Transformation and Resilience on Urban Coasts (TRUC)

Partners

King's College London
Anna University
City University of New York
United Nations University
University of Lagos
University of Reading
University of Tokyo
(East China Normal University, Shanghai)
(Universidade do Algarve)

City Case Studies

Kolkata
Lagos
London
New York
Tokyo
(Shanghai)

Advisory Board

BGS
WMO
Durban Municipality

Presentation:

Aims
Structure
Progress
Next steps

Aims

TRUC objectives:

1. Conceptualise resilience, transition and transformation for urban sustainability
2. Develop an integrated approach for biophysical and social vulnerability assessment
3. Provide space for stakeholder, researcher and student reflection on urban development and risk management priorities and approaches.

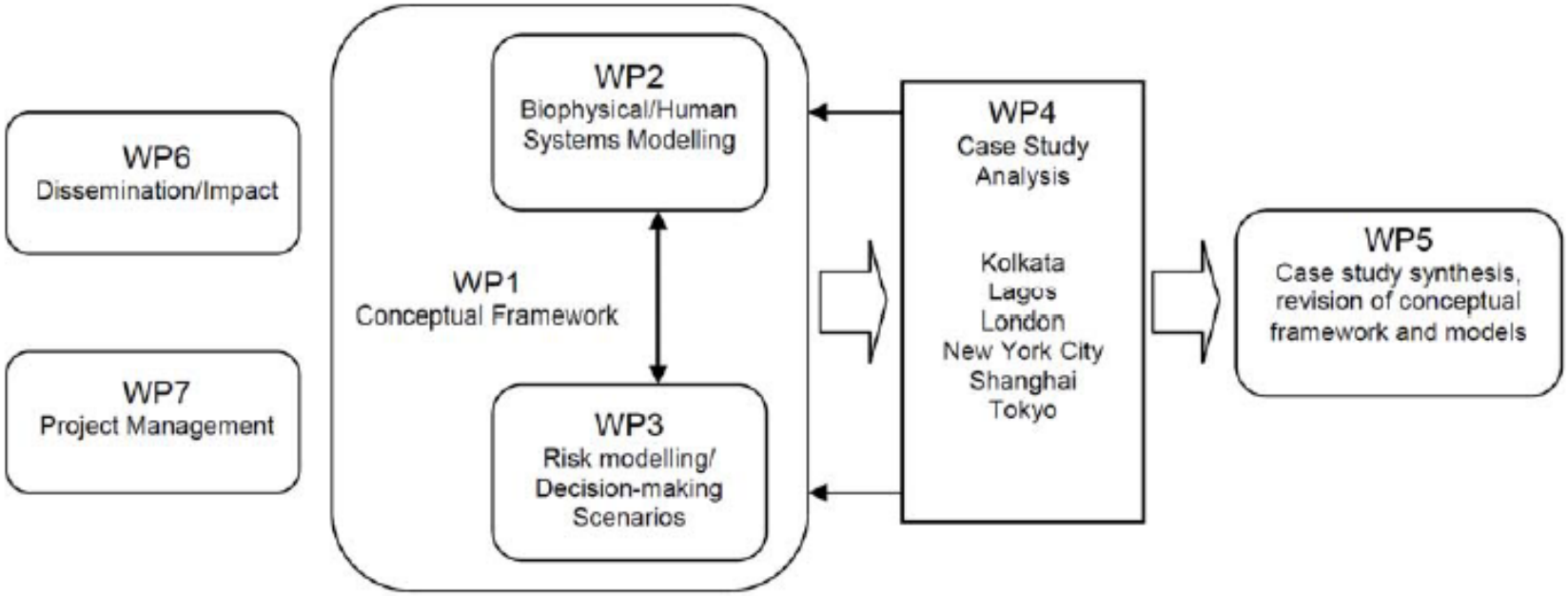
Research questions:

1. What are the factors and contexts that constrain or precipitate transition and transformation?
2. What happens to decayed systems components and interested stakeholders during periods of change?
3. Are there early warning signals that can indicate a transition or transformation might be imminent?
4. Can policy chose and support deliberate transformation?

"The task of TRUC's integrated modelling is to help characterise these respective moments and their determinants using past observations, and help stakeholders to think through future risks in a world increasingly influenced by climate change and consider" (case for support).

