Foresight Future Flooding

Insights from the UK, China and USA studies

Paul Sayers MICE

24th May 2012

SAYERS AND PARTNERS

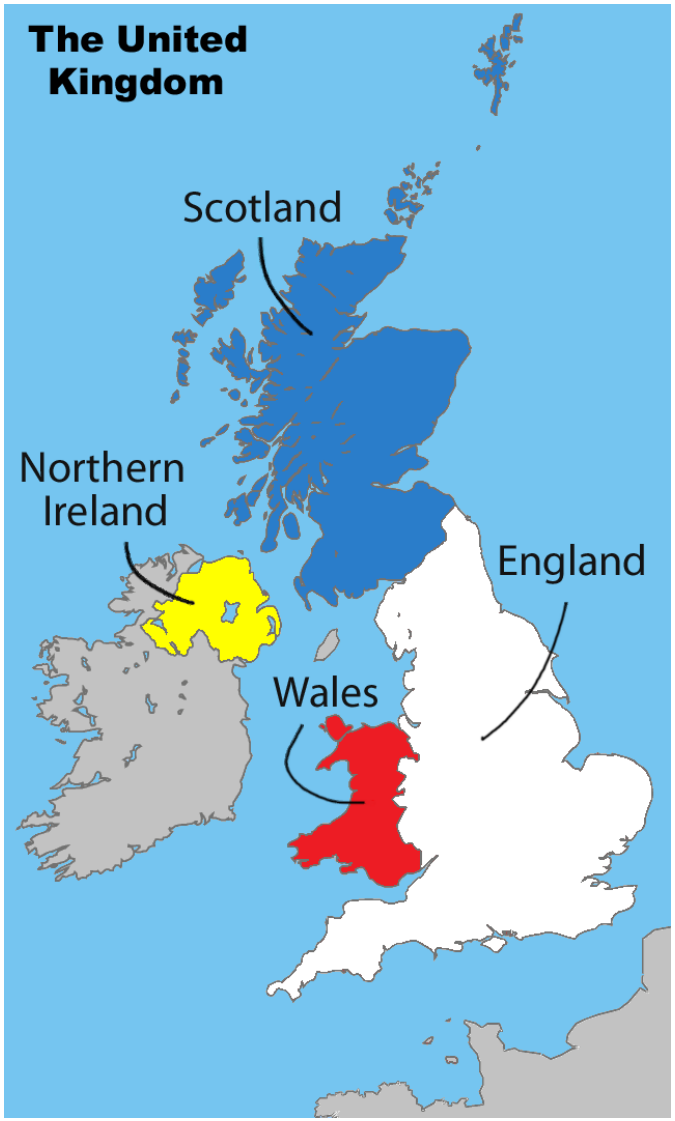
Foresight

Government Office for Science

Scope of the talk

- **Revise the Foresight projects and review the:**
  - High level lessons that may be learnt?
  - Barriers to delivering policy change?
  - Barriers to developing longer term strategic flood risk management?

An overview – UK Foresight study



Multiple sources of flooding considered

Headlines

Future increases in risk between 2x and 20x in a 'business as usual'

Portfolio of responses needed

Risk = f(**outrage**)

An overview – UK Foresight study

SAYERS AND PARTNERS

‘Short-comings’ of existing approaches highlighted

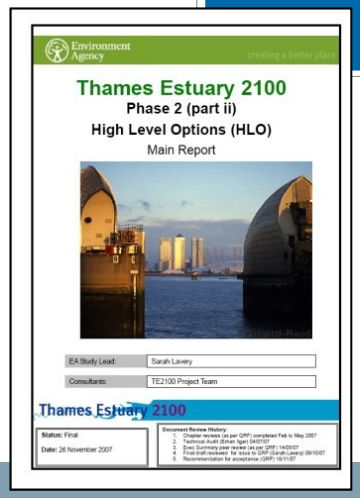
- A lack of imagination strategies proposed
- Poor connections between flood risk management and land use planning
- A reluctance to explore a full range of uncertain, by plausible, futures
- The lack of joined up thinking in managing all sources of flood risk

An overview – UK Foresight study

SAYERS AND PARTNERS

and promoted new:

- **Policy** - Government Policy of Making Space for Water
- **Organisation** - Promoted the Environment Agency to take a strategic overview of "all sources of flooding"
- **Planning –** specific promotion of new planning guidance (PPS 25) with a presumption of not building in the flood prone areas
- Influenced regional **Strategy planning** (e.g Catchment, Shoreline and Estuary Plans, e.g.TE2100)



An overview – US Foresight

- **What we did**
  - **Workshop** (2008) – Army Corps of Engineers (ERDC, Risk Centre), FEMA, Water Resources, Urban planners
  - **Scoping** of regional Foresight Study (Schultz, et al 2010)
- **Background to the exchange**
  - A number of major events – Katrina, 2005 – was forcing a rethink towards a more strategic risk based approach

