NATURE AND CLIMATE NEXUS

Nature-Based Solutions for Urban and Rural Landscapes

Lecture Series + Project Design Clinic
17–19 September 2024 • ADB Multifunction Halls 2 and 3 • Hybrid

This training is organized by **the ADB Environment Group** together with the **Water and Urban Development Sector Group,** and the **Agriculture, Food, Nature, and Rural Development Sector Office.**

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SECTION/CHAPTER 1

NBS in practice, and key considerations for implementing at scale

Speakers

Resilient watersheds/rural expert

Erik Spiro-Larrea

Senior Engagement Manager
(Nature for Water Facility)
The Nature Conservancy

Urban expert

Lyndon DeSalvo

Urban Conservation
Program Manager
The Nature Conservancy

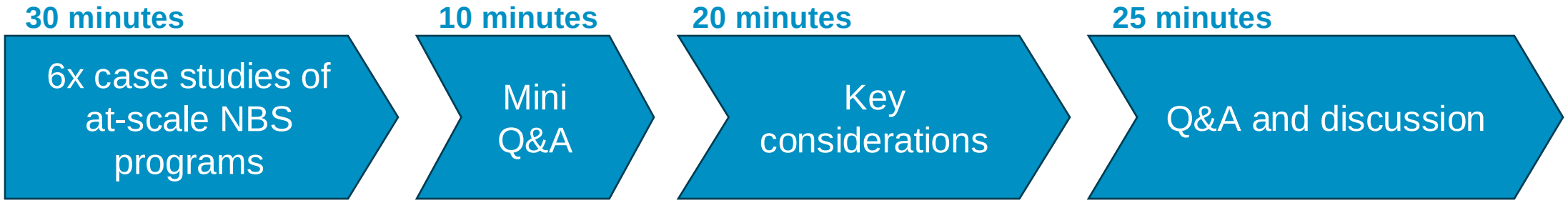
Urban expert

Ben Furmage

Chief Executive Officer
Water Sensitive Cities
Australia

Plan for this session

We will spend the first 30 minutes presenting six case studies, have a 10-minute discussion, and then run through some of the key considerations for doing NBS at scale.



Please enter your questions and discussion points at the Menti 2486 9344. We will come back to this at the end and have an opportunity for you to vote for your favourite submissions, which we will then discuss.

Structure of this session

- **NBS in practice**
  - Camboriu, Brazil
  - Norfolk, UK
  - Kruger, RSA
  - Washington, USA
  - Australia
  - Kunshan, China
- **Key considerations for implementing at scale**
  - Program-level approach
  - Multiple step process
  - Recap

Discussion

Discussion

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NBS in practice

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Key considerations for implementing at scale

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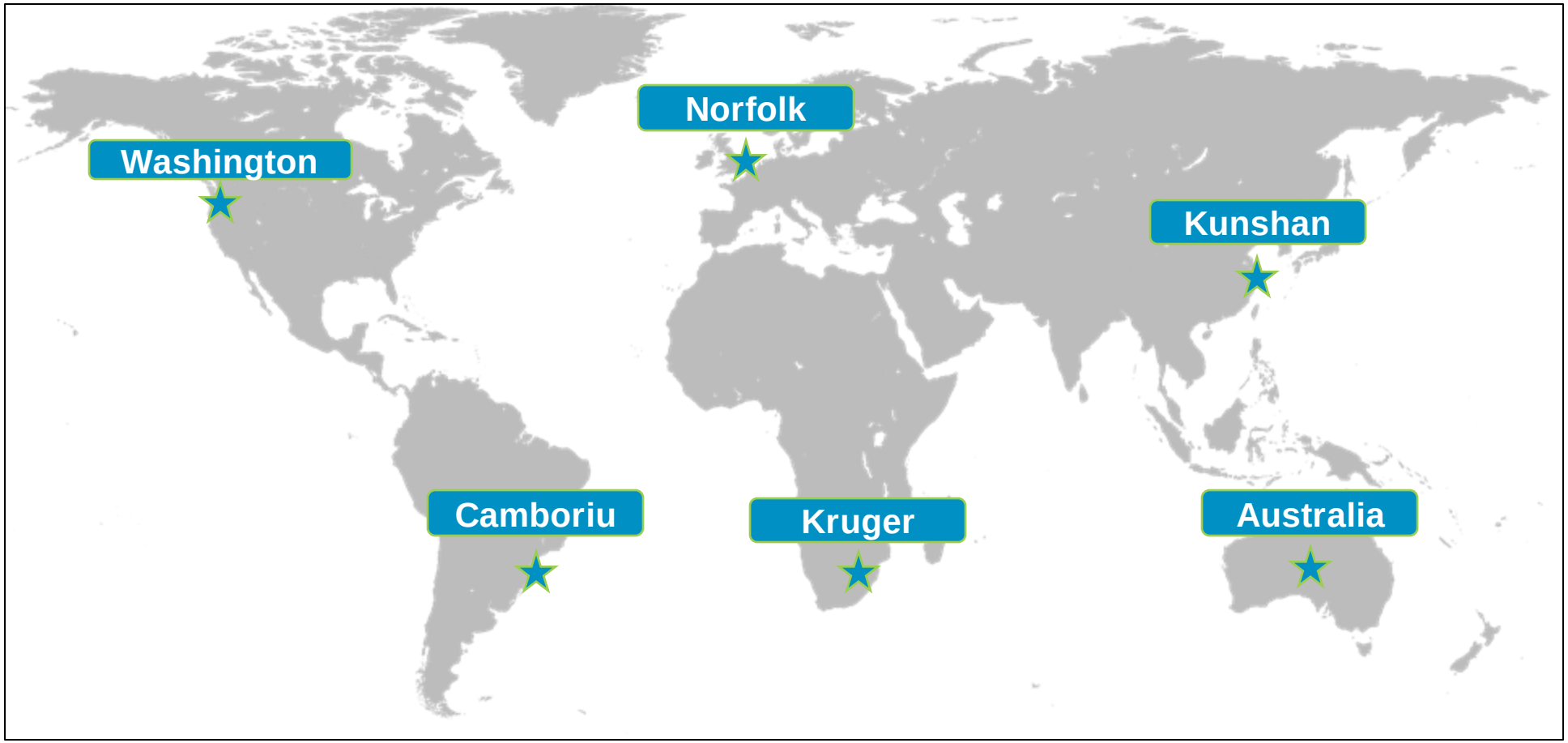
Discussion

