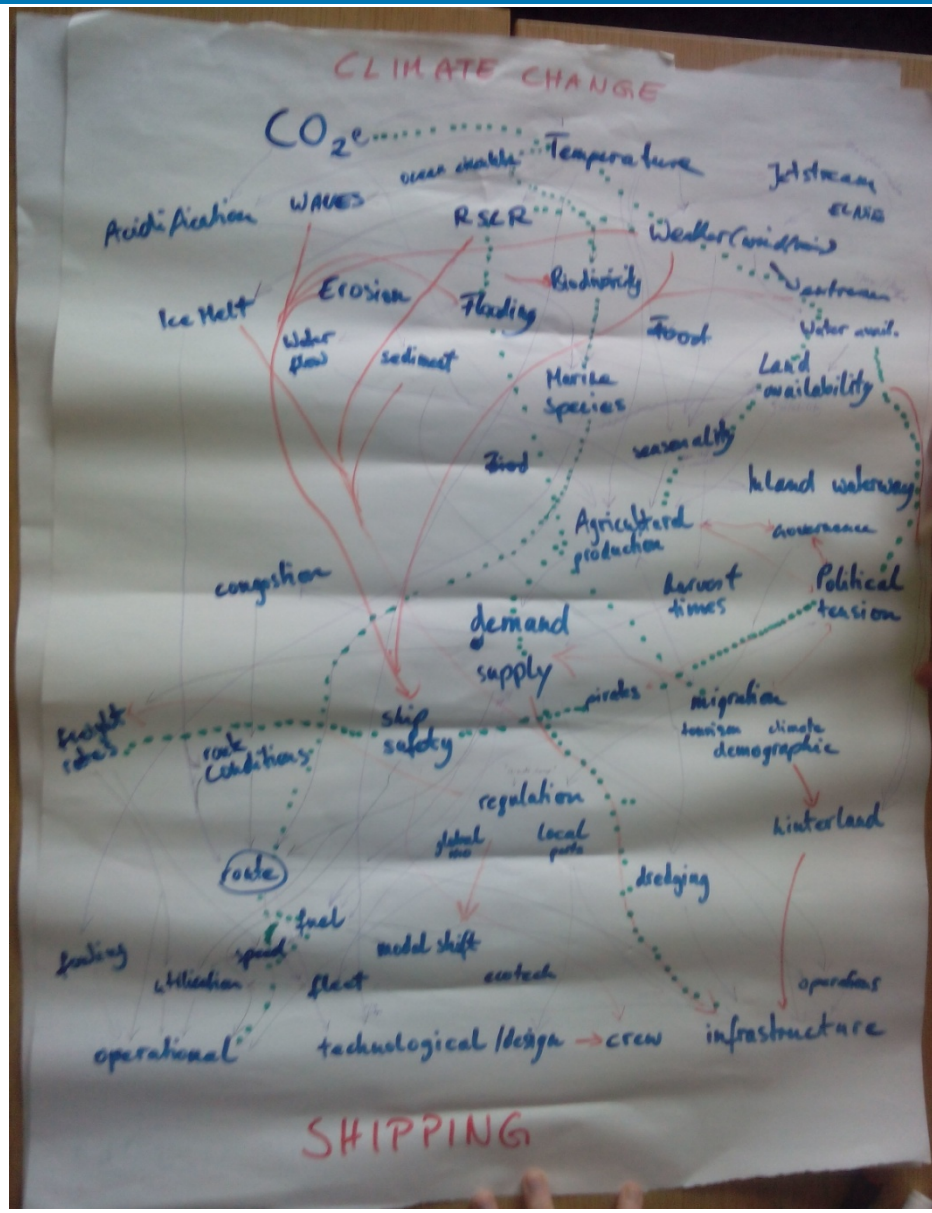