An overview – US Foresight

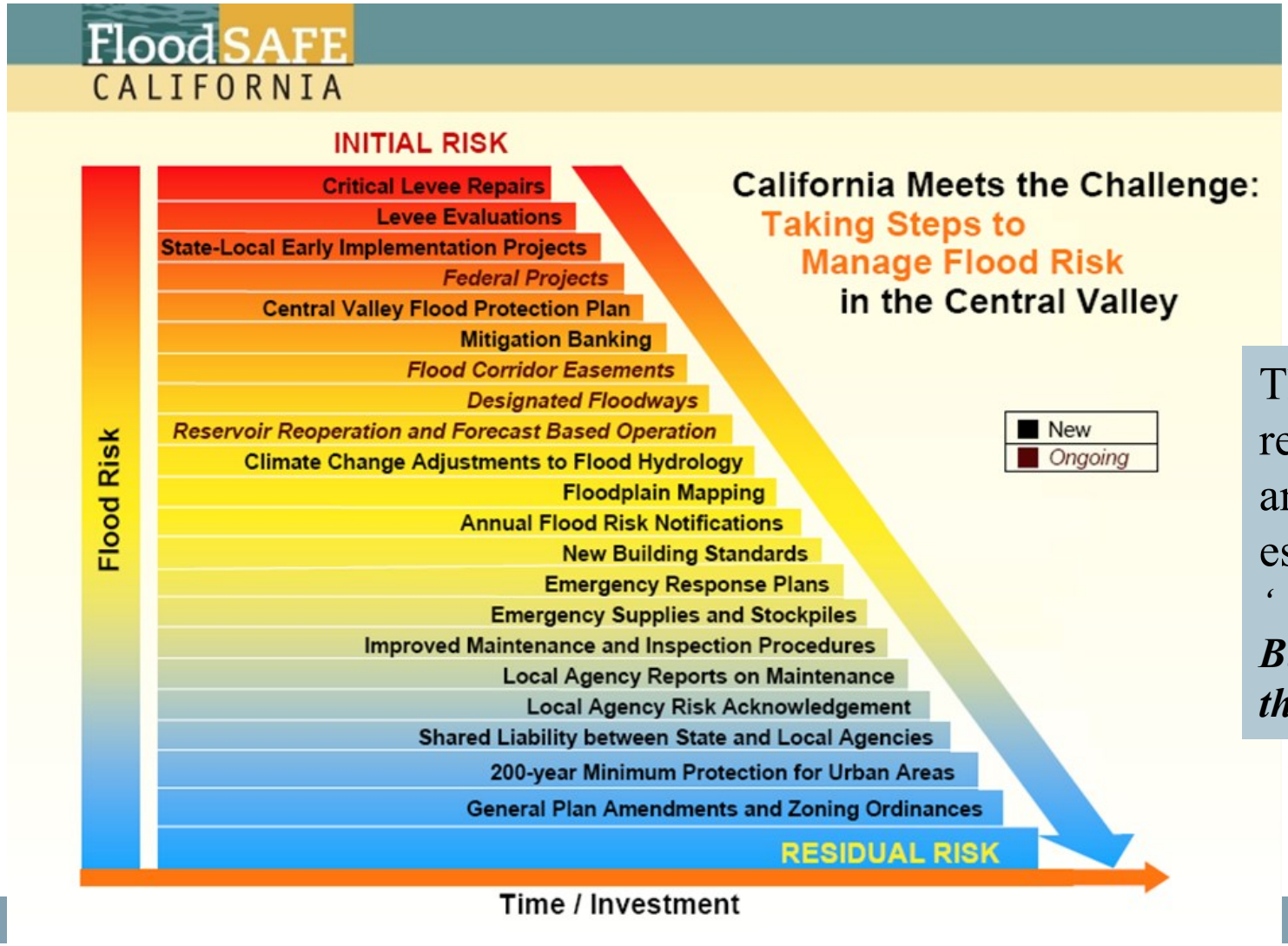
SAYERS AND PARTNERS

Headlines

- Multiple responsibilities – **but no lead**
- **No process of strategic planning** – recognised as a serious barrier to sustainable choices
- Major investment needs - Estimated **$2trillion** needed to improve existing levees to a desirable standard (Steve Stockton, US Army Corp) – **but no means of prioritising investment**
- Significant loss of life possible (hurricanes e.g. New Orleans - flash floods e.g. San Antonio) – **but unclear how to determine an approach level of investment to reduce the risk to life.**