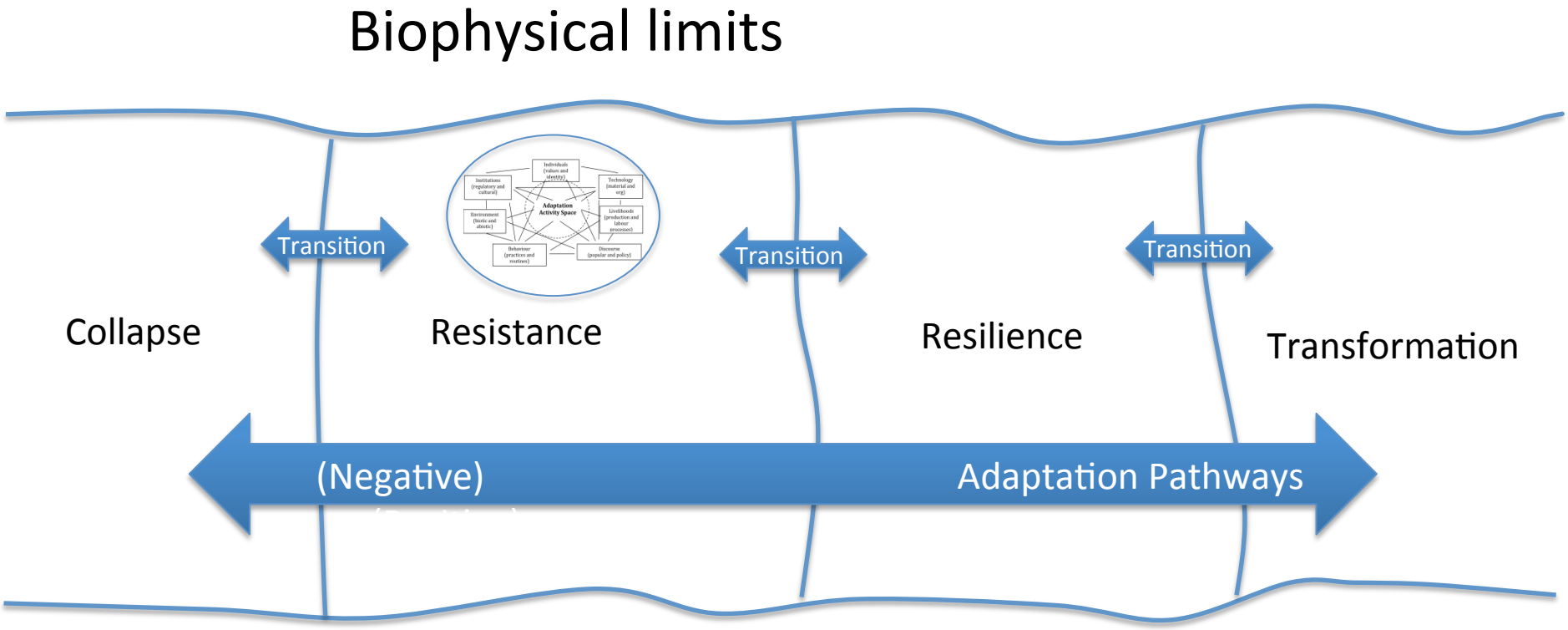
Structure

Figure 2: TRUC WP Interactions



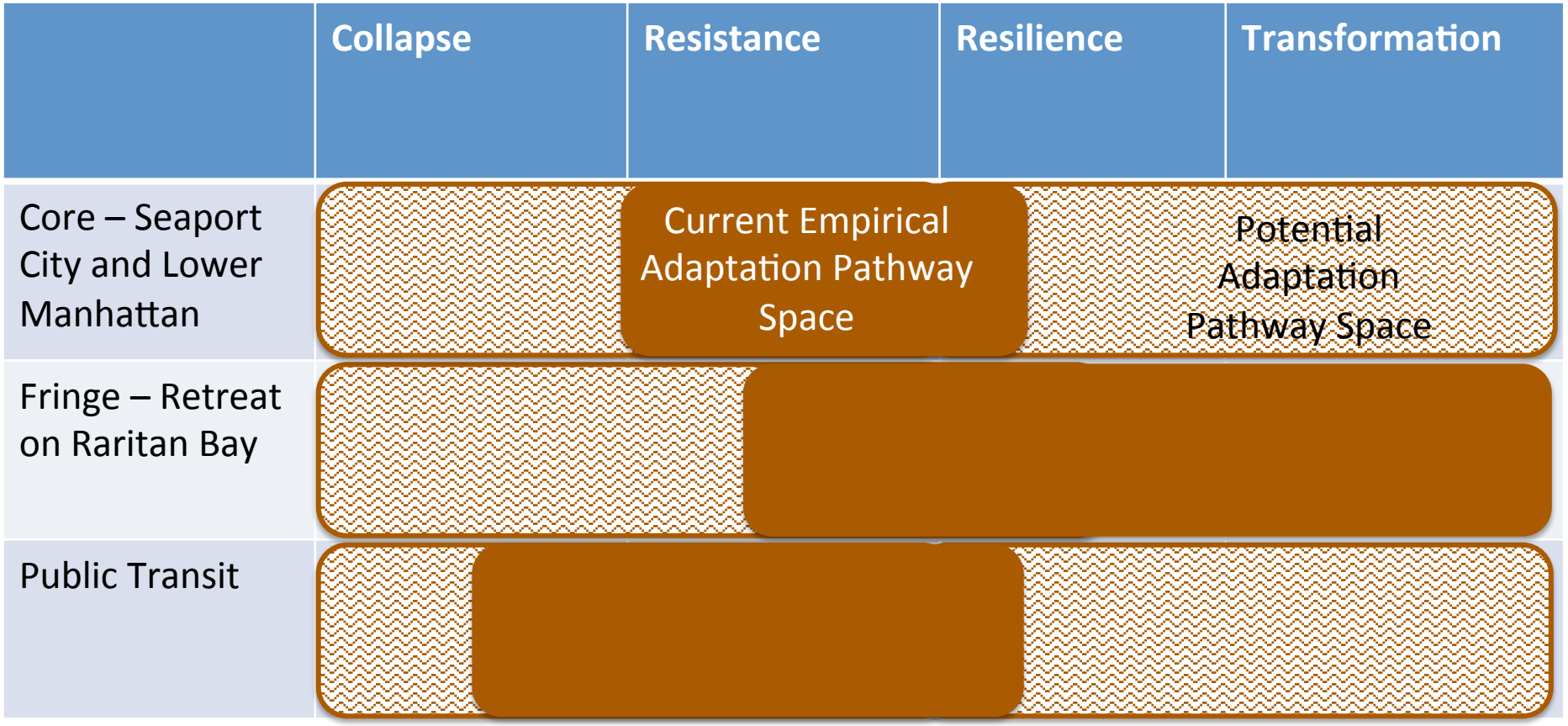
1: Conceptual Framework

OVERHEAD VIEW



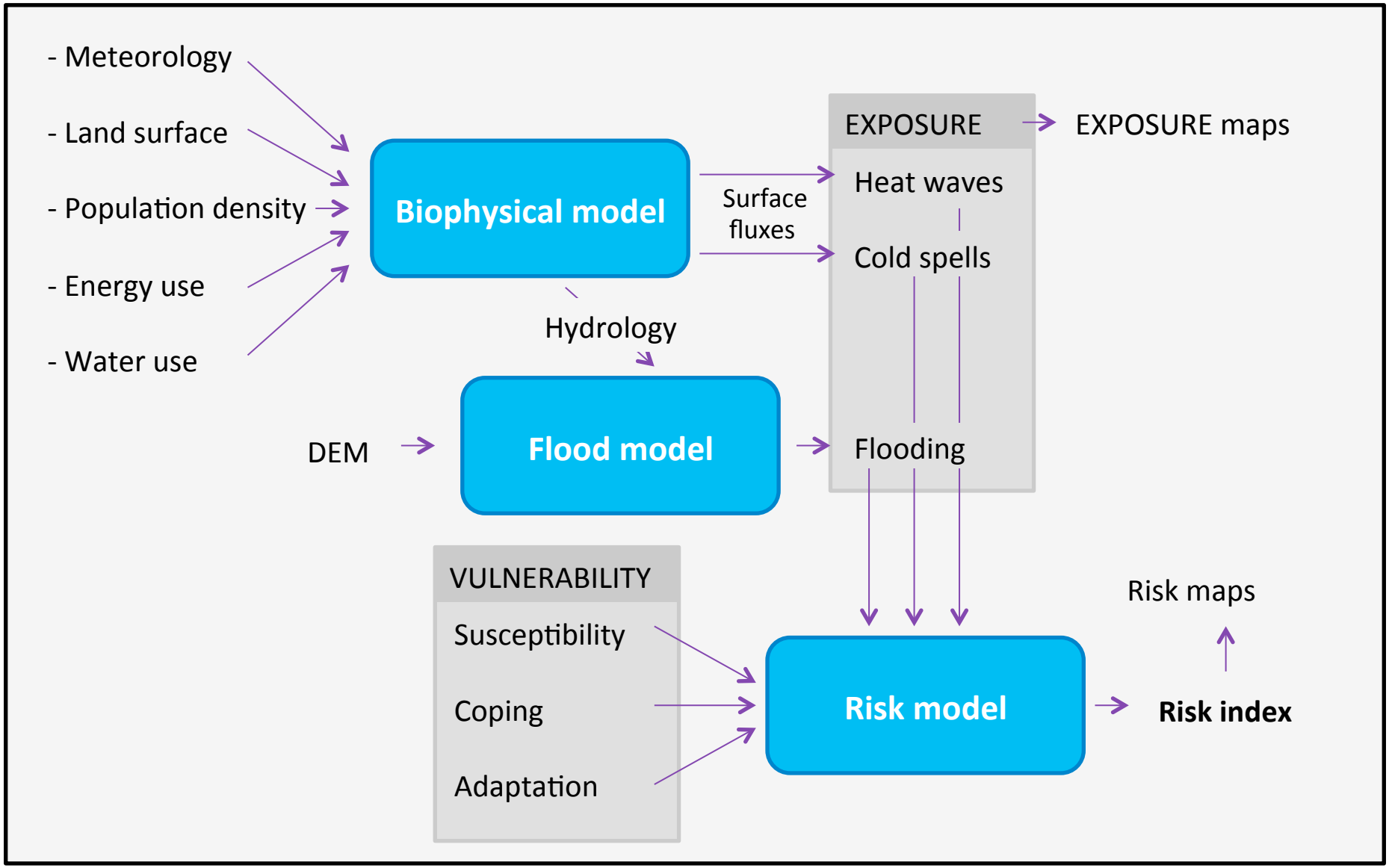
Note – Time in this diagram is not left to right. Adaptation pathways can move from a lower state to higher state (i.e. left to right) or from a higher state to lower state (i.e., right to left); Time is referenced from the current to moments or eras in a future time.