Discussion

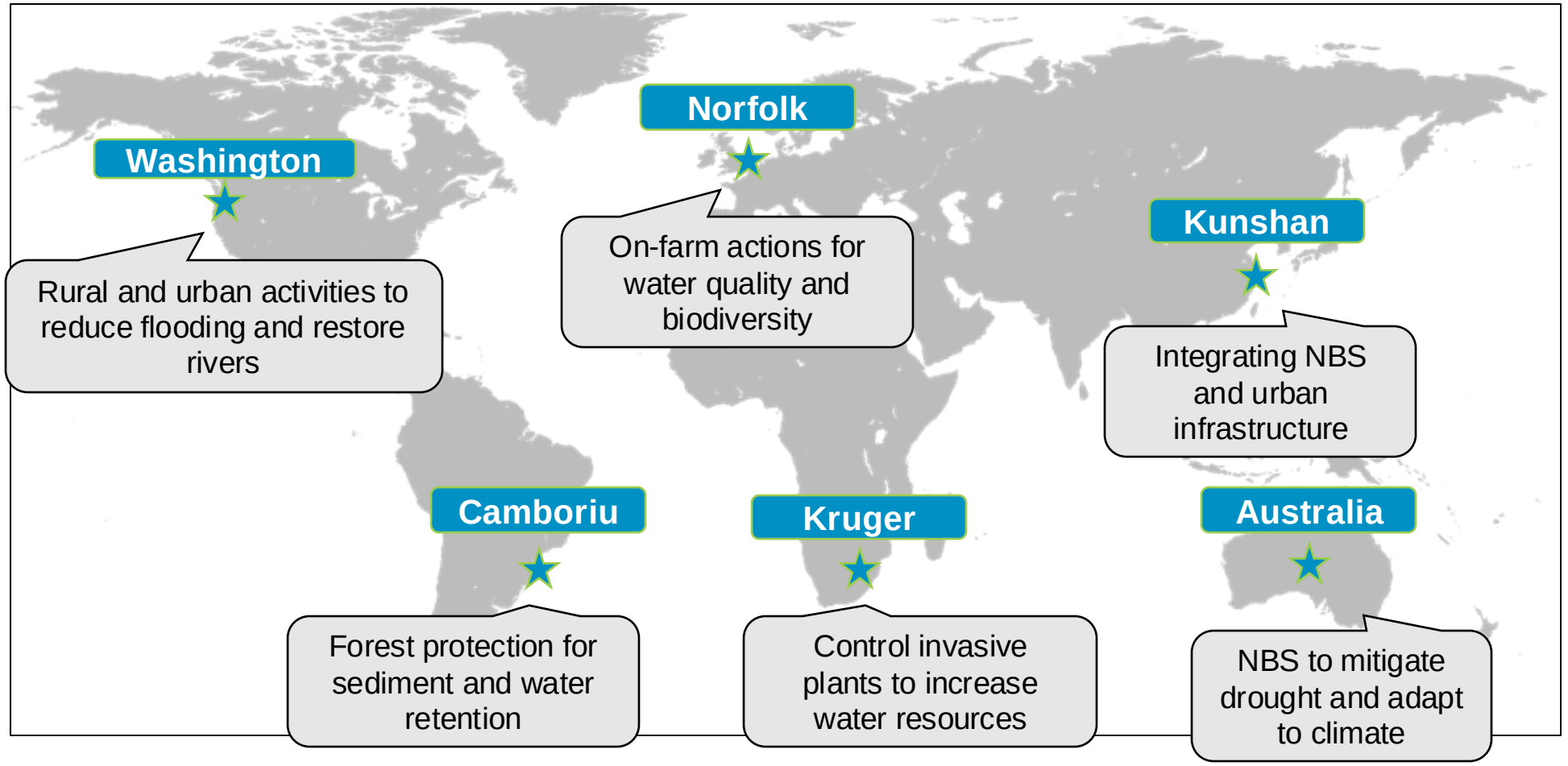
Case studies

We will run through six examples of at-scale NBS programs around the world.



Case studies

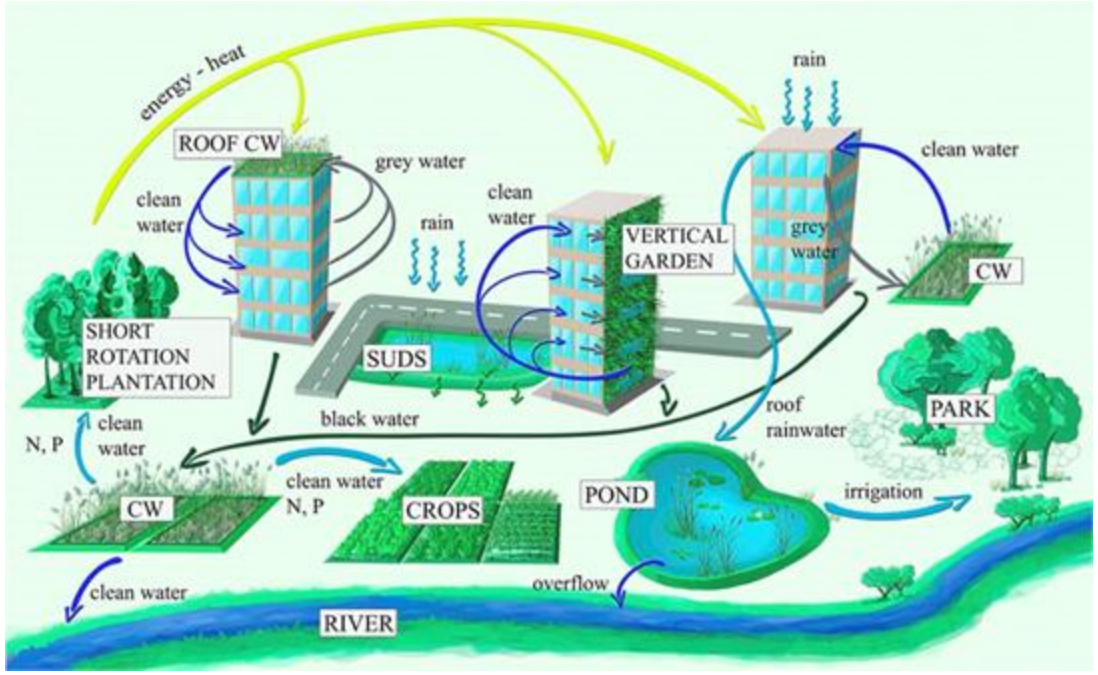
Each of these examples is responding to different challenges and using different NBS.



Hybrid Urban NBS

- Three quarters of 2050's infrastructure doesn't yet exist. We need to integrate nature into infrastructure as we build it.

- Includes green and hybrid infrastructure:
  - To control surface run-off volumes and timing and hence reduce the risk of flooding during heavy rainfall events
  - Sustainable urban drainage systems to reduce storm water volumes through interception, evaporation and infiltration
  - As part of treatment systems to improve water quality



Masi et al. (2018) Journal of Environmental Management, Vol. 216, 275-284

Structure of this session

NBS in practice

- **Camboriu, Brazil**
- **Norfolk, UK**
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Discussion

Key considerations for implementing at scale

- **Program-level approach**
- **Multiple step process**
- **Recap**

Discussion

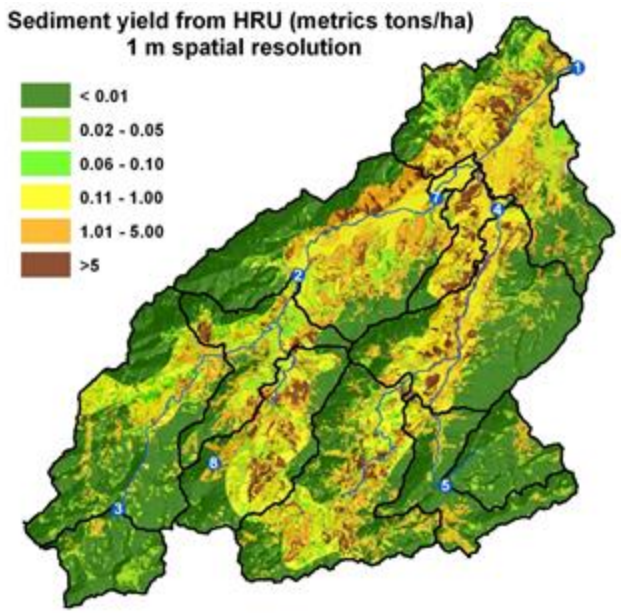
Camboriu – Overview

Location	Santa Catarina state, Southern Brazil
Key beneficiaries	Empresa Municipal de Água e Saneamento EMASA
Key challenges	Treatment cost (sediment) Dry-season water availability
Key metrics of success	WTP treatment cost Water losses in dry season
Priority co-benefits	Sustainable livelihoods; Urban flooding; Biodiversity