An overview – US Foresight

Enables of strategic risk approach where starting to emerge



The concept of residual risk and portfolios established

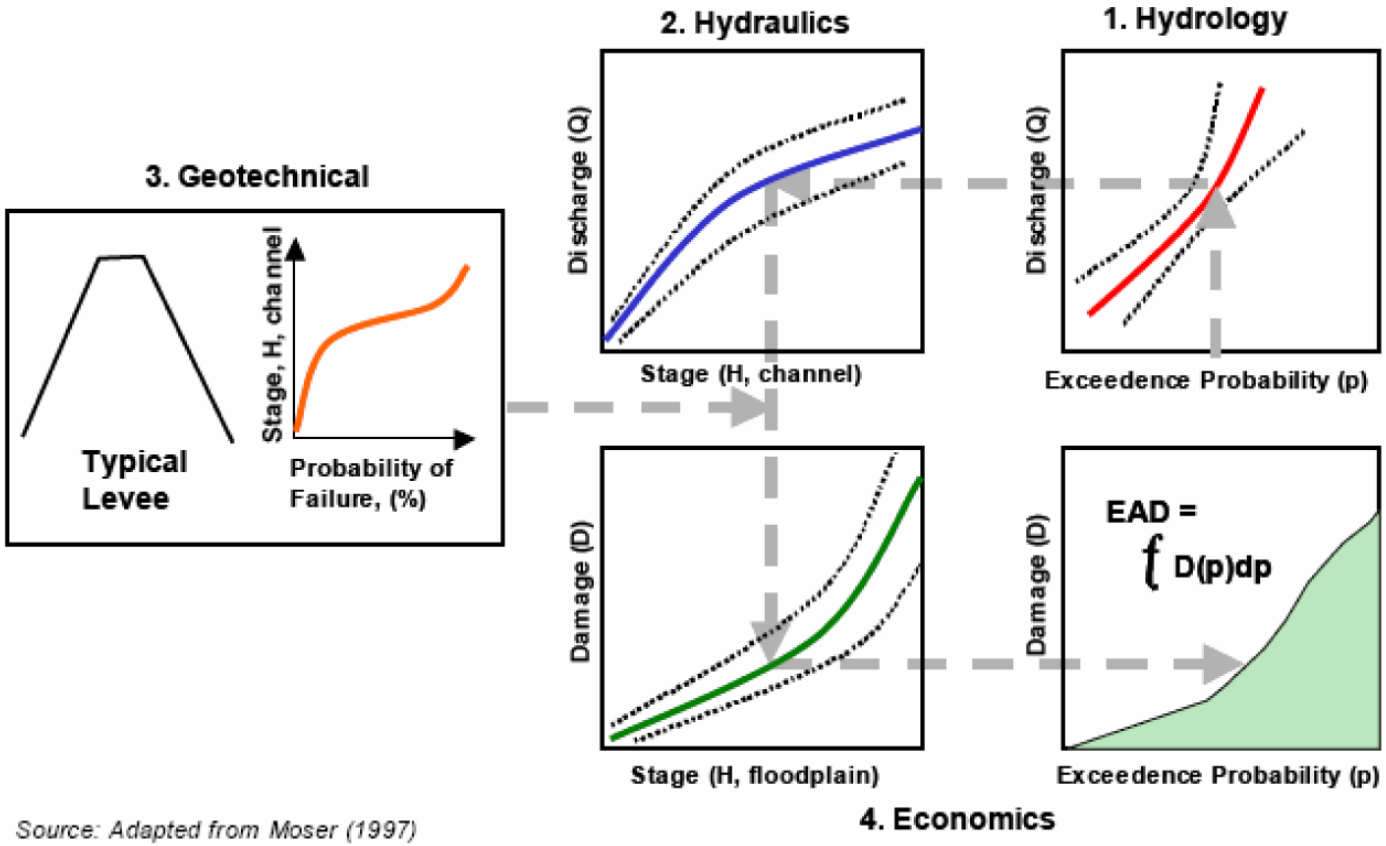
‘***Buying down the risk’***

An overview – US Foresight

Enables of strategic risk approach where starting to emerge

- The concept of residual risk and portfolios established
- The concept of a system risk model well-established

HEC-FDA (Flood Damage Assessment)
HEC-FRM (Flood Risk Management)



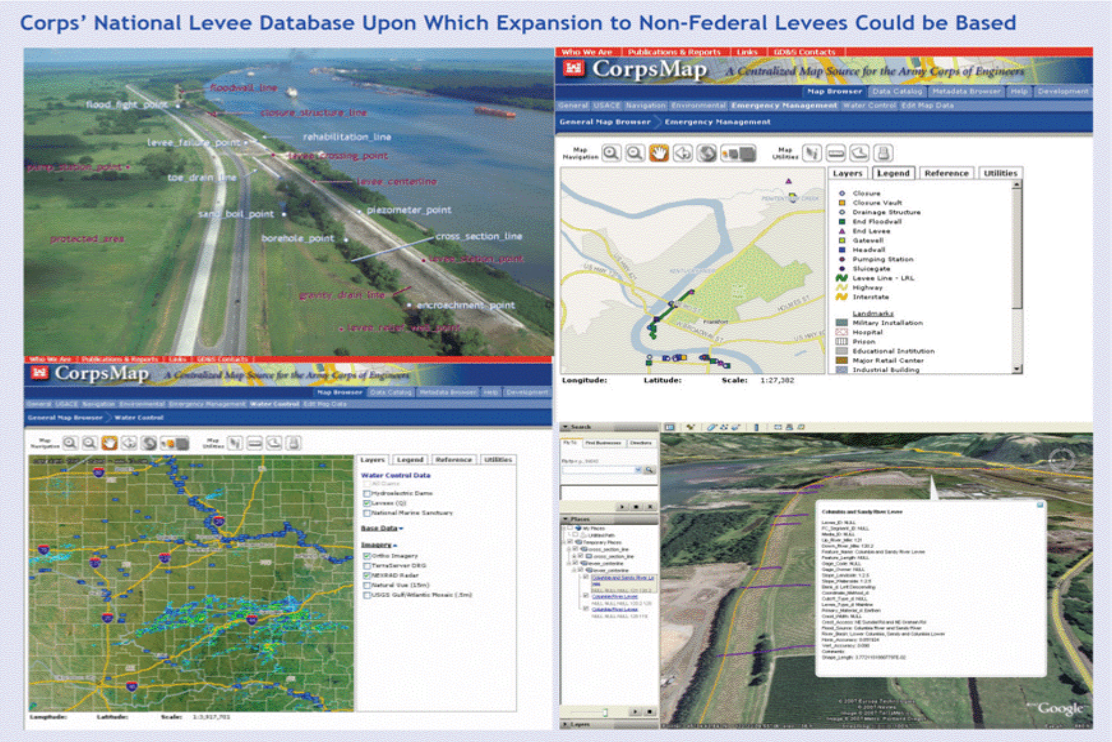
Source: Adapted from Moser (1997)

An overview – US Foresight

SAYERS AND PARTNERS

Enables of strategic risk approach where starting to emerge

- The concept of residual risk and portfolios established
- The concept of a system risk model established
- Good coverage of available data and getting better (central databases promoting *collect once use many times* principle)



An overview – US Foresight

SAYERS AND PARTNERS

Barriers to success – undermining a strategic approach

- **Local schemes promoted and costs shared**
  - Locals want protection not relocation
- **Loss of life drives acceptable risk focus**
  - Requiring defence standards to be set making prioritisation between areas difficult/impossible
- **Future change**
  - Uncertainty in future change – considered too be high and therefore ignored?!
- **The 'tail wagged the dog' - Insurance**
  - Mandatory insurance for those outside of the 'protection' of certified leveed made living in defended areas desirable and appear 'officially safe'

An overview – US Foresight

SAYERS AND PARTNERS

So, conclusions….