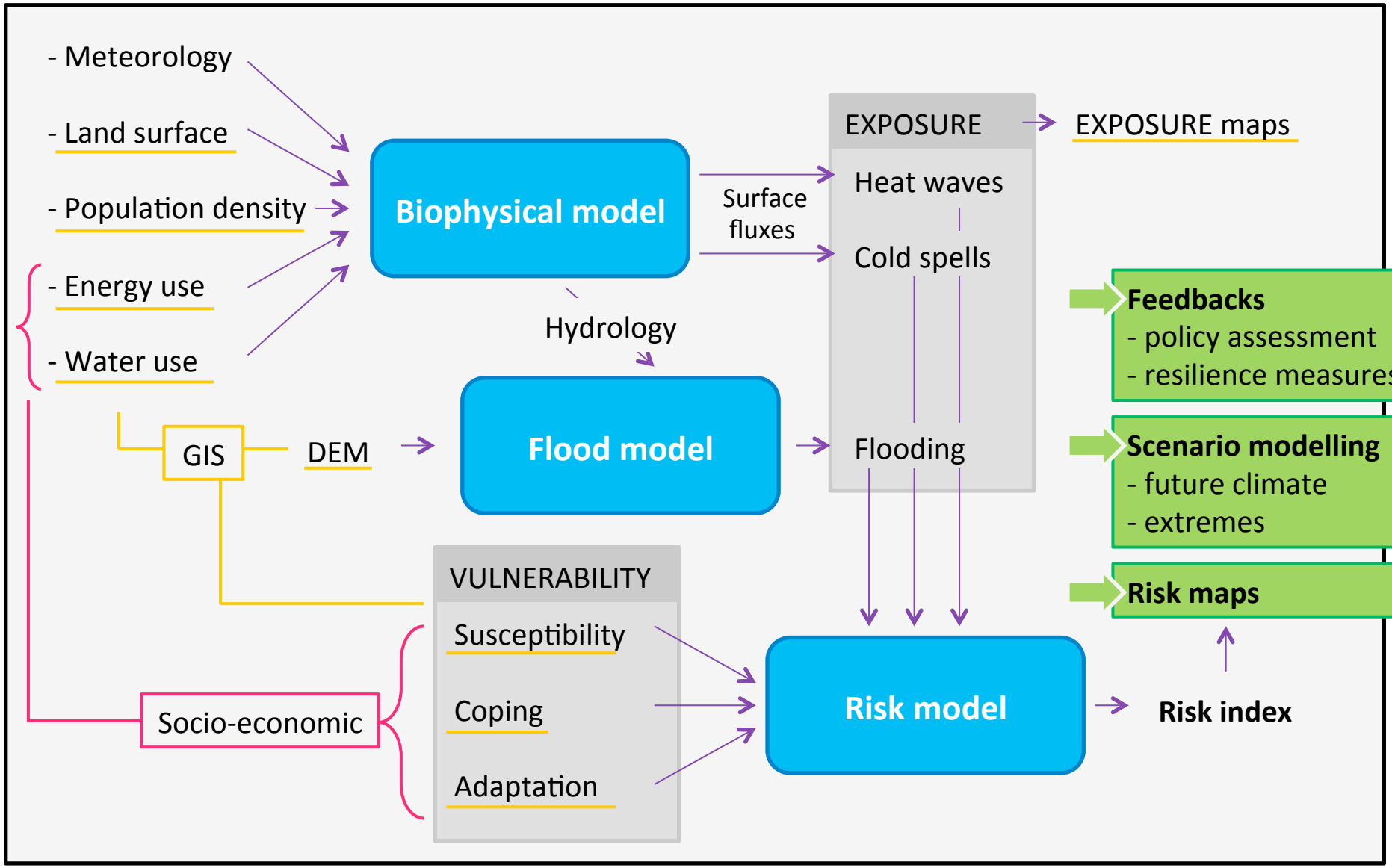
New York City Case Examples and Adaptation Pathways



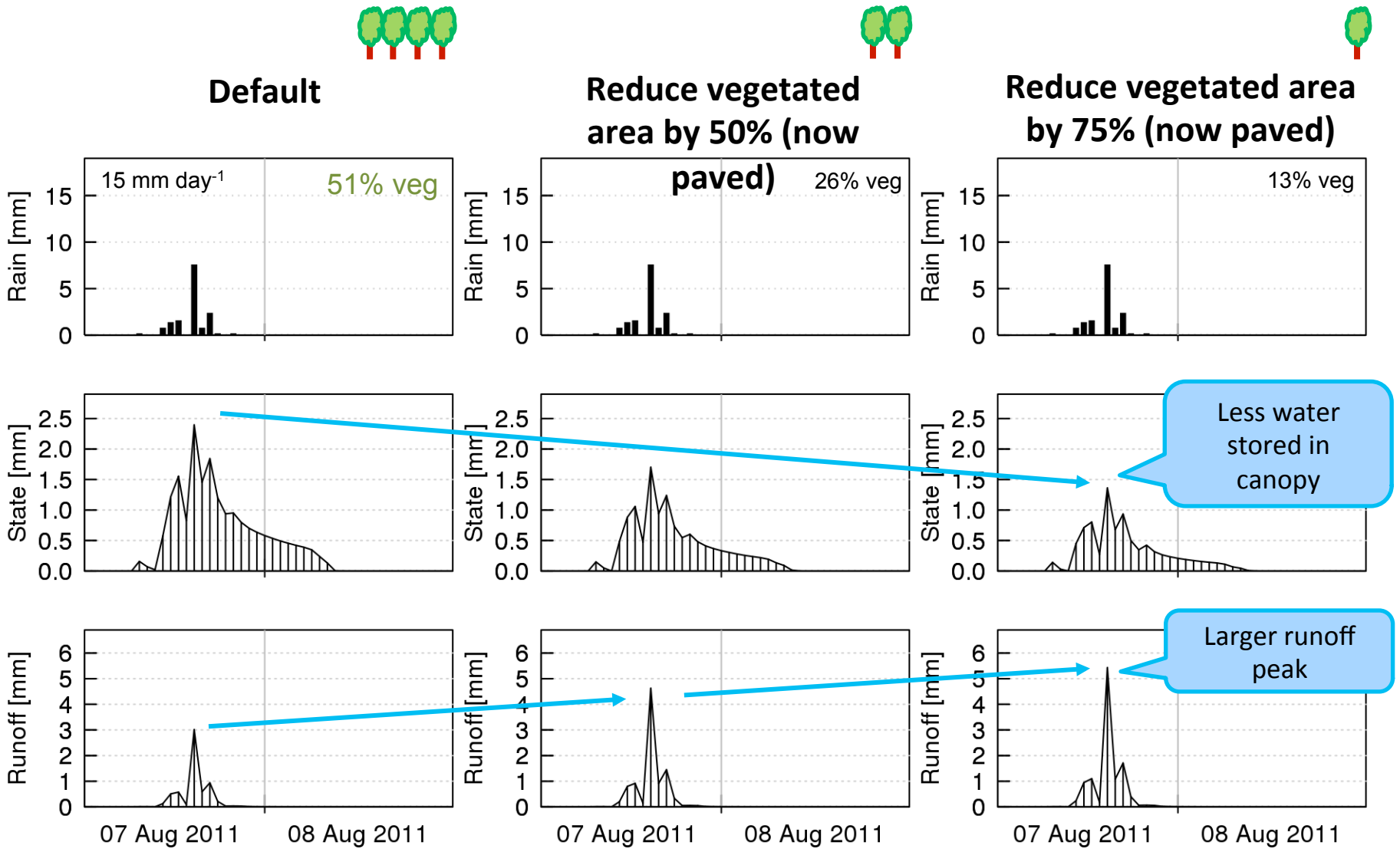
*Empirical adaptation pathways will be derived from the case study data; understanding of potential adaptation pathways will be derived from the modeling, scenario work, and face to face discussions with local stakeholders