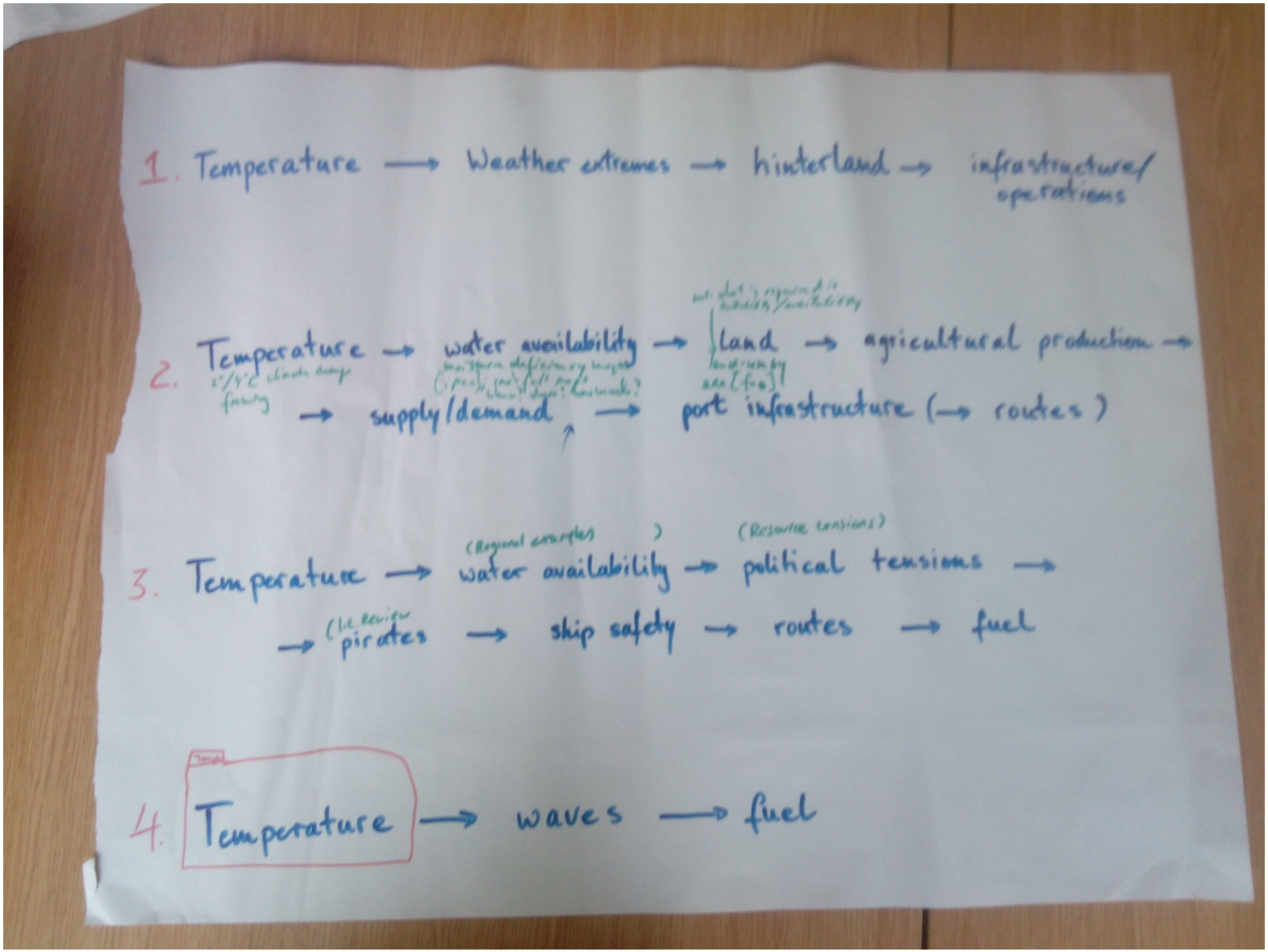
Climate change impacts