- **It was not possible to take a develop a high level strategic plan because:**
  - No clear lead with responsibility for taking a long term view
  - No organisation ready to challenge the status quo
- **The US recognise this and are trying to…..**
  - Establish a strategic planning layer and associated organisational responsibilities.
  - Recognising the future regrets that often follow autonomous local choices

An overview – China in flood (courtesy Prof Cheng, IWHR)

Guangzhou, 7 May 10

Wuzhou, Guangxi, 22 June 05

Beijing in 10 July 04

Wuhan 18 June 11

Flash flood Jinan July 18, 2007

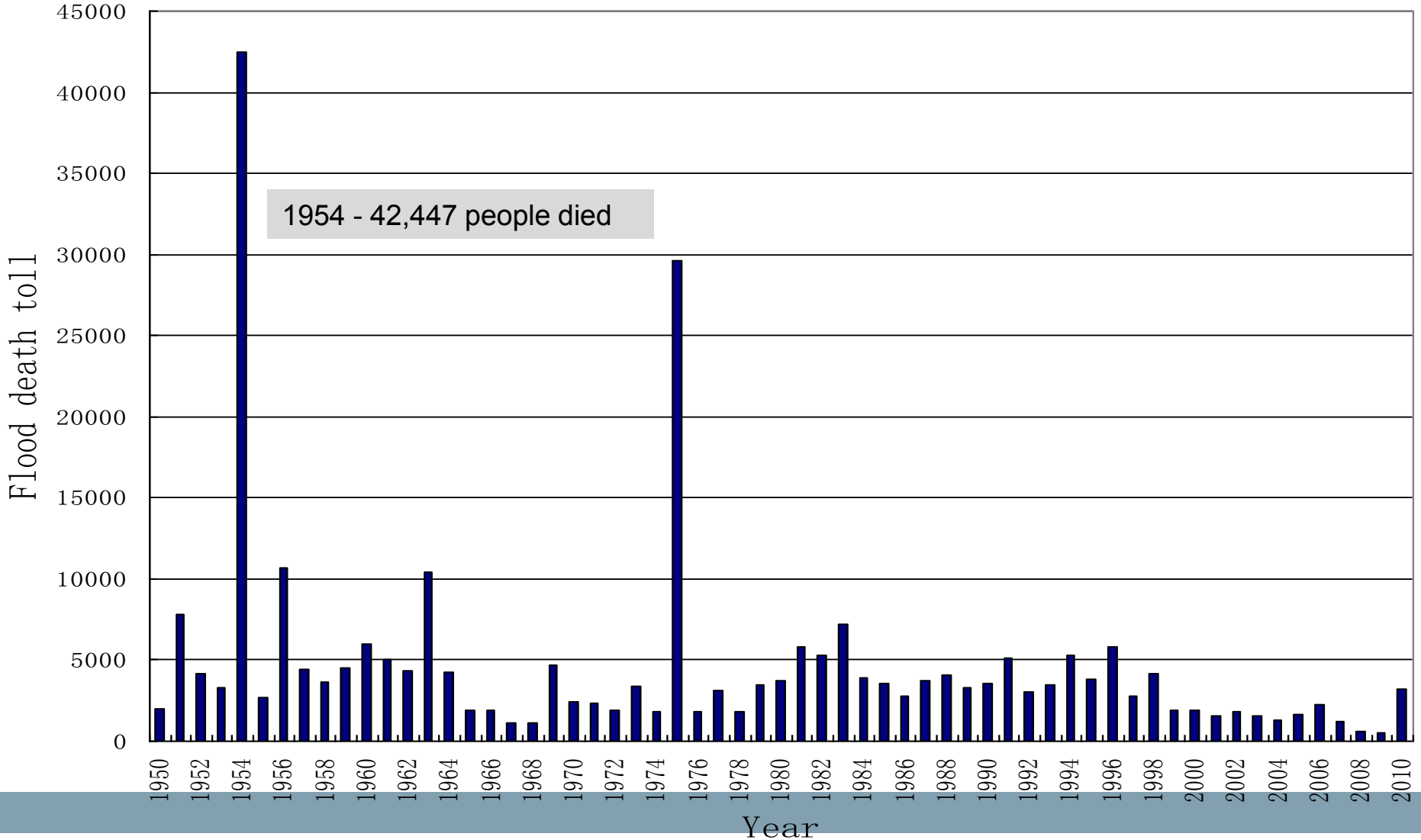
An overview – China in flood (courtesy Prof Cheng, IWHR)