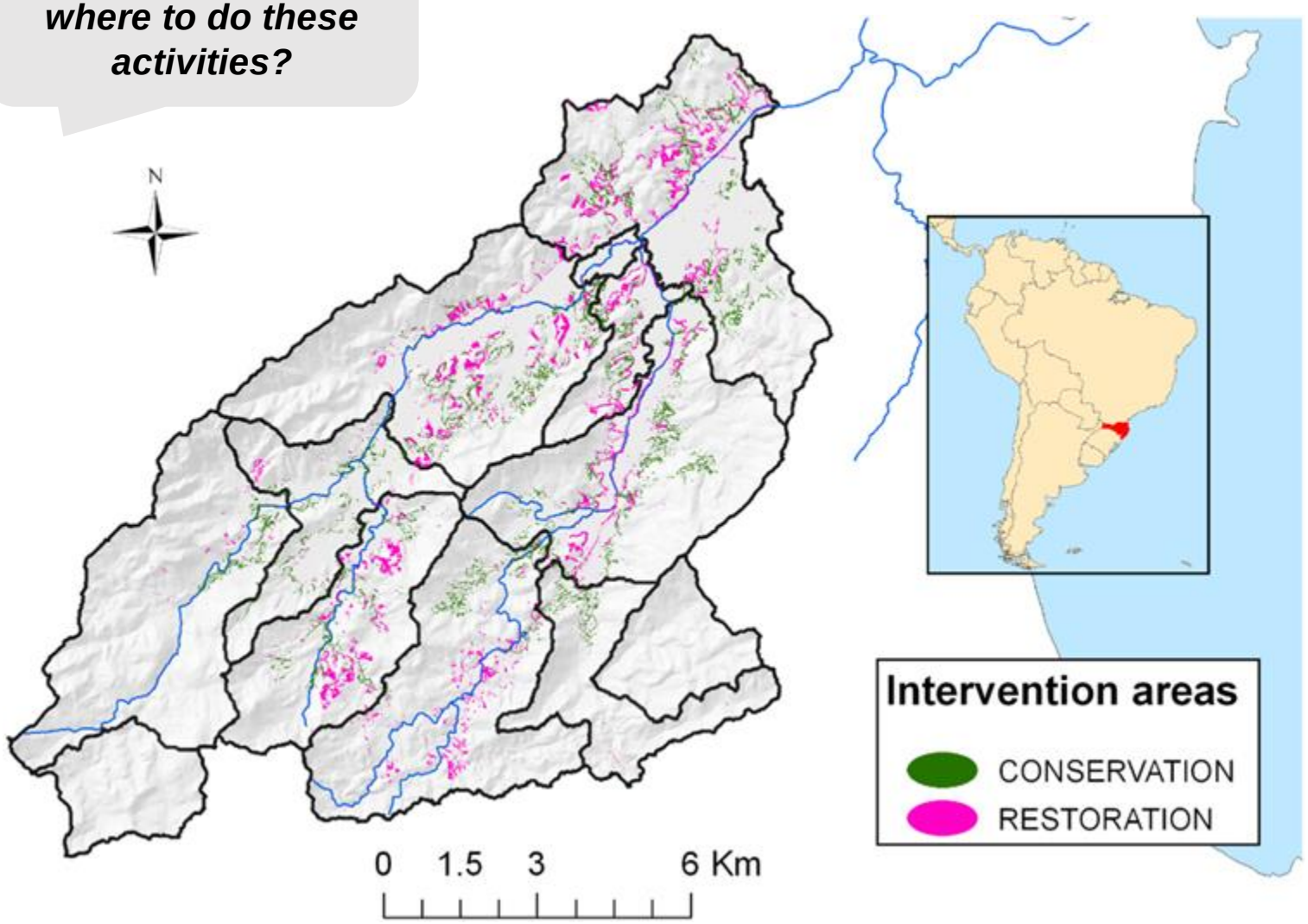
Camboriu – Geographic context

Priority interventions for watershed area

Reforestation;
Riparian buffers & livestock exclusion;
Forest conservation



How to prioritise where to do these activities?

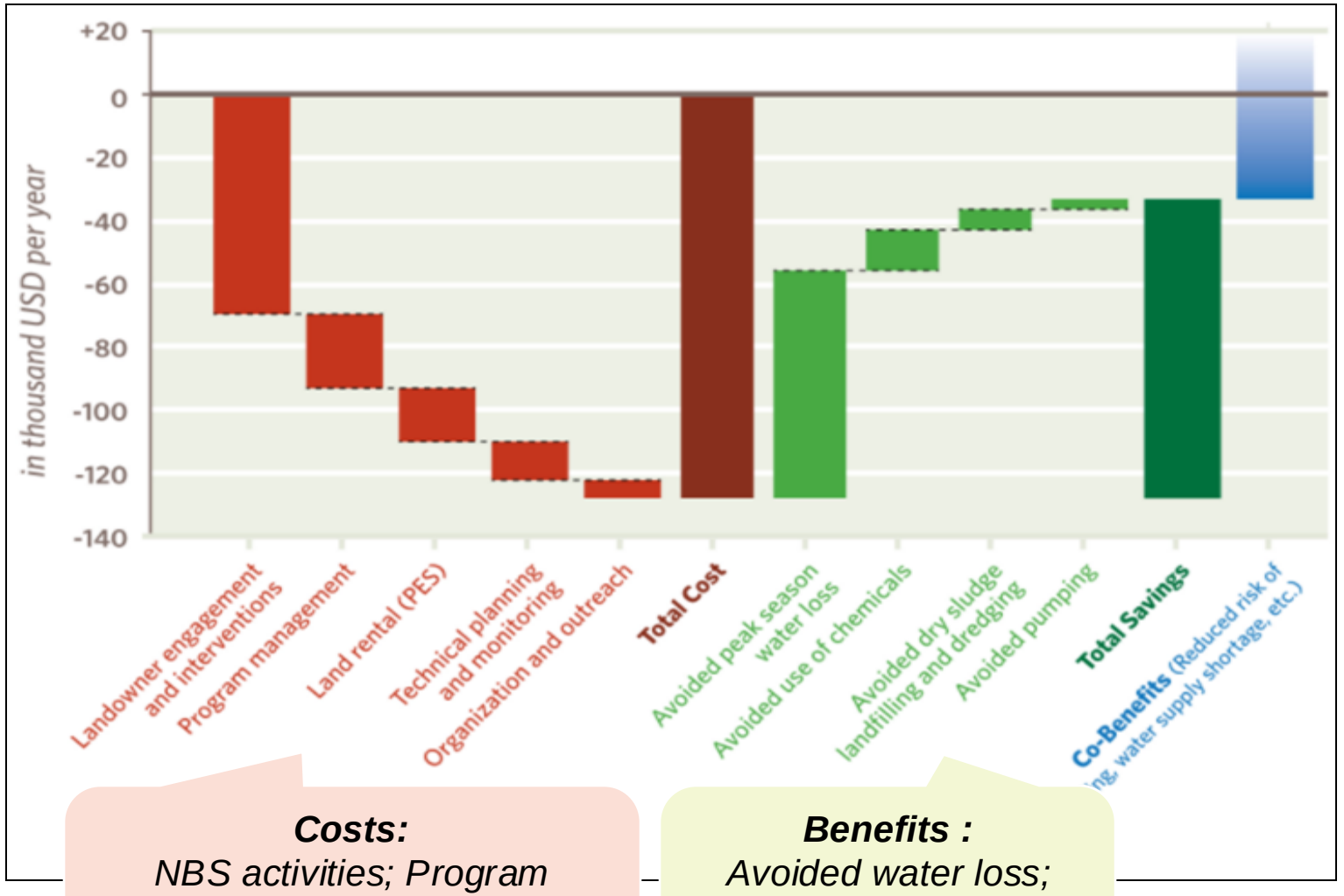


Camboriu – Economic analysis

Objective: use economic analysis to justify a change in regulation to allow for investment in nature

What would you want to assess to understand this?

Reductions in sediment treatment cost and water losses offset 80% of the water company's investment in the program, justifying policy change. Co-benefits sufficient to raise remainder of funding.