2: Integrated Modelling




- Meteorology
- Land surface
- Population density
- Energy use
- Water use
Biophysical model
Surface fluxes
Hydrology
EXPOSURE
EXPOSURE maps
Heat waves
Cold spells
Flooding
GIS
DEM
Flood model
VULNERABILITY
Susceptibility
Coping
Adaptation
Socio-economic
Risk model
Risk index
Feedbacks
- policy assessment
- resilience measures
Scenario modelling
- future climate
- extremes
Risk maps

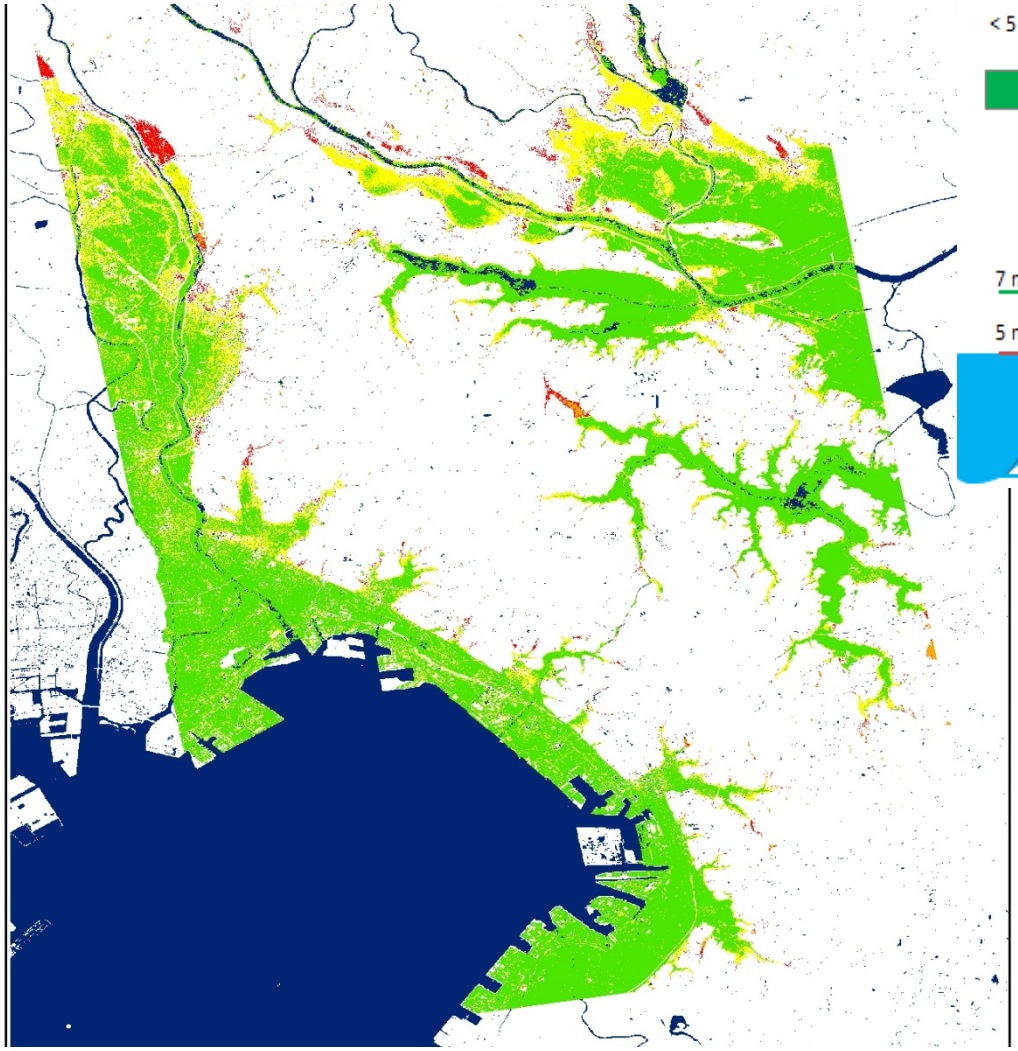
Biophysical modelling: eg land cover change