SAYERS AND PARTNERS

Loss of life

The 1931 Yangtze & Huai River basins,

51 million people affected and 400,000 died

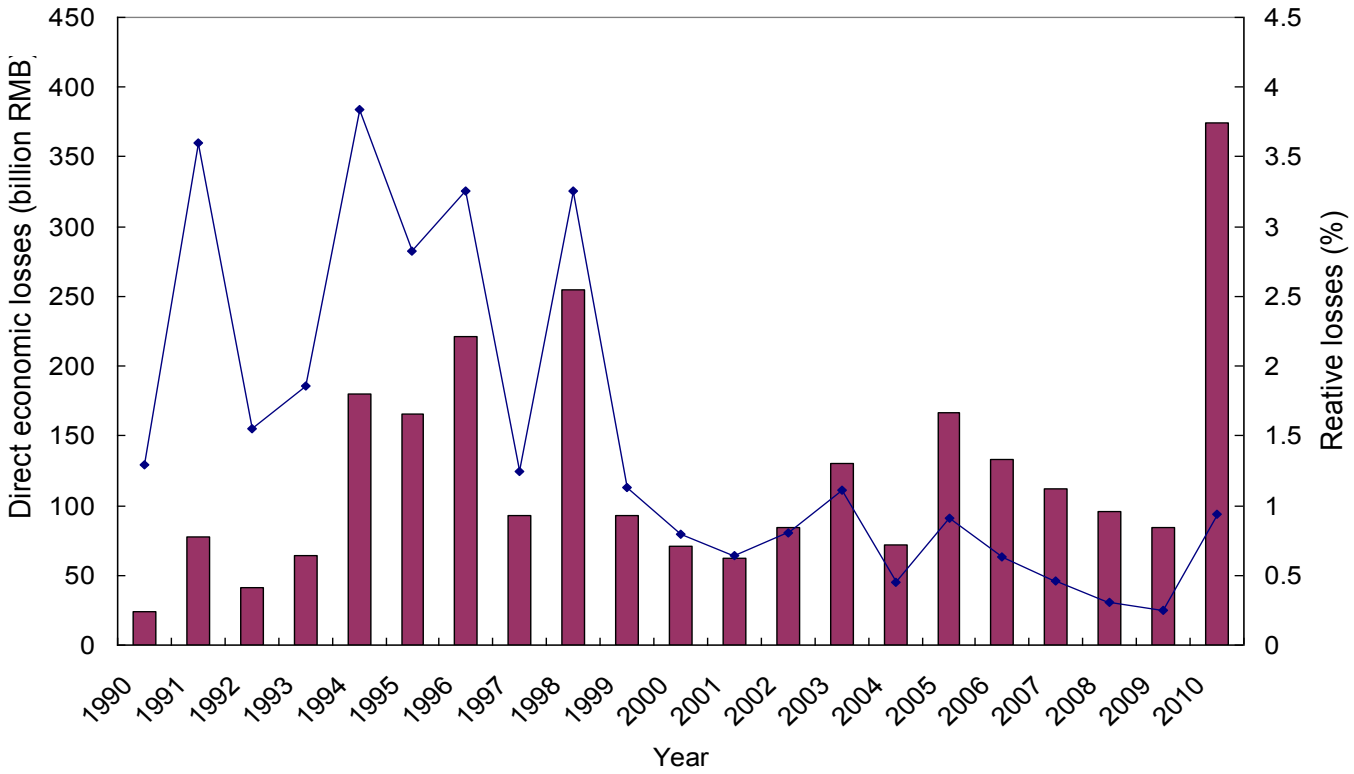


An overview – China in flood (courtesy Prof Cheng, IWHR)

SAYERS AND PARTNERS

Flood economic losses in China (1990-2010)

In 2010 more than 250 cities at or above the county level were inundated; most caused by the local rainstorms.



China - Regional Study: Taihu Basin

SAYERS AND PARTNERS

Some interesting early discussions:

- **Risk**
  - Starting point, 'risk' not well established – focused on flood hazard (flood control)
- **Data**
  - Very sparse and poor data
- **Terminology**
  - The risk of language – few common meanings
  - 'Foresight' - no obvious translation

China - Regional Study: Taihu Basin

SAYERS AND PARTNERS

Barriers to adopting a strategic risk approach….

- **Believing history is a good guide to the future**
  - Historical 'worst' case floods typically used as design criteria (extremes values, non-stationarity – live debates – but no clear guidance)
- **Short term planning horizon**
  - 5 years typically adopted – promoting the status quo and preventing the implementation of 'new approaches' (after considerable discussion 20 years horizon agreed for Foresight)
- **Lack of joined up Governance**
  - Tensions between Local Cities, TBA, Regional and National Governments – just the same!

China - Regional Study: Taihu Basin

SAYERS AND PARTNERS

Facilitators to adopting a strategic risk approach….

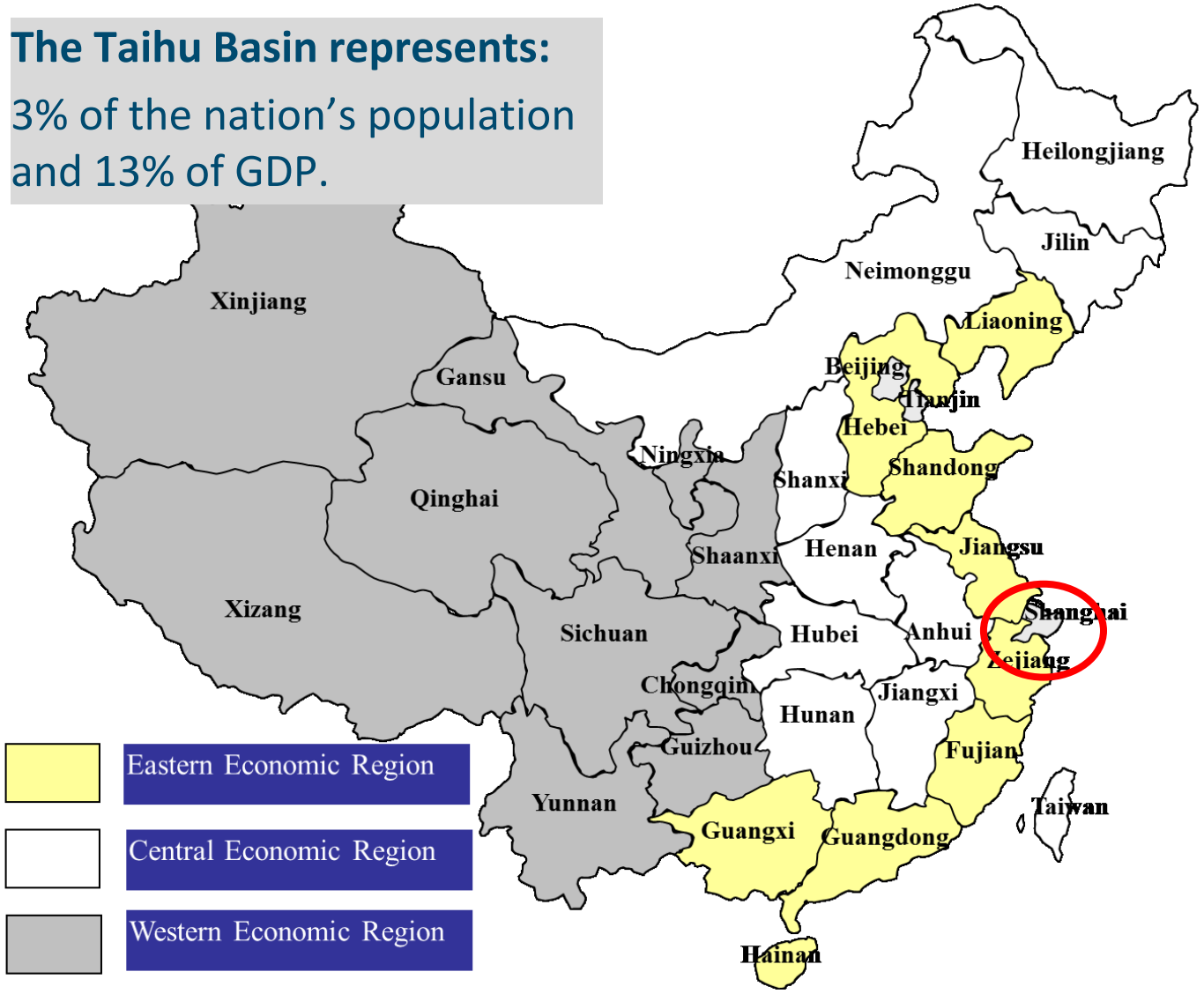
- **A willing and collaborative team with a common goal**
- **The right team**
  - UK Foresight Team
  - Institute of Water and Hydropower Research (IWHR)
  - Taihu Basin Authority (TBA)
- **A belief in a risk approach and an acceptance of uncertainty**