Climate change impacts characterised as:
Causal chains of individual links and elements

Can be categorised:

- **Direct vs. Indirect**
  (i.e. shorter vs. longer causal chains)
- affecting **Supply or Demand**
- **Short vs. Medium vs. Long Term**
  in terms of onset and longevity




1. Temperature → Weather extremes → hinterland → infrastructure/ operations
2. Temperature → water availability → land → agricultural production →
→ supply/demand → port infrastructure (→ routes)
3. Temperature → water availability → political tensions →
→ pirates → ship safety → routes → fuel
4. Temperature → waves → fuel

General notes on climate change - Examples

- temperature rise → weather extremes → hinterland → infrastructure/ops
- temperature rise → water availability → land suitability → agricultural production → supply/demand → port infrastructure (→ routes)
- temperature rise → water availability → political tensions → piracy → ship safety → routes → fuel
- temperature rise → waves → fuel (consumption)

General notes on climate change – Framework

- A → B → C → D (Hypothesis)
- A → B (Deep-dive research individual elements/links)
- A → B → C → D (Final impact on shipping under different climate change scenarios)
- Responses (Identification of intervention points)
- Varying manifestations for SCC scenarios (including narratives about mitigation and adaptation measures)

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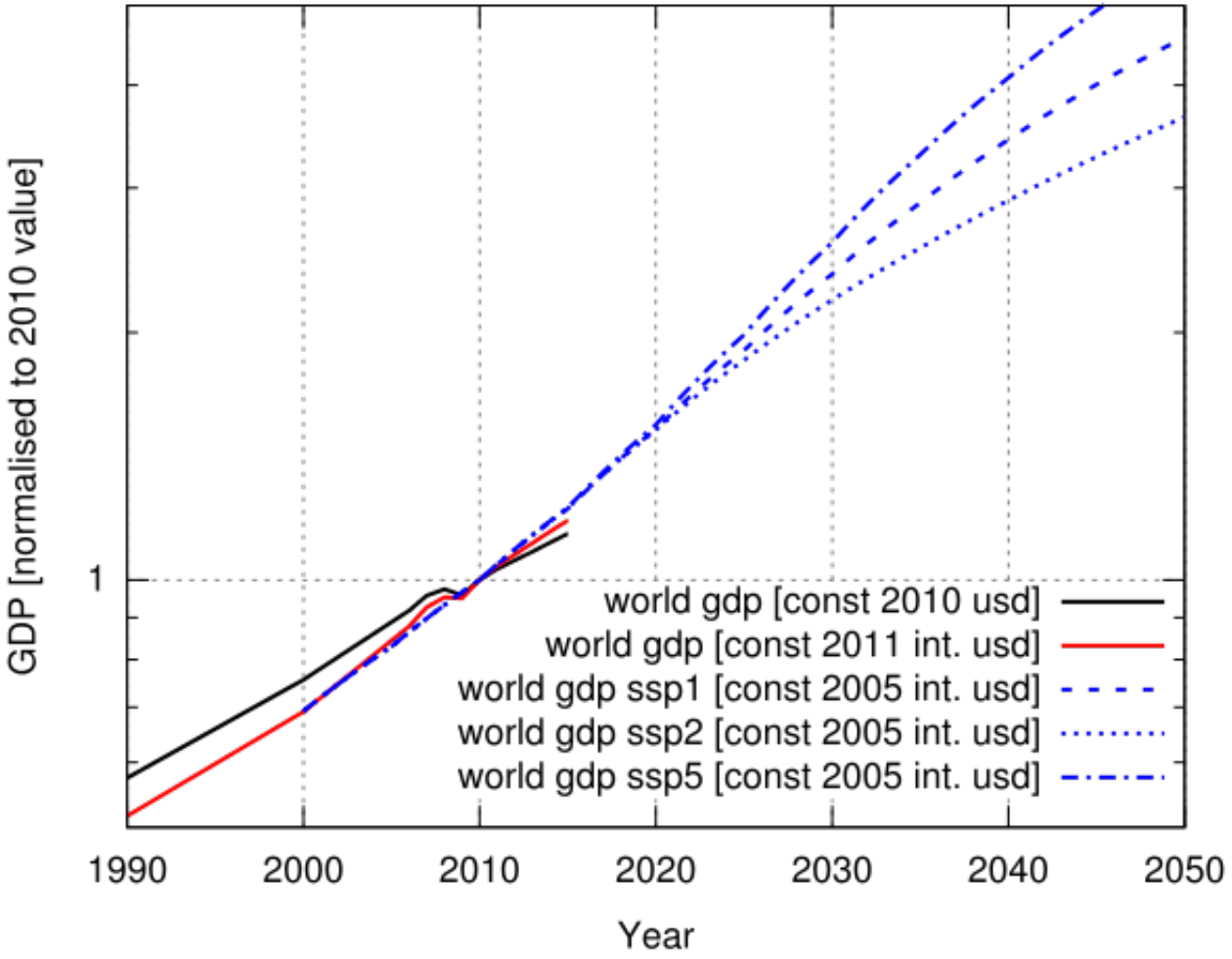
SCC scenarios – Elements

Based on *Shared Socio-economic Pathways* (SSP)