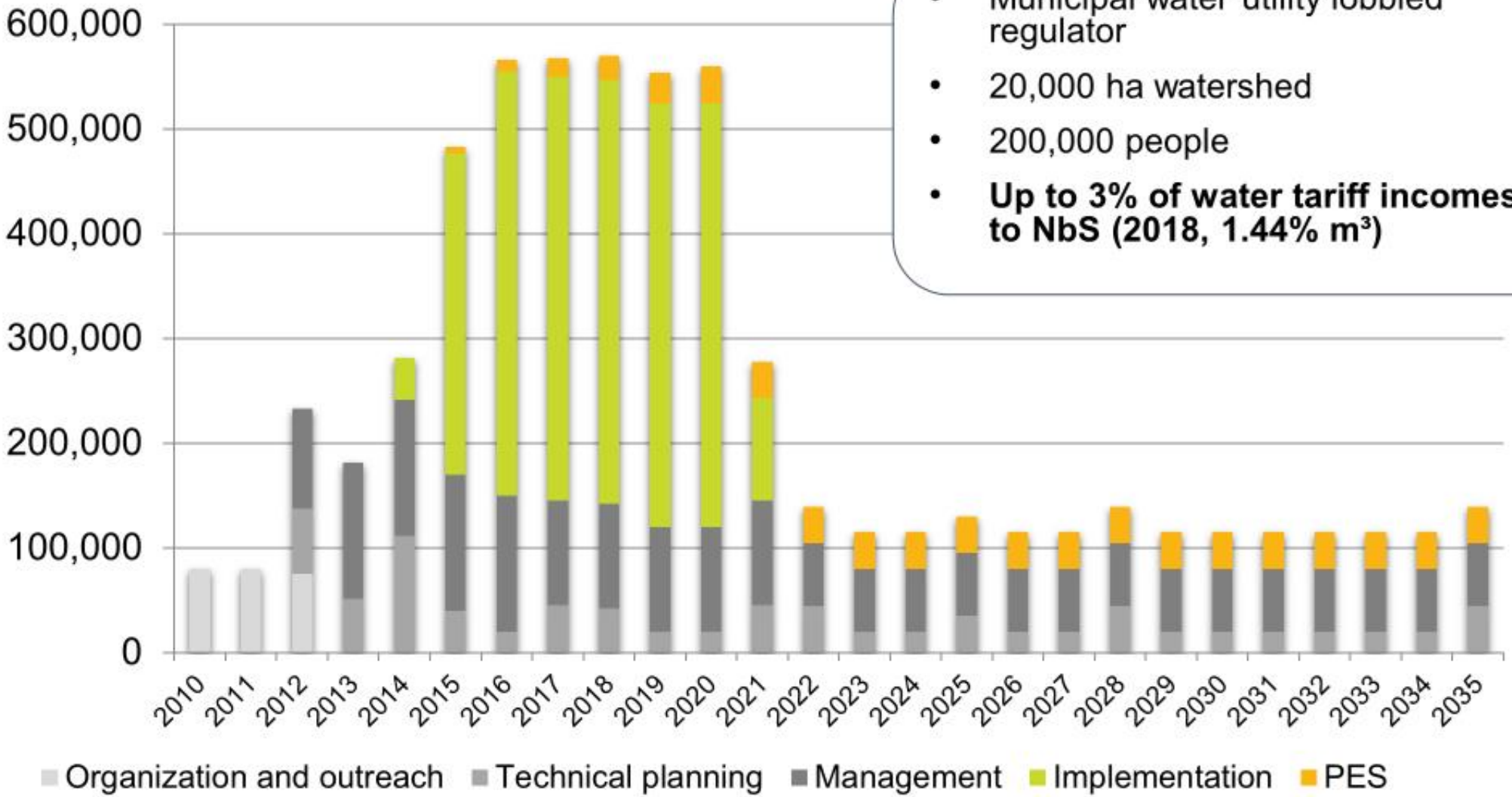


Costs:
NBS activities; Program management; Land rental Planning; Overheads

Benefits :
Avoided water loss; chemical use; sludge treatment; pumping

Camboriu – Investment plan & funding

- Municipal water utility lobbied regulator
- 20,000 ha watershed
- 200,000 people
- **Up to 3% of water tariff incomes to NbS (2018, 1.44% m³)**



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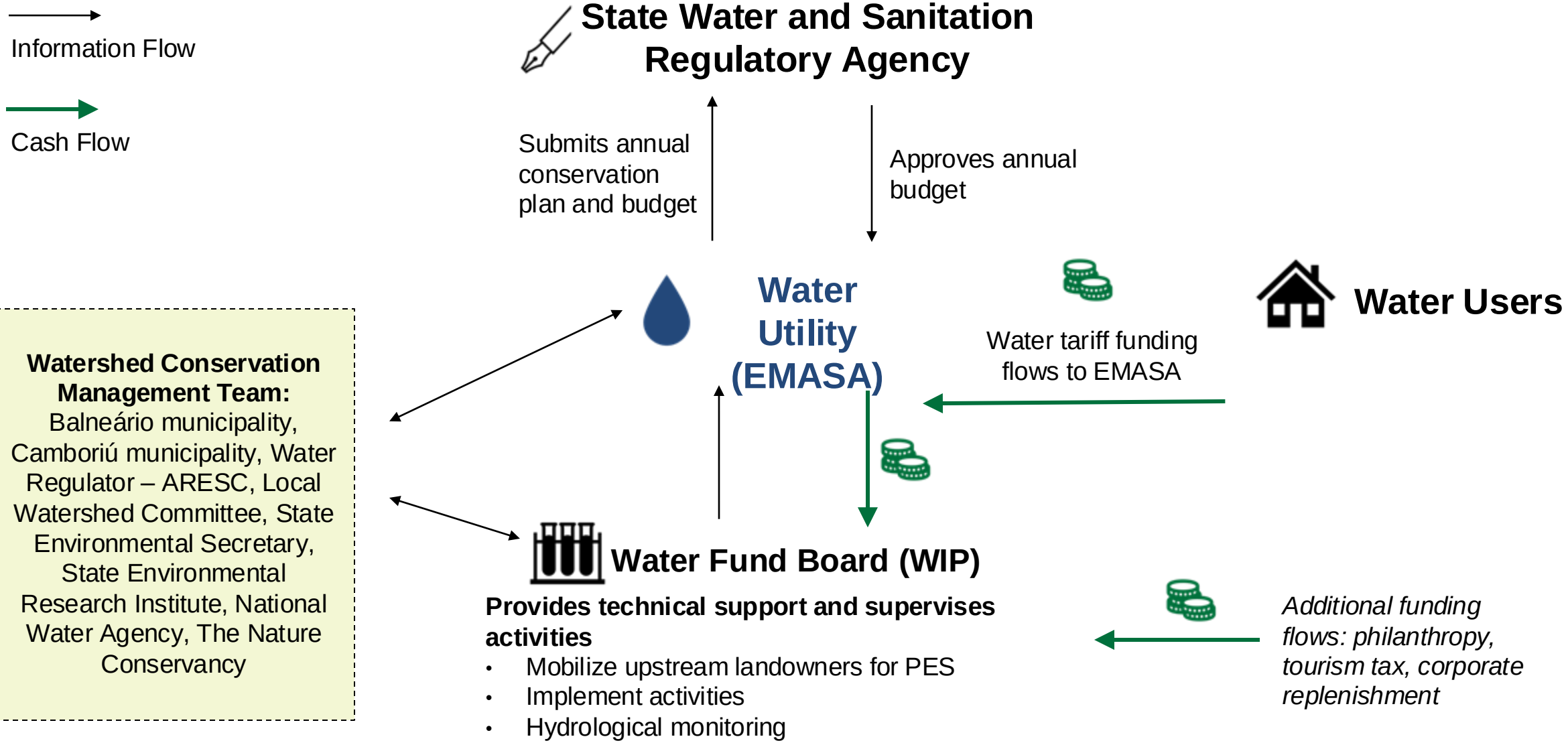
Camboriu – Governance and management structure