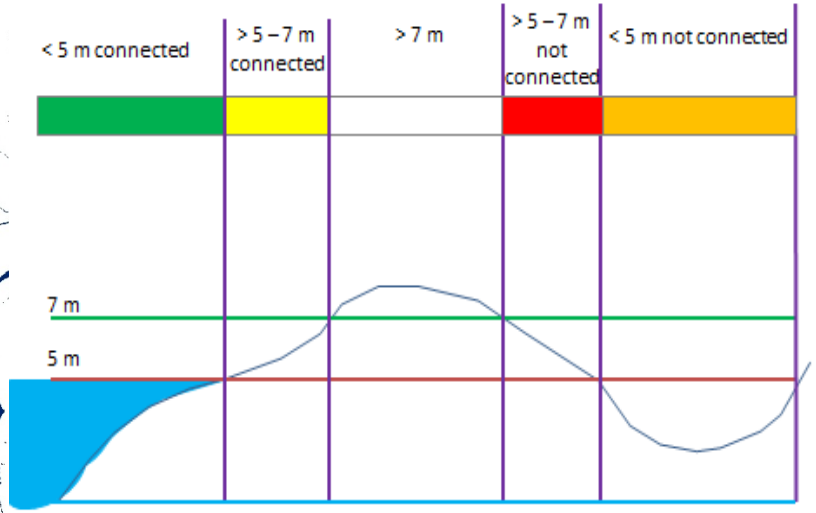


Flood hazard modelling: A static modeling approach

- Create elevation mesh with explicit representation of dikes, channels, roads, etc.
- Only area below the flood elevation that has a connection to the ocean is flooded
- Difficulties in getting accurate enough elevation data
  - Vertical for barriers
  - Horizontal for channels
- Our primary data requirement will be accurate DEMs + supplementary data for augmenting the DEMs, particularly in terms of assessing connectivity potentially floodable areas to the ocean. Supplemented with road, rail and subway maps; aerial photographs, flood management plans to determine connections and barriers between potential flood areas – if possible.

Preliminary results for Tokyo using TanDEM-X DEM





Vulnerability and risk modelling: structure

Vulnerabilty= 1/3*(Susceptibility+ lack of coping capacity + lack of adaptive capacity)

Source: Birkmann et al. 2011

The vulnerability index applied to London

Susceptibility

Demography

A) Migrant population/short term migrants
B) % of pupils whose first language is not English (2013)
C) Dependency ratio
D) % people aged 3+ whose main language is not English (2011 census)
E) New migrant (NINo) rates, (2012/13)
F) 1 person HH >65y

Health and Nutrition

G) Obesity in Adults
H) /Health status

Poverty and Income

I) Children in Poverty
J) Multiple Deprivation Rank of Average Score
K) Income Support claimant rate (Feb-13)
L) % children in out-of-work families (2012)
M) Percentage of People on Low Income
N) ILO Unemployment rate (2012/13)
O) Youth Unemployment rate (2012/13)
P) Proportion of the working-age population who claim benefits (%) (May-2013)
Q) Employment rate

Housing and Neighborhood conditions

R) Overcrowded Households by Borough
S) Median House Price, (£) (2013)
T) London Happiness Scores

Coping Capacity

Government and Authorities

A) Crime rates per thousand population (2012/13)
B) Turnout at 2010 local elections (%)

Medical Services/DRR

C) % working-age with a disability (2012)

Economic Coverage

D) Total Mean Gross **Annual Pay** (2013) (Income)

Social Networks

E) Volunteering Work Among Adults
F) Social Isolation: % of adult social care users who have as much social contact as they would like

DRR strategies

G) Internet usage

Adaptive Capacity

Education and Research

A) Proportion of working age people with no qualification
B) Proportion of 16-18 years not in Employment, education or training

Gender Equity

C) Gender parity in Annual gross pay (female-male)

Environmental Status / Ecosystem Protection

D) % of people with access to opne space
E) Environmental Footprint
F) Net change in Street Trees (2009-2010)

Investment

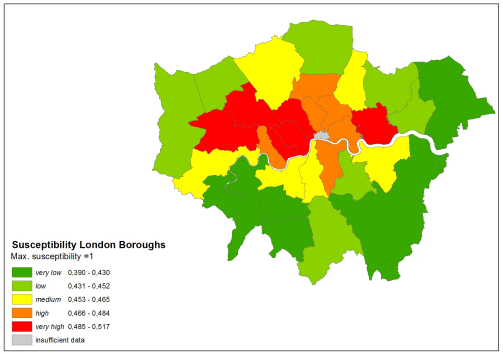
G) life expectancy, (2010-12)

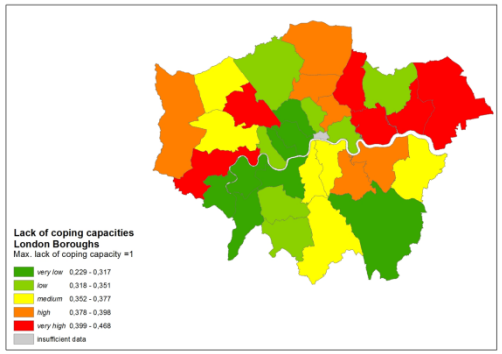
Adaptation strategies/Awareness

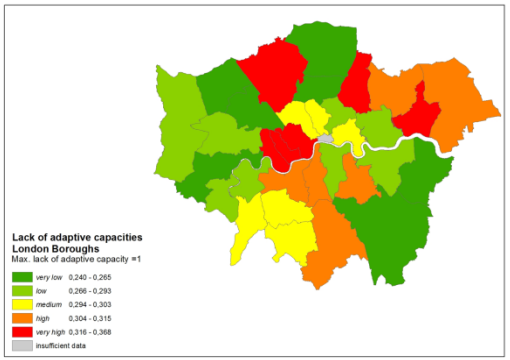
H) Household Waste Recycling Rate, (2012/13)