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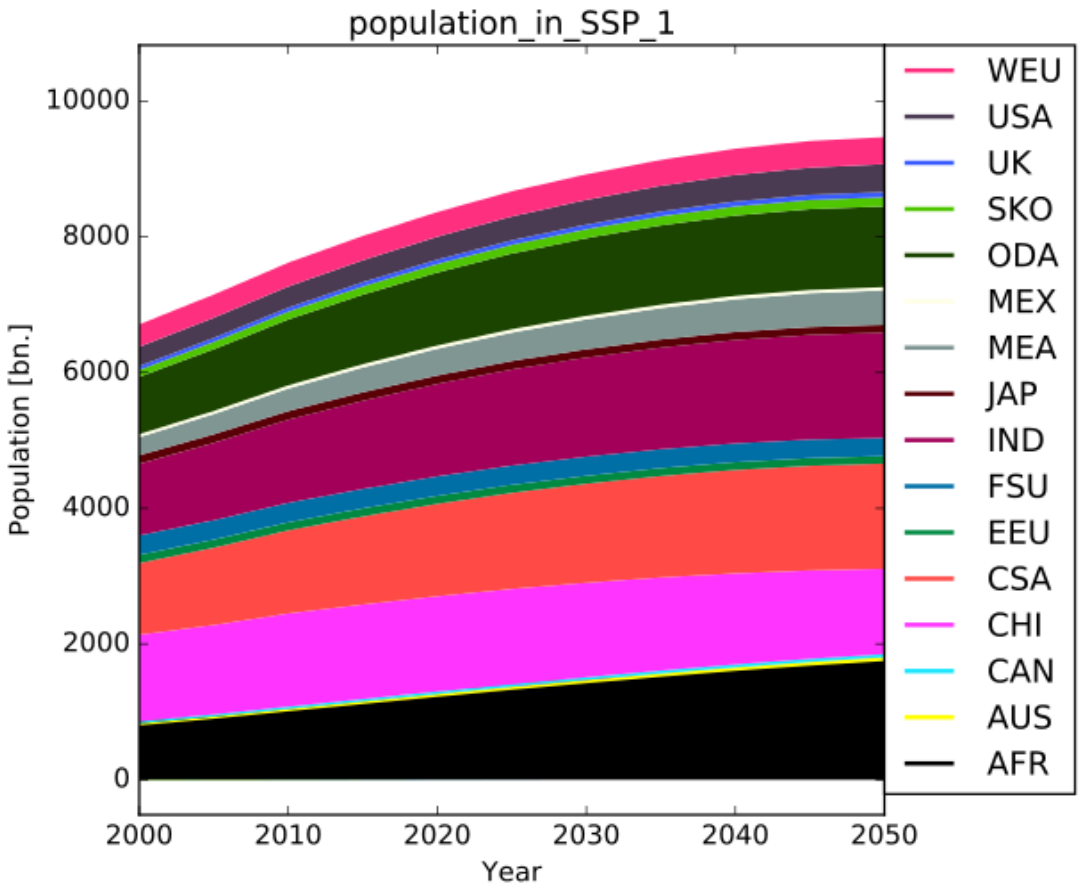

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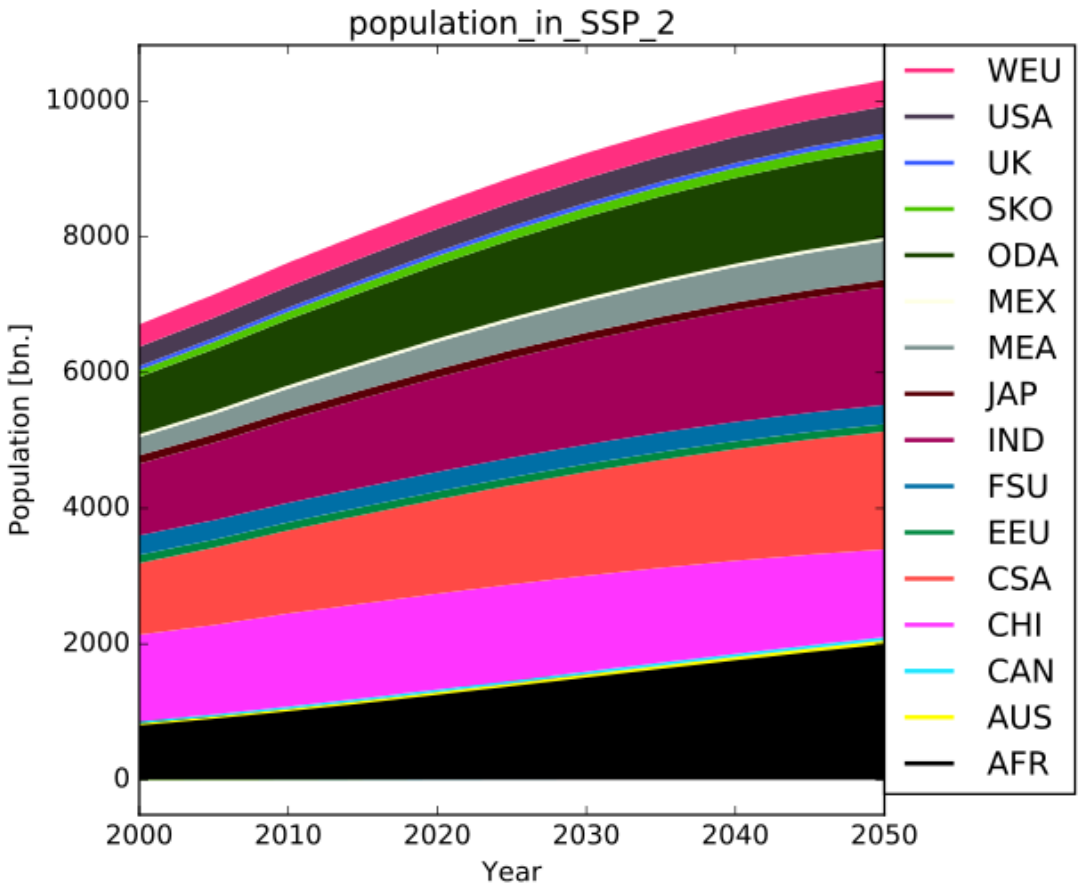