China – Foresight Regional Study: Taihu Basin

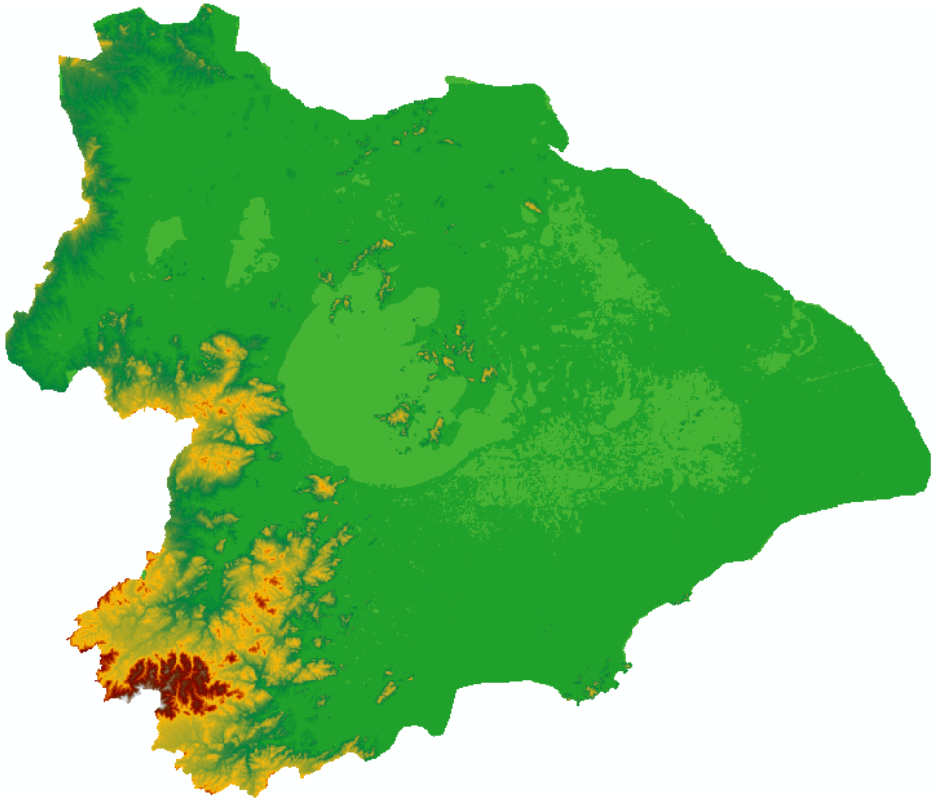
SAYERS AND PARTNERS

The Taihu Basin represents:

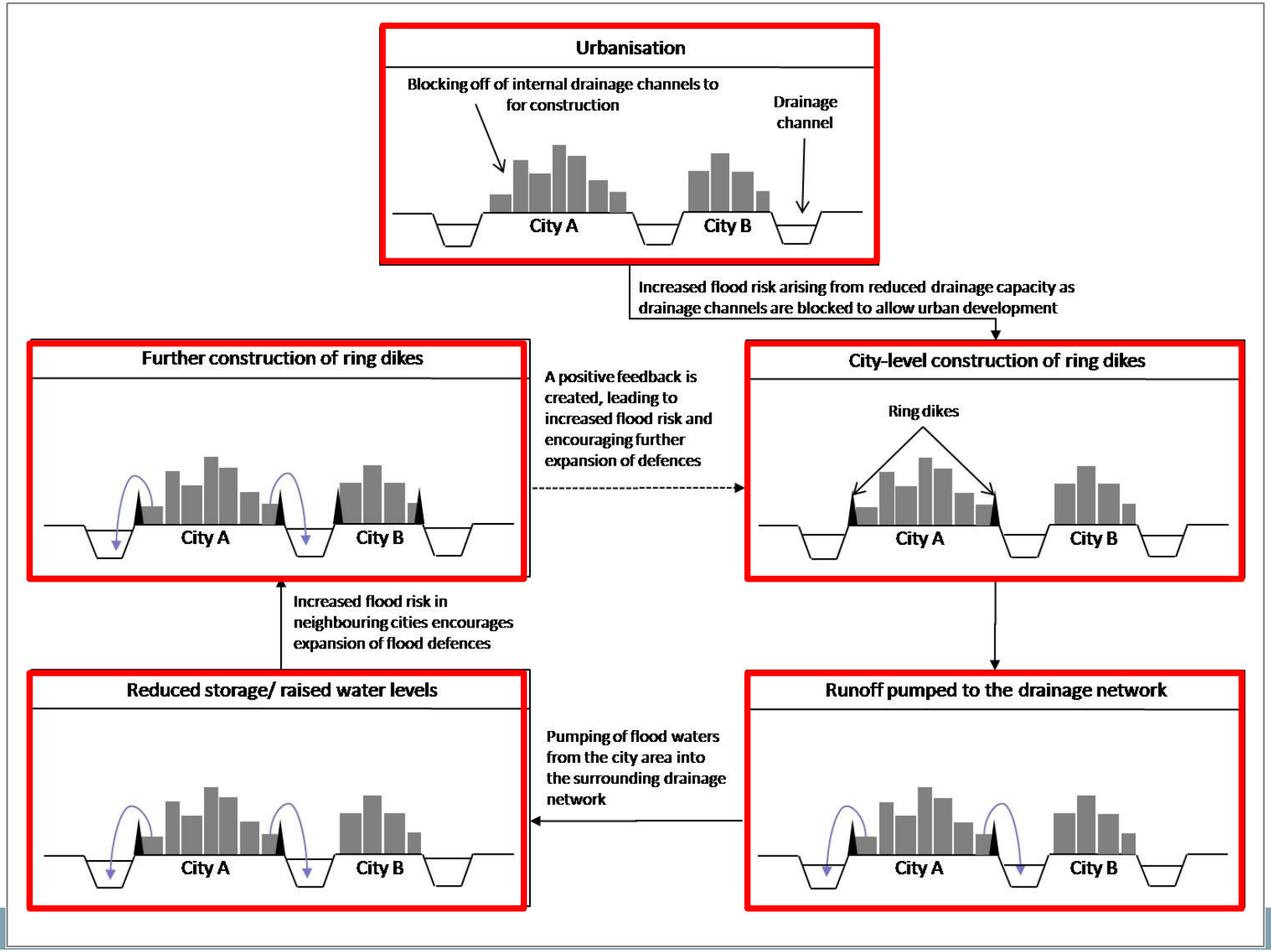
3% of the nation's population and 13% of GDP.