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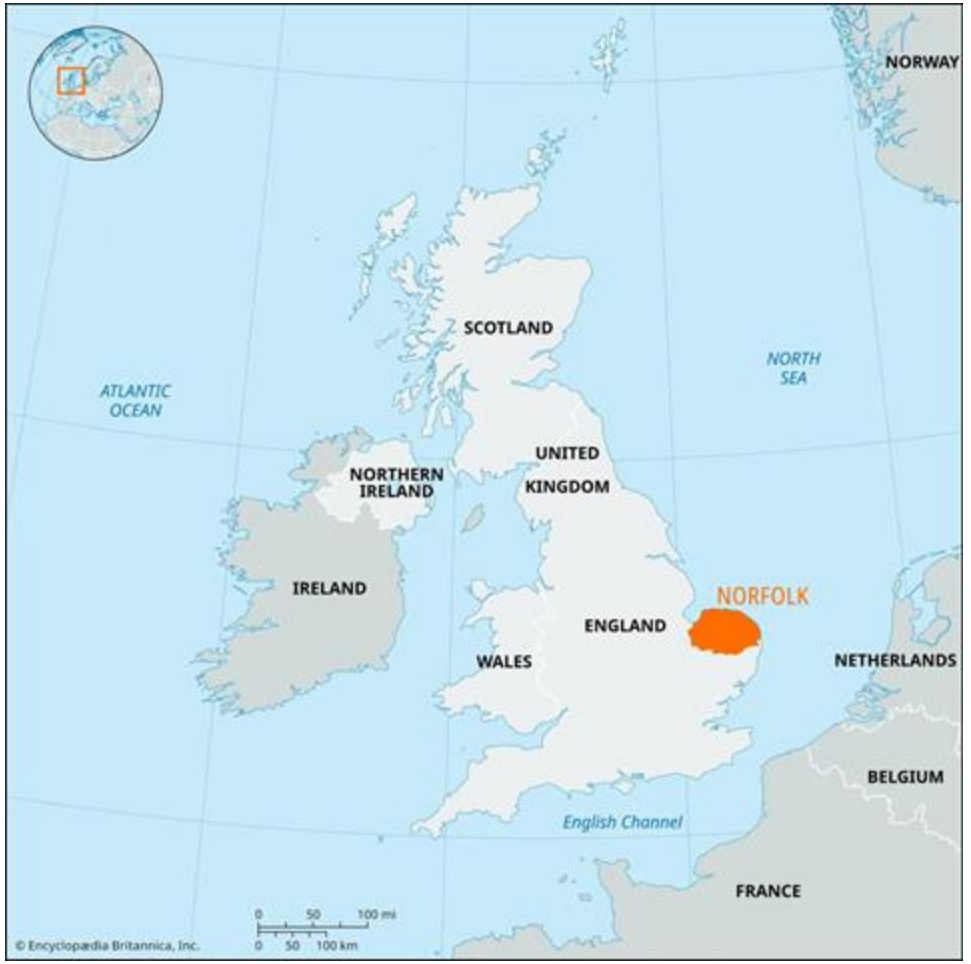
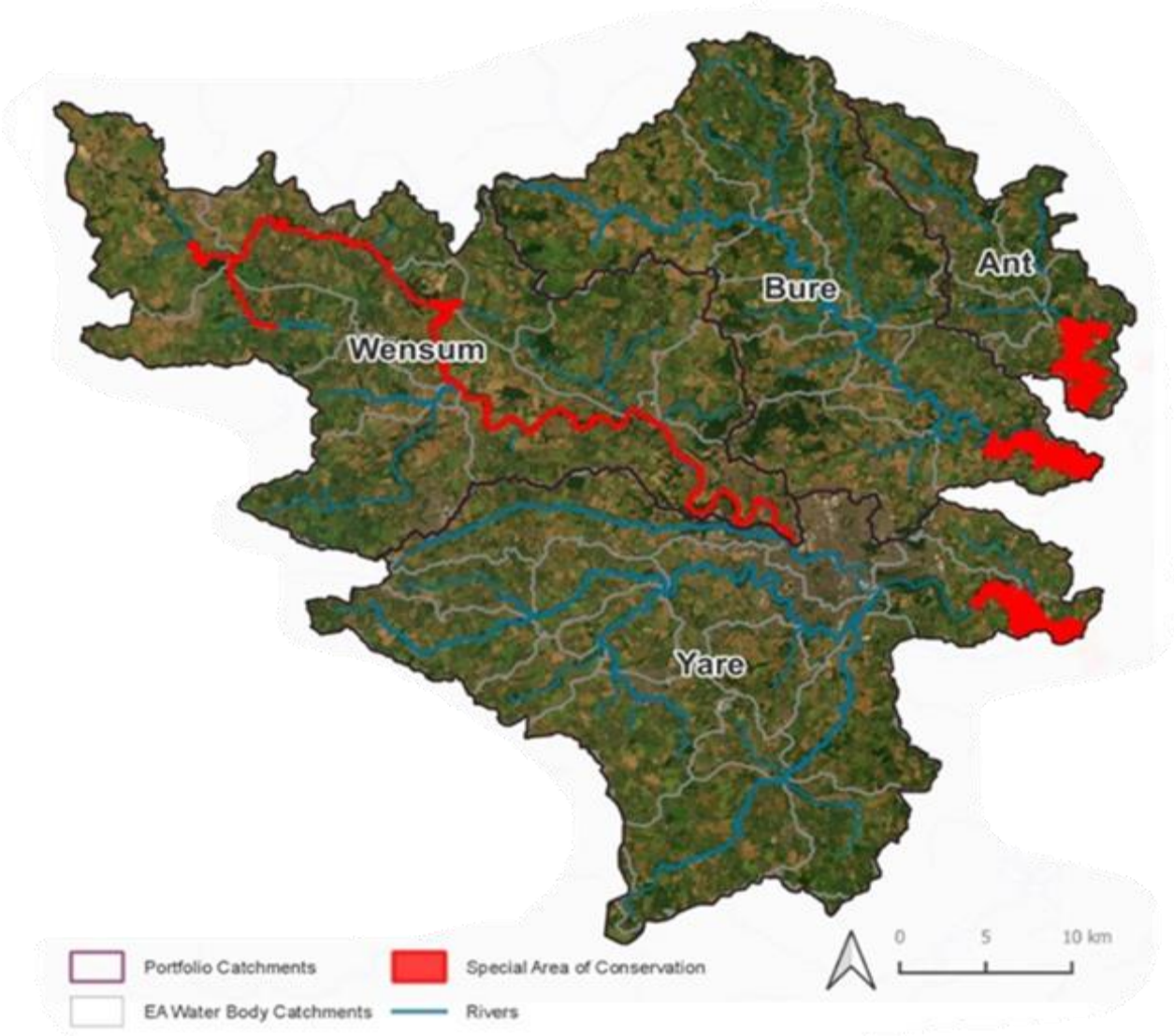
Norfolk – Overview

Location	Norfolk county, United Kingdom
Key beneficiaries	Norfolk Wildlife Trust; love every drop anglianwater; Norfolk County Council
Key challenges	Low flows; water quality; biodiversity loss
Key metrics of success	Infiltration; sediment and nutrient runoff; habitat and soil health
Priority co-benefits	Human health; carbon mitigation; unlocked housing via credits



Norfolk – Geographic context



Heritage and productive farmland

Internationally -important chalk rivers

Unique broads wetlands

Norfolk – Challenges and actions

	Low flows and water availability issues	Water quality challenges	Biodiversity loss and soil degradation
Key water challenges			
How to respond?	Increase sponge functioning of landscape Increase infiltration to groundwater	Decrease the mobilisation and delivery of nutrient pollution to rivers and streams	Promote habitat creation and soil conservation in priority areas
With which NBS?	Runoff attenuation features Soil management practices	Land use change Riparian buffer creation and restoration	Land use change Soil management practices

Runoff Attenuation Features

Riparian Zone Restoration

Soil Management

Norfolk – Economic analysis

Each £1 invested in nature yields £6.70 in benefits

3.7 million m³/year
More water in the landscape through infiltration

£10.8 million
Worth of CO_2 capture and removal of micro-particles improving climate and air quality

25,800 hectares benefiting from NBS interventions
Improving habitats for Norfolk´s wildlife