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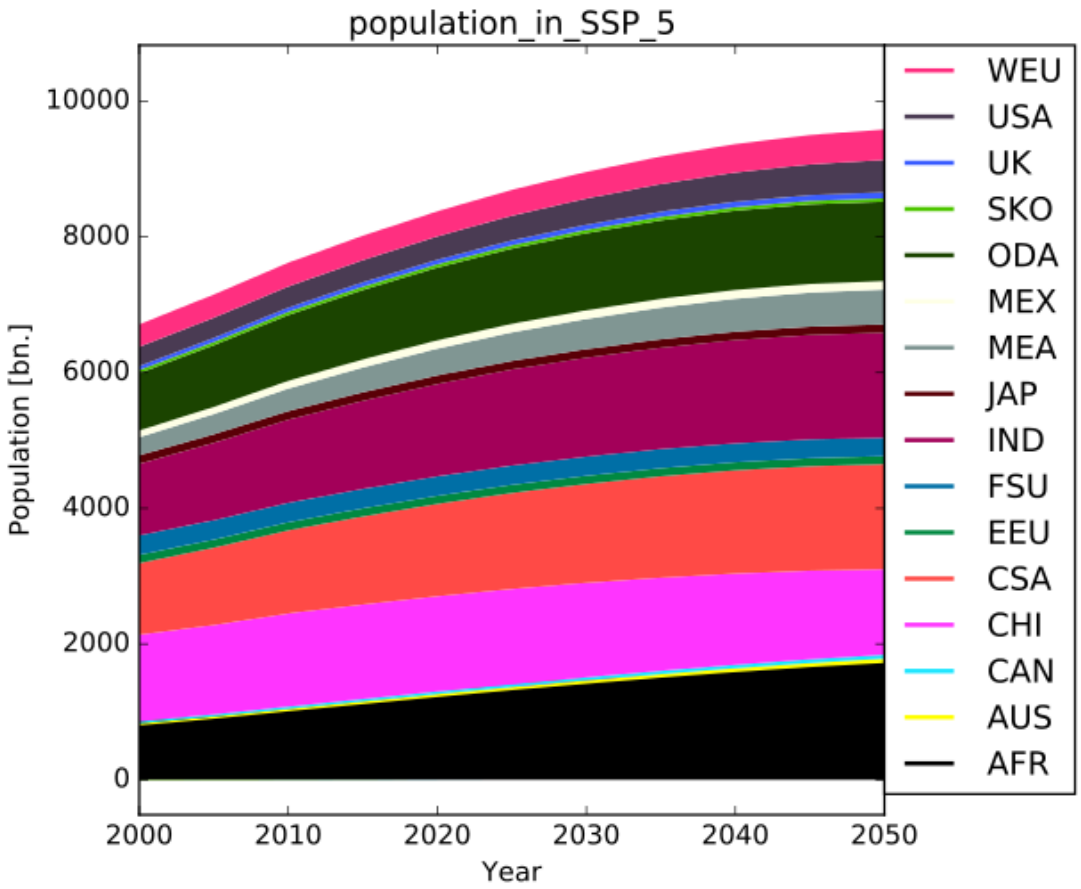