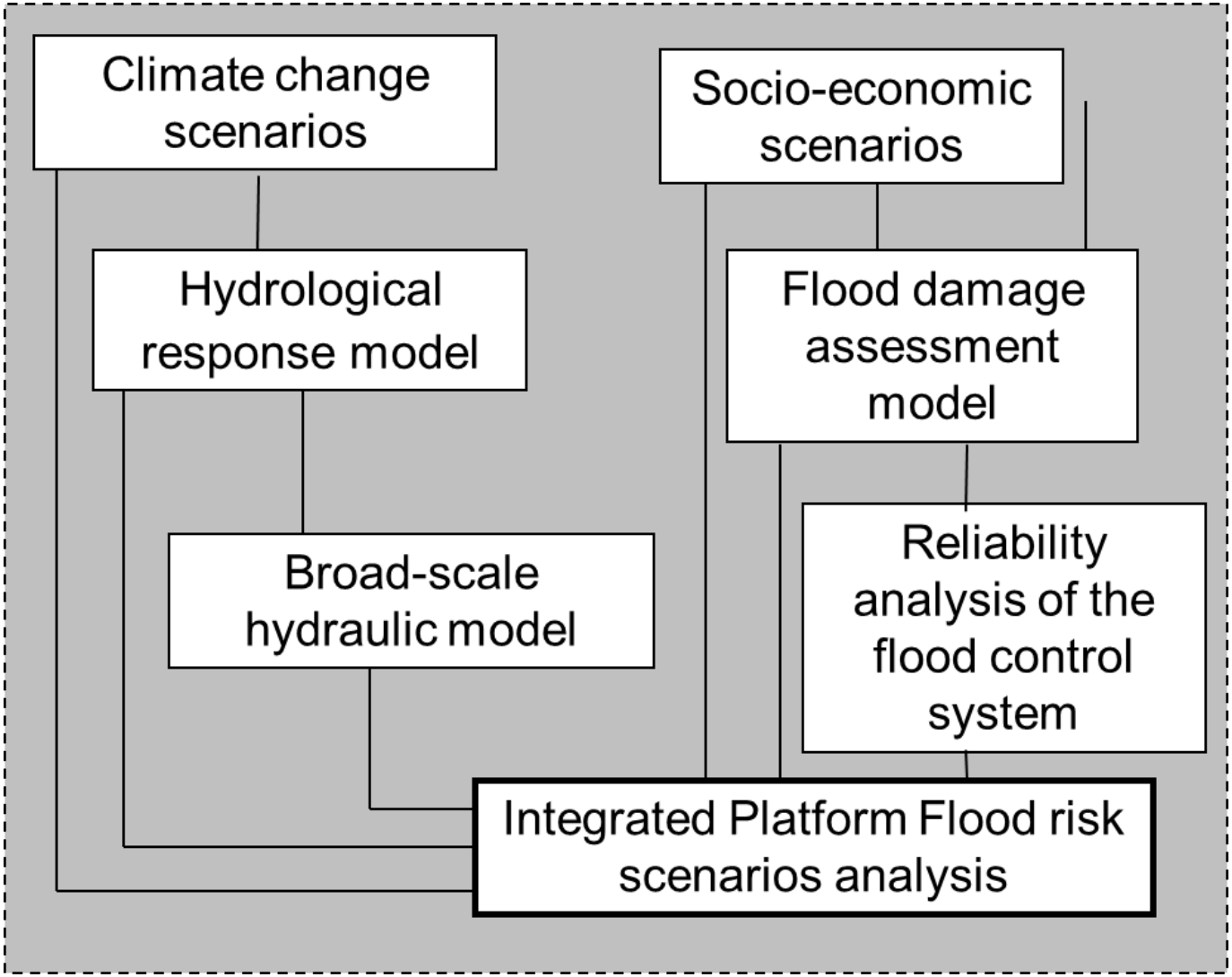
China - Regional Study: Taihu Basin



The development of flood system in Taihu Basin



Quantified analysis in Taihu

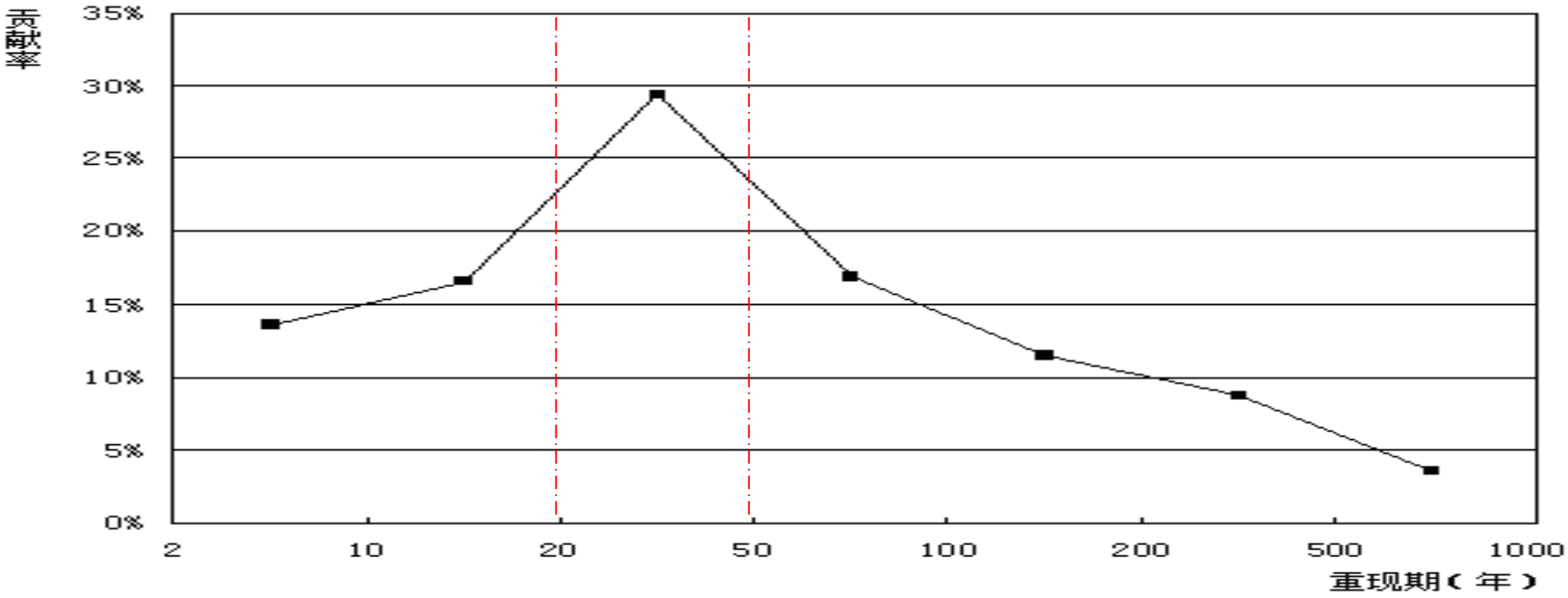


Note:
A rapid running broad scale risk model was developed - replacing a highly detailed (un-useable) existing model.

This enabled multiple runs to be completed and 'what-if' tests to be explored.

China - Regional Study: Taihu Basin

- Results – What did they show
  - Rare floods contribute little to the EAD and is dominated by more frequent floods
  - Socio-economic development and deterioration of the levee systems domains future changes in risk.



Lessons from China

SAYERS AND PARTNERS

- **Some general insights**
  - The 'Foresight process' translated well to China, but in an adapted , not transplanted, form
  - Developed an evidence base that could be used to support decisions
  - Reinforced the C*onfucian* ideal of ***harmony*** – achieving social harmony requires *'the river to have its natural way'*…**No idea is new only refound**…!

China/UK scientific cooperation project

Scenario Analysis Technology for River Basin Flood Risk Management in the Taihu Basin

Summary report

Foresight
Government Office for Science

The University of Nottingham

Foresight type work in the Netherlands

- **Delta Commission 2008**
  - In response to Katrina causing concerns about NL flooding safety
  - Aim: long term national strategy for dealing with sea level rise

DELTACOMMISSIE 2008

- **Starting points:**
  - Here to stay! → Not considering moving to Germany…
  - Sea Level Rise: high scenarios

Foresight type work in NL

SAYERS AND PARTNERS

- **Outcomes:**
  - Defences: B/C-analysis shows economic optimum is to increase defence standards by factor 10
    – up to 1:100,000 per year!