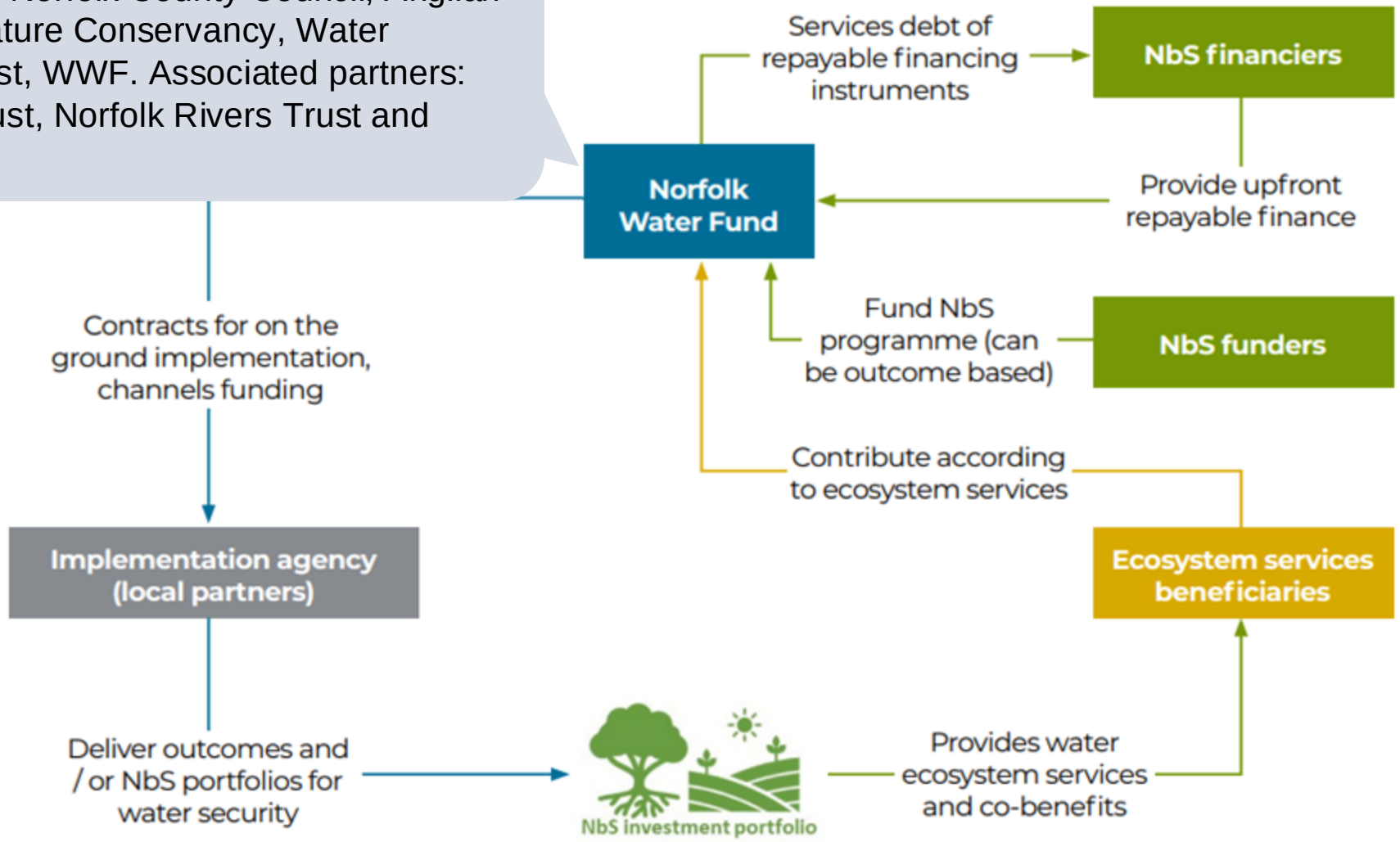
273 kgs of phosphorus
and
13,794 kgs of nitrogen
offset per year, improving river water quality

1,721 houses unlocked
Worth £158 million

Plus a significant opportunity to create jobs, generate social co-benefits, and multiple other benefits

Norfolk – Program structure

Core partners: Norfolk County Council, Anglian Water, The Nature Conservancy, Water Resources East, WWF. Associated partners: The Rivers Trust, Norfolk Rivers Trust and others



E.g. Carbon; Government; Developers

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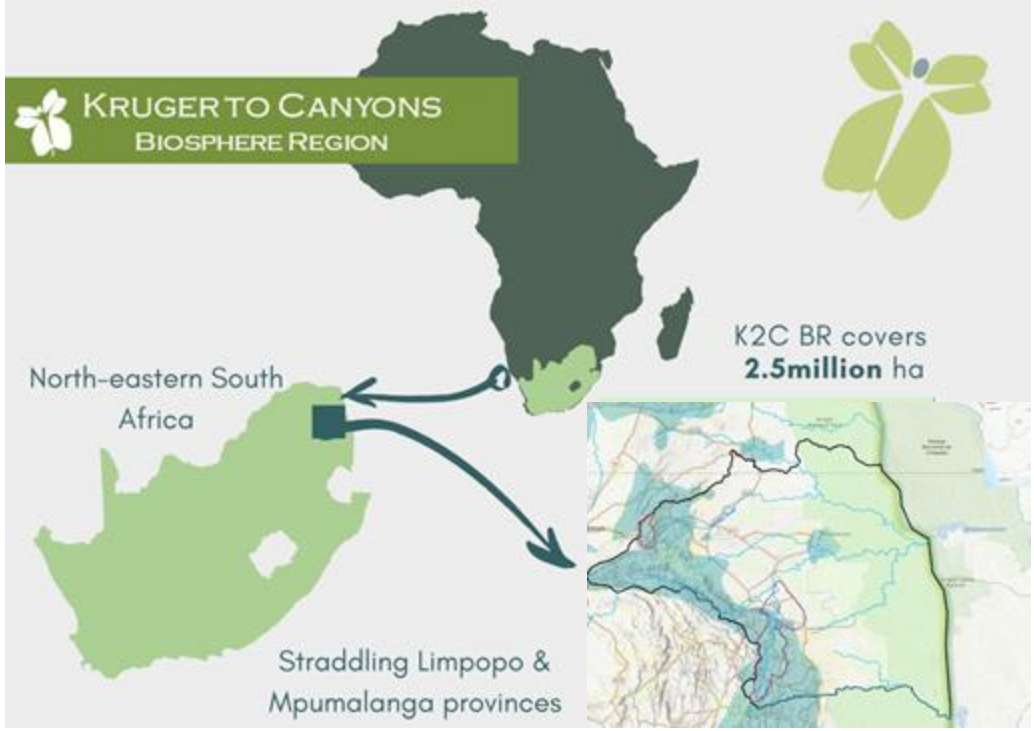
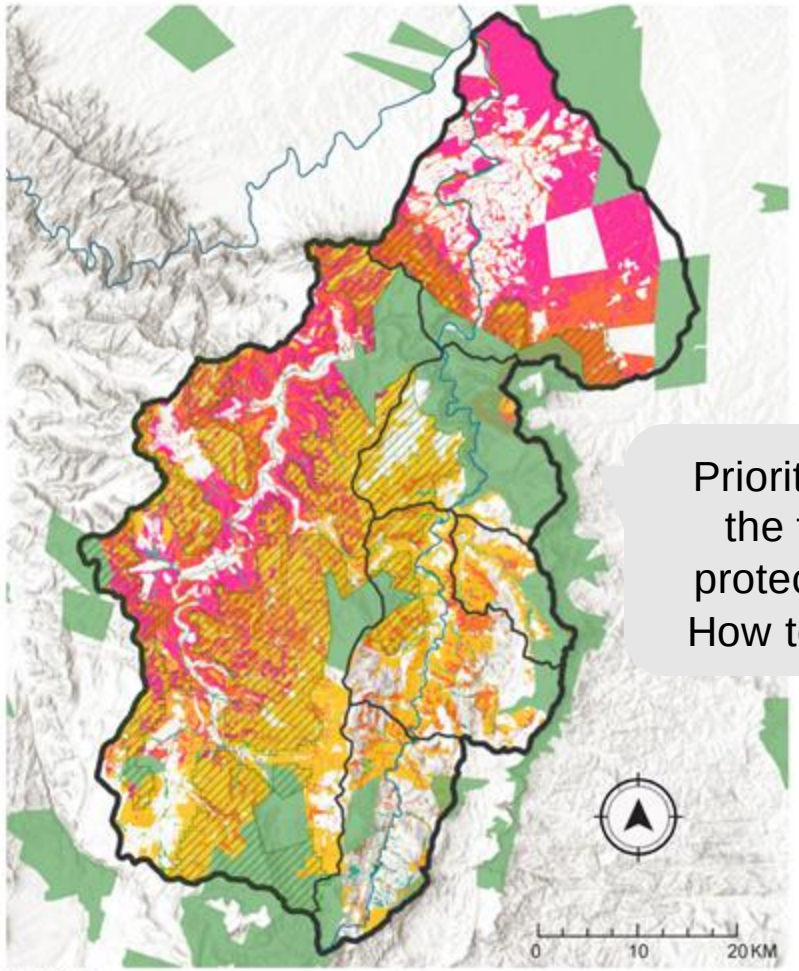
Kruger – Overview