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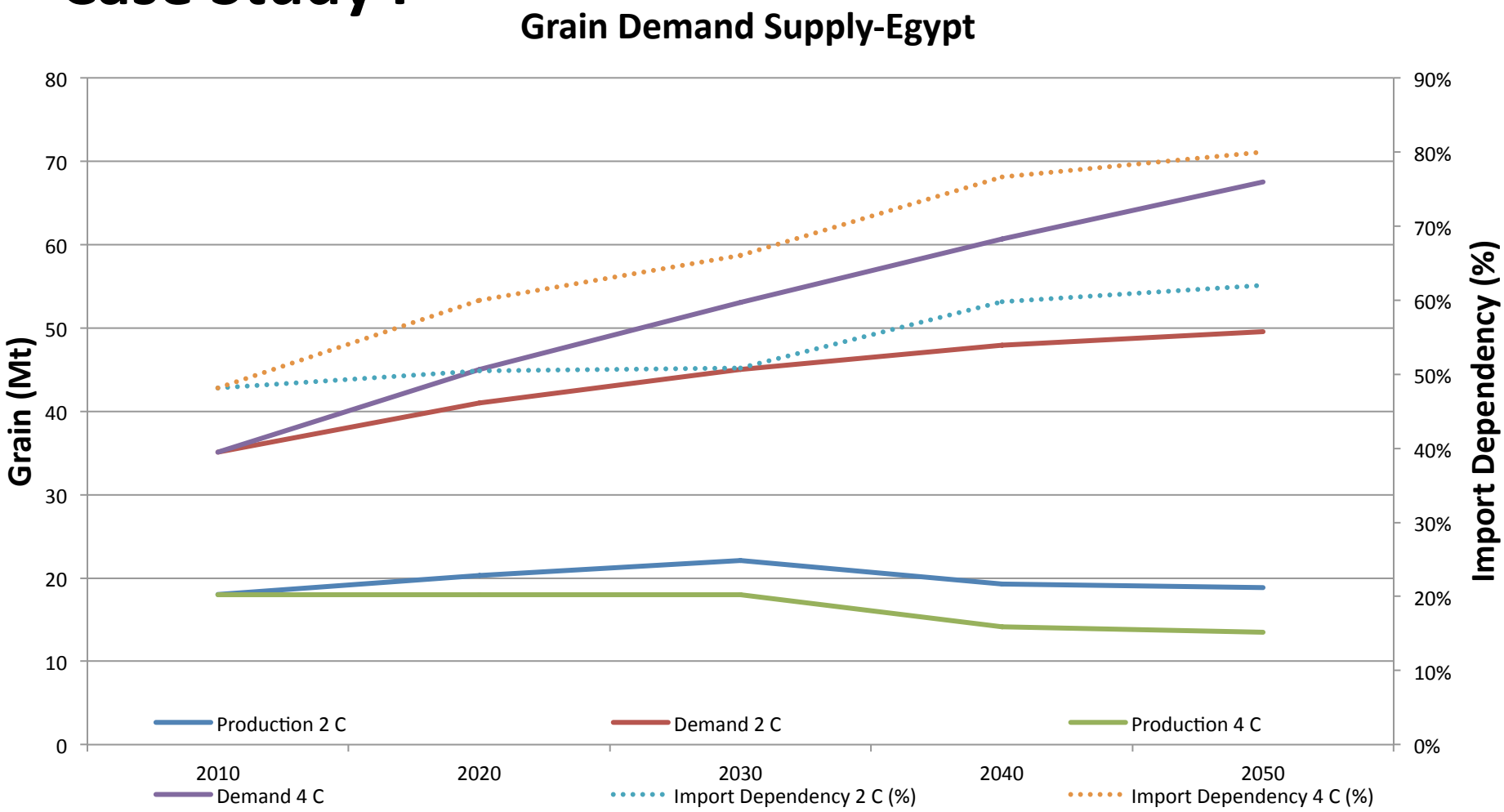