Preliminary results: London

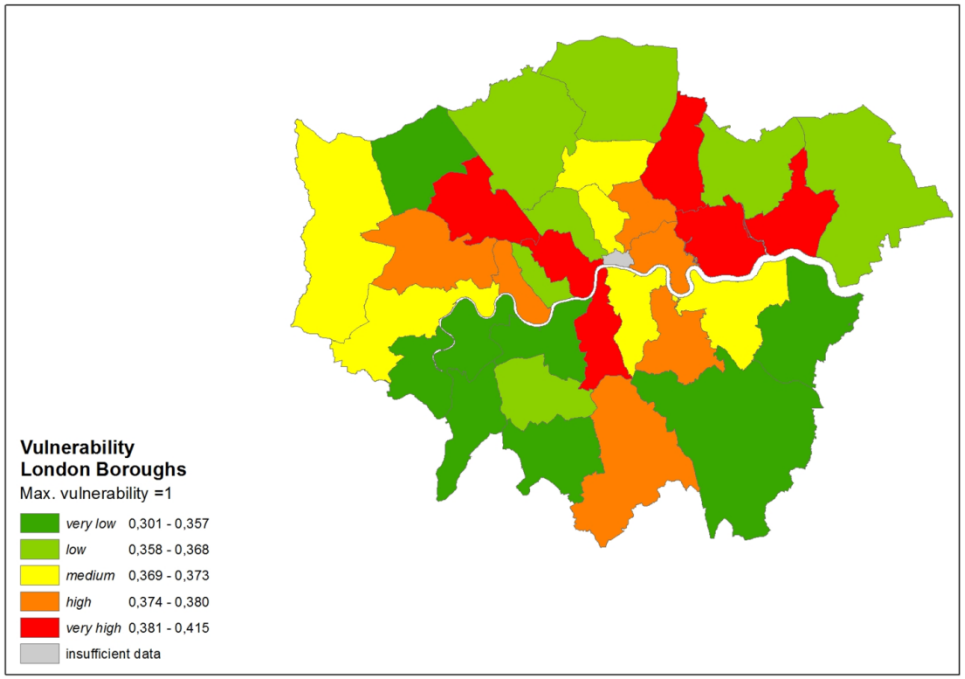
Susceptibility + Coping Capacity + Adaptive Capacity