  - Increase 'room for the river' and other measures
  - Costs: €1-1.8 billion per year up to 2100

- **Impact:**
  - Principles accepted by politicians and public
  - 5 key 'Delta decisions' for government to make in 2014
  - Follow-up embedded in law and policy

http://www.deltacommissaris.nl/english/

Conclusions – Common findings

SAYERS AND PARTNERS

A wide acceptance that ‘good’ policies promote the need to:

- **Learn to live with floods** (In harmony, Making Space for Water, Room for the River)
- **Take a long term view**
- **Consider many drives of future change** (climate change is important but socio-economic change is often more so)
- **Promote imaginative portfolios of responses**
- **Explicitly recognise uncertainty and look for robust choices**

Conclusions – Common findings

SAYERS AND PARTNERS

But perhaps the most difficult….and perhaps important…

- **Getting the balance right - Localisation v strategic overview**
  - **US** – They are trying to establish a strategic planning layer and associated organisational responsibilities. They recognise, through experience, that the future regrets that often follow autonomous local choices
  - **UK** - The UK is trying to promote greater local responsibility for decisions made. They recognise that without 'buy-in' of local communities strategic plans – however good on paper - can not be delivered.

But don't believe us….

The impact is of far-reaching significance in China . It brought a new understanding and methodology in flood risk scenario analysis for large basins, and is helping us make wise decisions in flood risk management for the sustainable development.

Professor Xiaotao Cheng
Director, Department of Water Hazard Research
China Institute of Water Resources and Hydropower Research