Location	Blyde River Catchment, Mpumalanga Drakensberg
Key beneficiaries	Blyderivierspoort Dam (mining & ag. users); Kruger National Park
Key challenges	Invasive plants; unsustainable grazing; mining; burning
Key metrics of success	Water supply to dam; reduced sediment runoff
Priority co-benefits	Biodiversity recovery; human health; green jobs; carbon

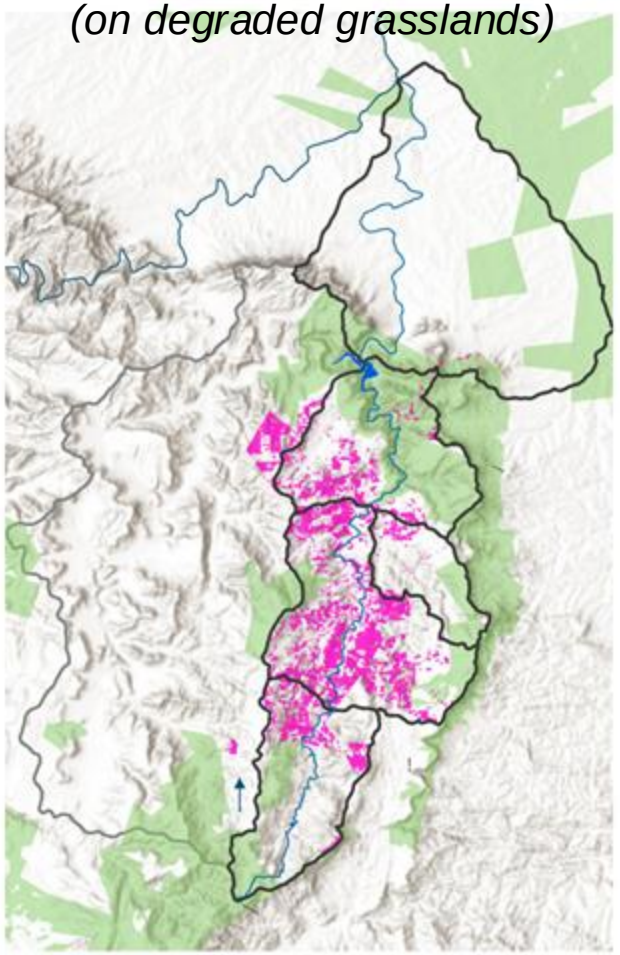


Kruger – Geographic context

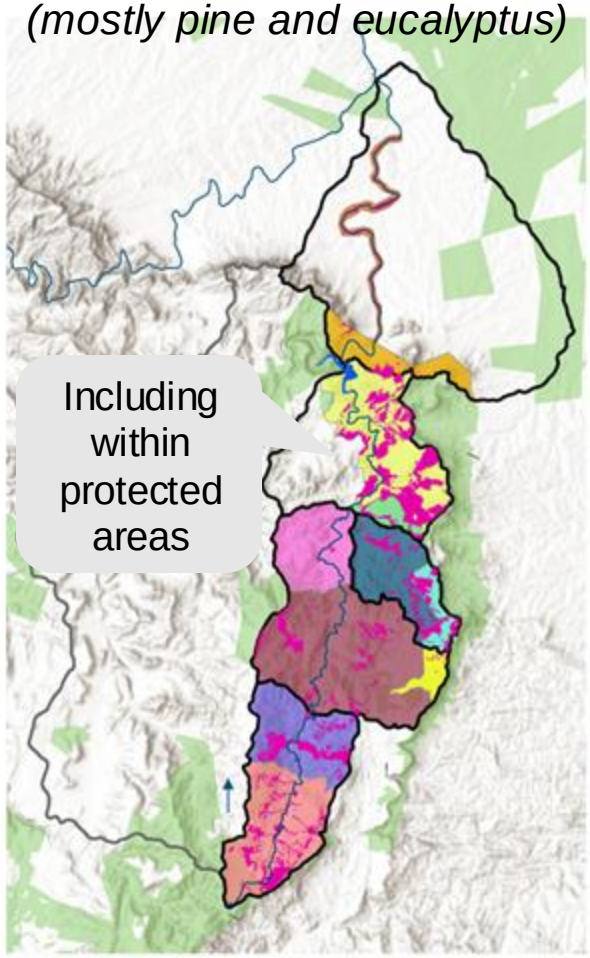


Priority areas on the fringes of protected areas. How to respond?

~10.5k ha of grazing management areas
(on degraded grasslands)

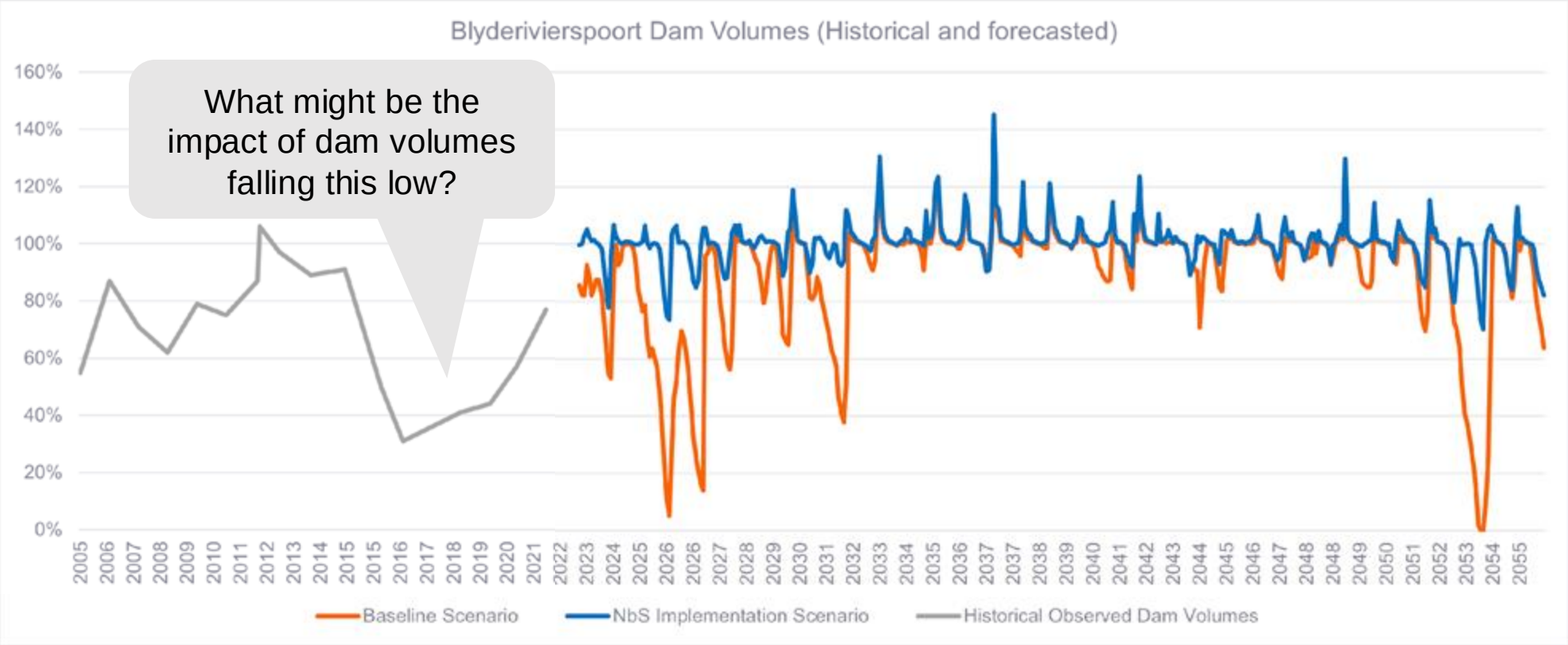


~10.5k ha of Invasive plant control areas
(mostly pine and eucalyptus)