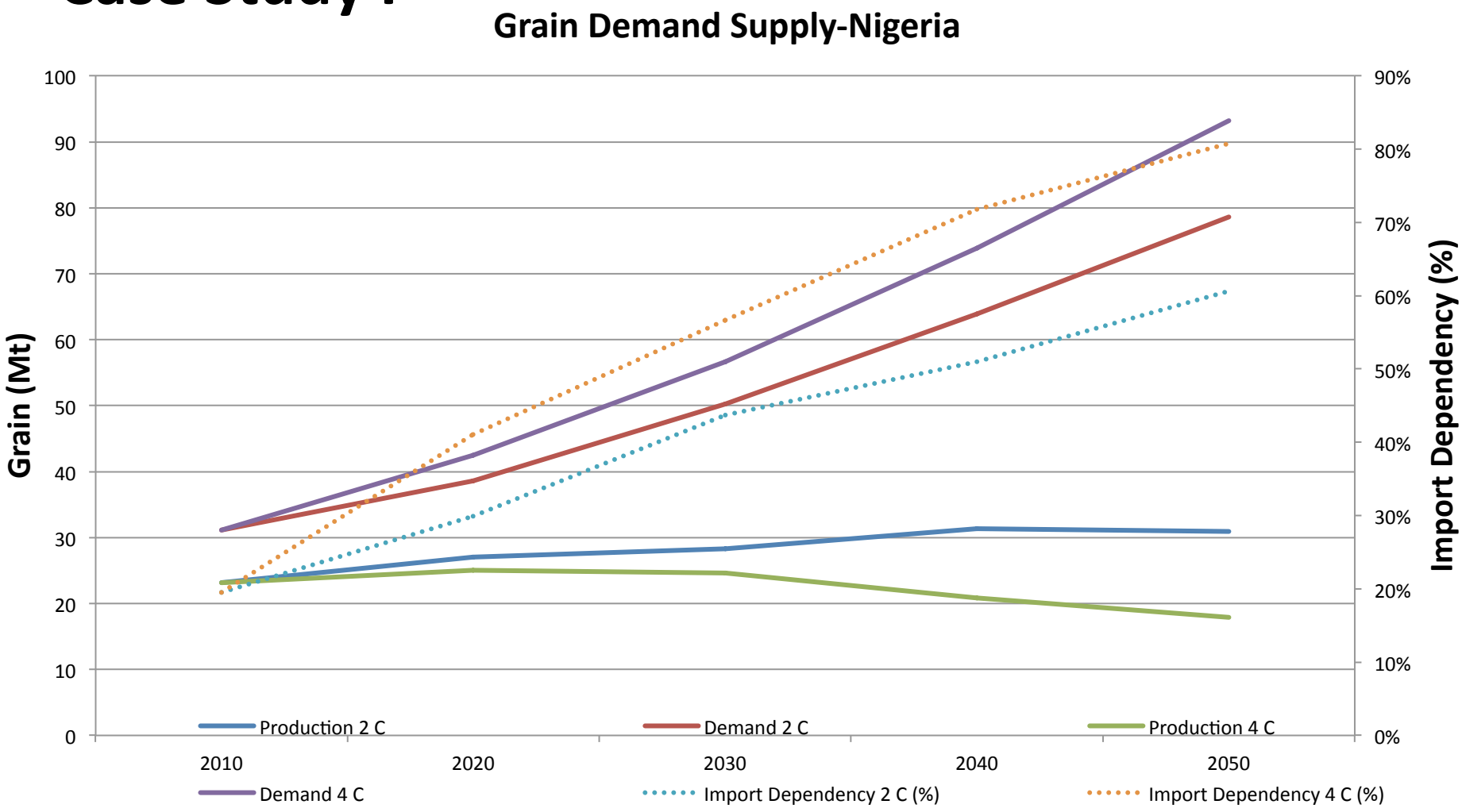
Case Study I