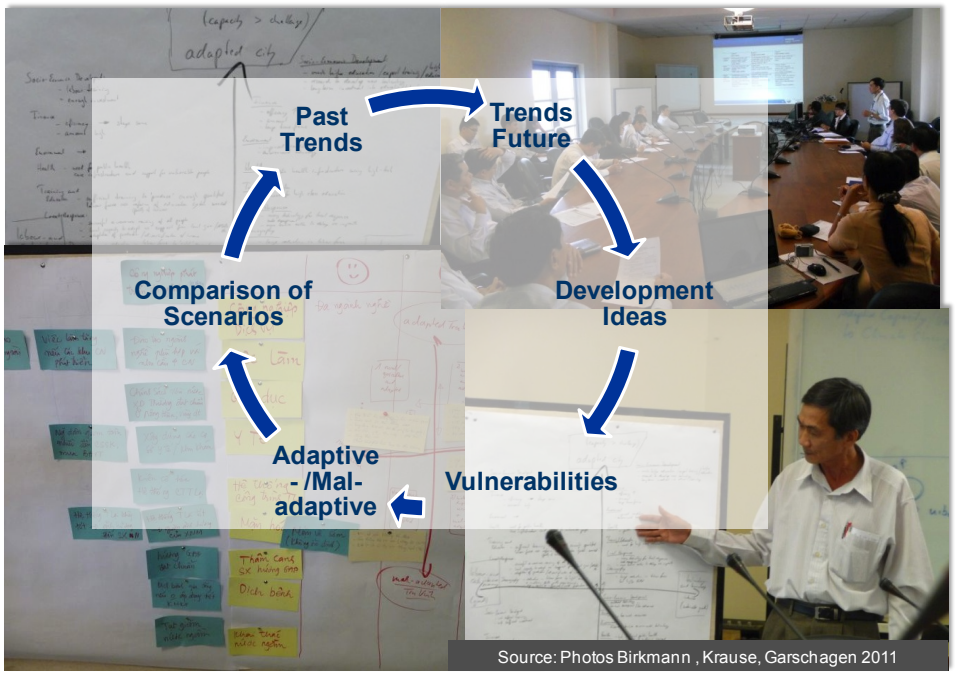
= Human Vulnerability



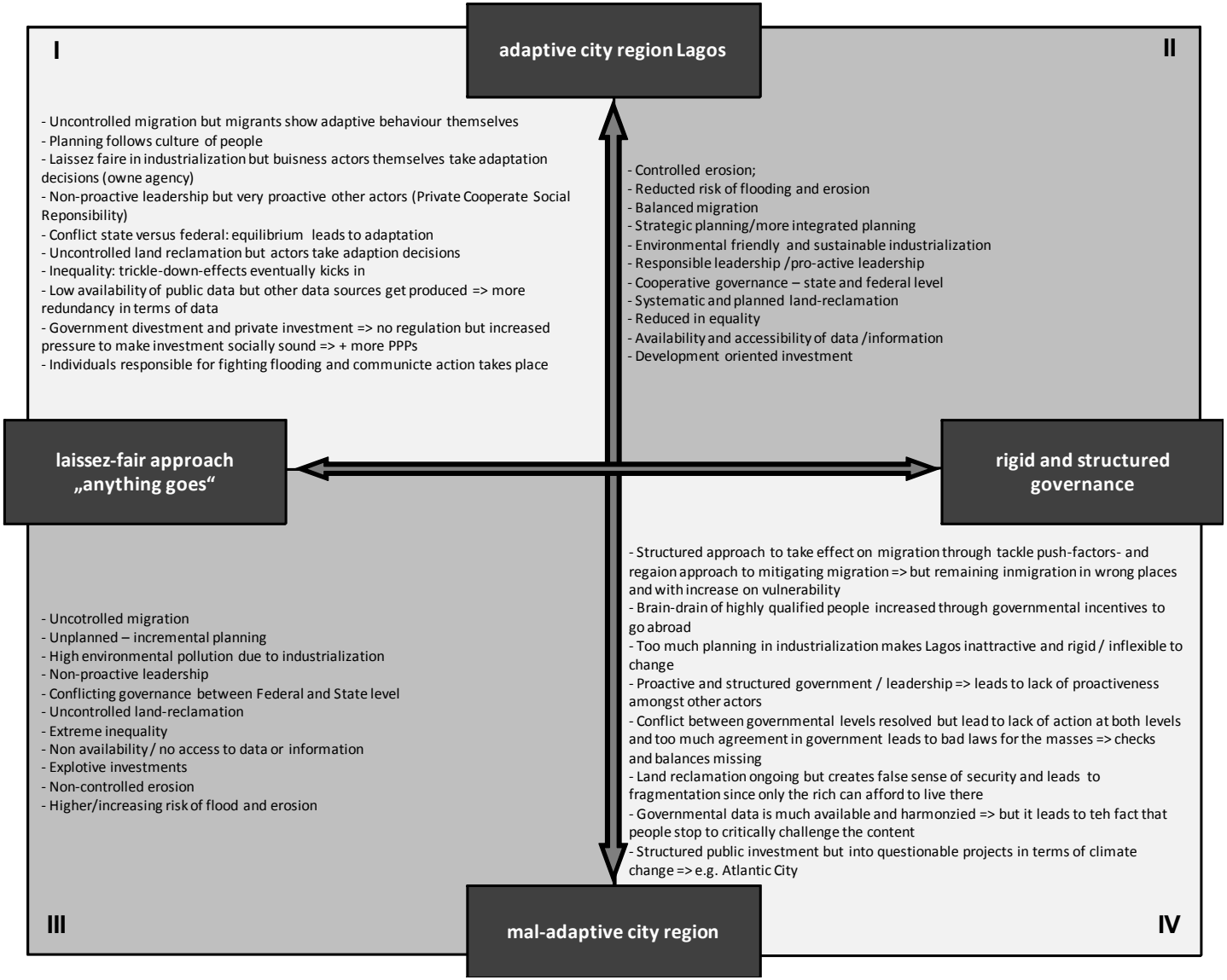
Spaces for reflection: scenario workshops

Two workshops in each case study city:

1. To establish relationships, access data, better understand drivers of adpative response and development visions
2. To presnet model findings and ply with preferences to conisder decision-making constraints and pathways for desired movement through adaptation.



Results from workshop 1, Lagos: Potential adaptation pathways in relation to wider socio-political trajectories



Next Steps

2014 Q4: Fix integration of three model components and pilot for London.

2015 Q1: Framing workshops in Kolkata, New York, Tokyo (and Shanghai)

2015 Q2, Q3: Calculate model for all cities

2015 Q4: Results workshops in all cities

2016 Q1, Q2: Sourcebook and publications.

http://www.bel-truc.org/

Additional slides

	month														
Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.1 Systematic literature review					D1.1										
1.2 A draft conceptual framework						D1.2									
1.2 Hypotheses for systems threshold breaching and resilience						D1.3									
2.1 Biophysical model development											D2.1				
2.2 Biophysical modelling on past and current data															D2.2
2.3 Biophysical modelling of future scenarios															
3.1 Risk Index development, incorporation of biophysical data												D3.1			
3.2 Production of risk scenarios for coastal vulnerability															
3.3 Assessing decision-making options															
4.1 Quantitative data collection planning									D.41						
4.2 Data quality and gap analysis											D4.2				
4.3 Case study kick-off meeting with key stakeholders									D4.3						
4.4 Case study scenario workshops															
4.5 Case study feedback and future agenda workshop															
5.1 Systematization of TRUC innovations															
5.2 TRUC final report															
6.1 Website Development		D6.1a													
6.2 Accademic publication							D6.2a								
6.3 Practitioner source book															
6.4 Learning resources															
7 Management	D7.1d						D7.1a								

	month																	
Task	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
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5.1 Systematization of TRUC innovations											D5.1							
5.2 TRUC final report											D5.2							
6.1 Website Development				D6.1b														D6.1c
6.2 Accademic publication													D6.2b					
6.3 Practitioner source book																		D6.3
6.4 Learning resources													D6.4					

Modelling work within TRUC: progress

Evaluation of SUEWS model in UK (and China)

- Model testing under wide range of conditions (multiple seasons and cities)
- Model development

Adaptation of SUEWS to meet the goals of TRUC

- Model outputs increased to provide information directly related to human health (e.g. thermal comfort)
- Linkage of societal decision-making, urban activities and urban form to model parameters (e.g. vegetation cover changes)
- Linkage of SUEWS to the World Risk Index
- Re-assessment of required model inputs (easily obtainable data)

Challenges

- Input data is not available for particular locations (are there suitable proxies?)
- Trade-off between spatial and temporal resolution
- Combining separately developed models designed for different purposes means all models need some adaptation to ensure consistency and compatibility

Modelling work within TRUC: future climate scenario