Grain Demand Supply-Egypt
Grain (Mt)
Import Dependency (%)
80
70
60
50
40
30
20
10
0
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2010
2020
2030
2040
2050
Production 2 C
Demand 2 C
Production 4 C
Demand 4 C
Import Dependency 2 C (%)
Import Dependency 4 C (%)

Case Study I


Grain Demand Supply-Nigeria
Grain (Mt)
Import Dependency (%)
100
90
80
70
60
50
40
30
20
10
0
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2010
2020
2030
2040
2050
Production 2 C
Demand 2 C
Production 4 C
Demand 4 C
Import Dependency 2 C (%)
Import Dependency 4 C (%)

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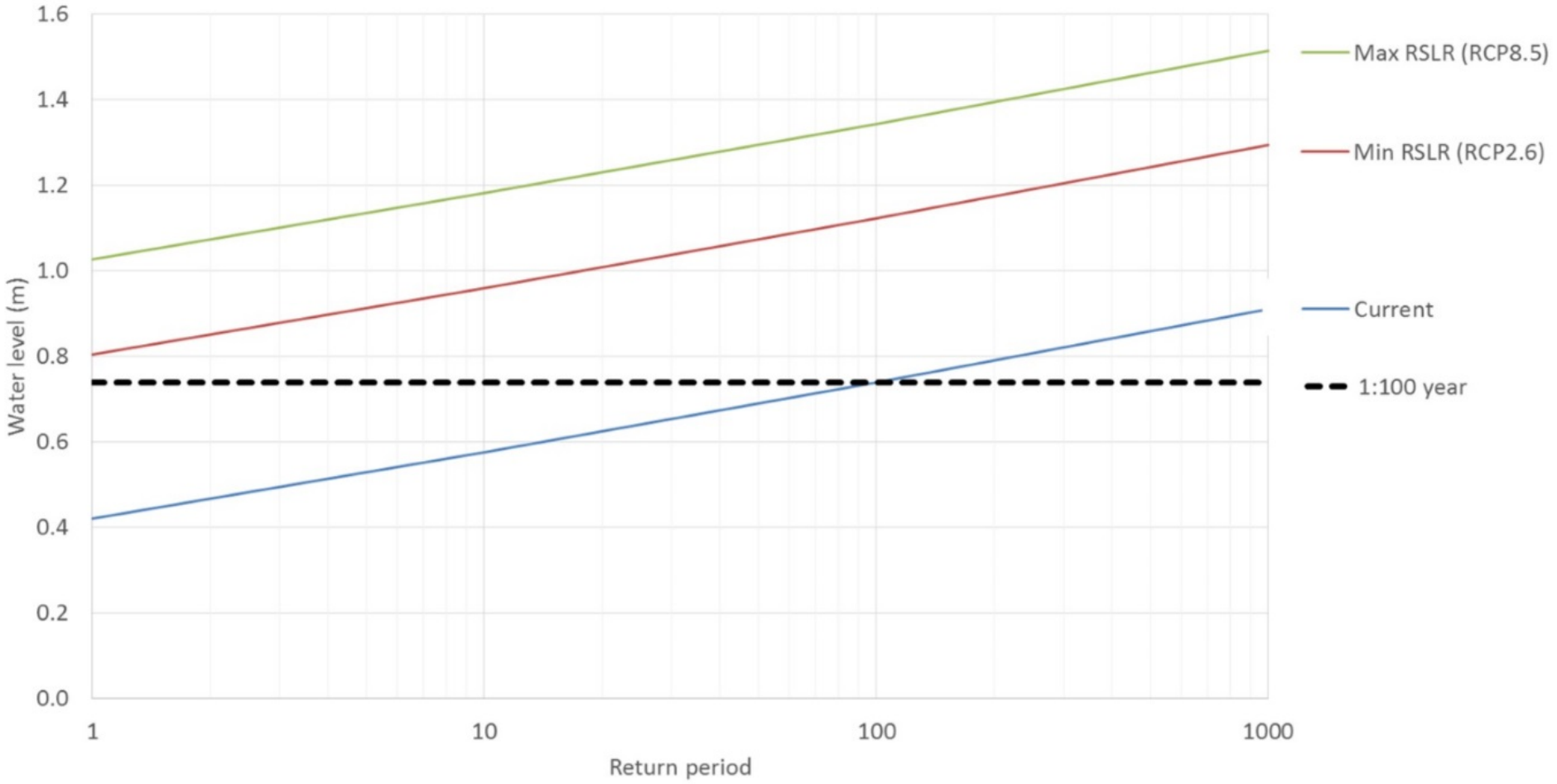
Case Study II

		Port area required (km^2)		Percentage (%) increase in area (2010-2015)
		2010	2050	
Egypt	RCP2.6	0.27	0.48	82
	RCP8.5		0.85	220
Nigeria	RCP2.6	0.1	0.75	685
	RCP8.5		1.18	1140

Case Study II



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Making use of model results

- In Egypt and Nigeria, climate change will put stress on food production
- As a consequence, and due to population growth, import dependency will grow
- Major ports of Alexandria and Lagos are area-constrained
- Both ports will, by 2050, face rising sea levels
- Uncertainty does not mean there is no risk
- But: responses must be robust with respect to uncertainty
- Aiming to make the system more resilient, and more sustainable

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A plethora of future work

- SCC scenarios to be fleshed out
- More deep dive research into climate chnange impacts
- Filling the toolbox
- Climate change unfolding
- Ignoring it is not a promising long term strategy

Thank you!