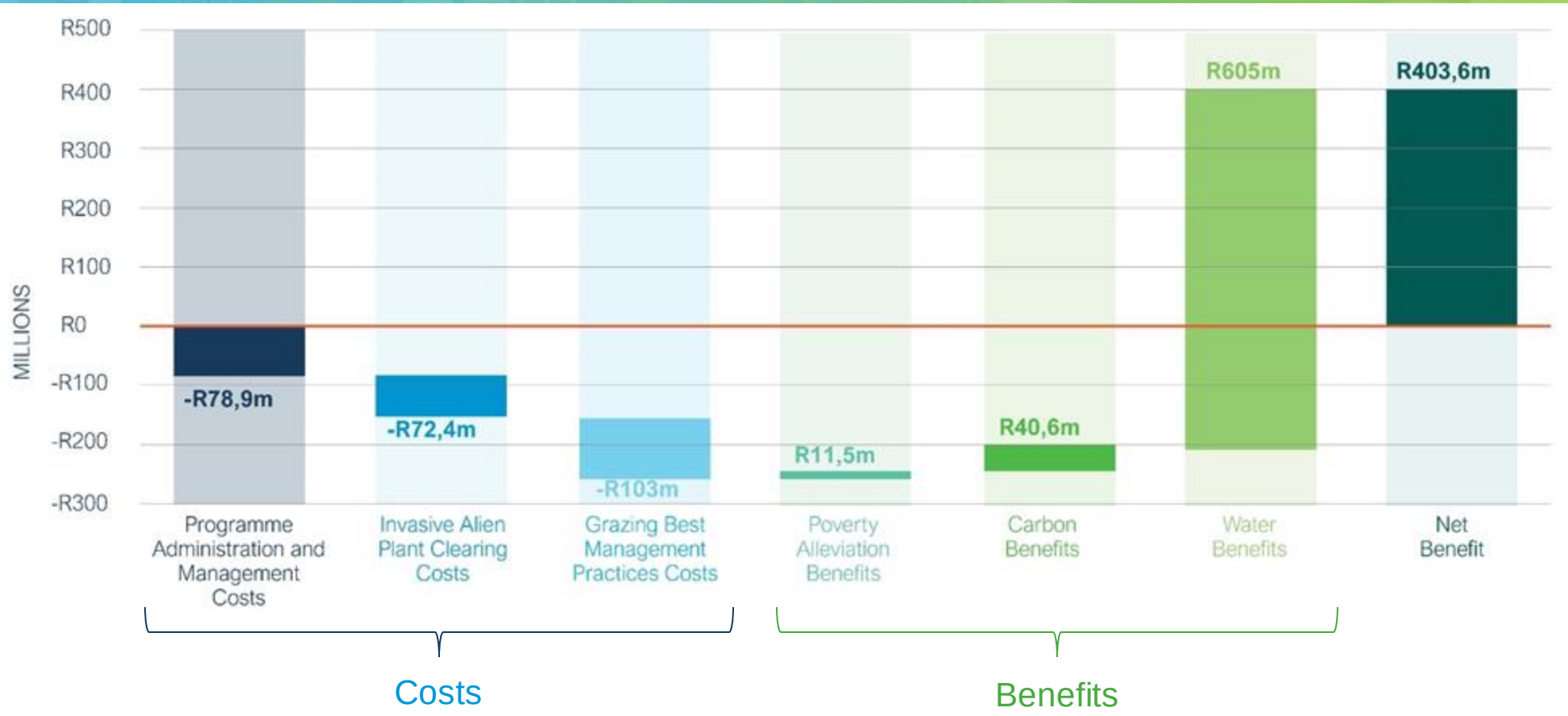
Including within protected areas

Kruger – Impact on dam level



Nature-based solutions upstream of the Blyderivierspoort dam would **reclaim the loss of 8.6 million m³ of water per year,** particularly in dry years

Kruger – Economic analysis



Results show that the benefits of Nature-based Solutions are more than double the costs.
Interventions deliver a net benefit of over R400 million (+/- USD22 million)

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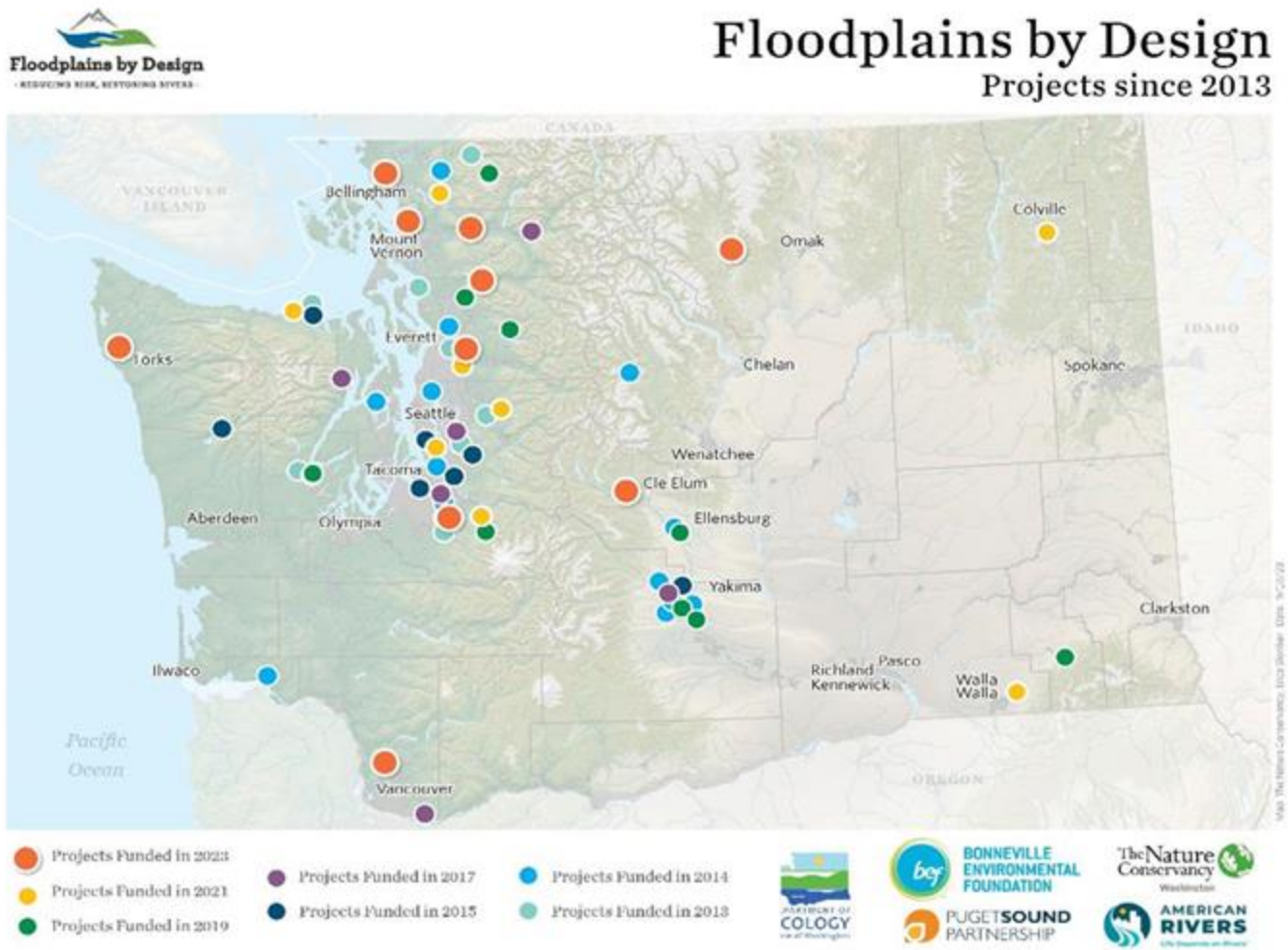
Washington - Overview

Location	Washington state, Northwest USA
Key beneficiaries	State Department of Ecology, cities and towns, farmers, indigenous peoples
Key challenges	Flooding of urban and rural communities; habitat loss; economic impacts
Key metrics of success	Avoided flood damages; economic activity generated; restored floodplain and habitat
Priority co-benefits	Local jobs and economic impacts; fish passage; recreation; agriculture

Washington – Geographic Context

Floodplains by Design (FbD) is an ambitious public-private partnership working to reduce flood risk and restore habitat along Washington's rivers and streams.

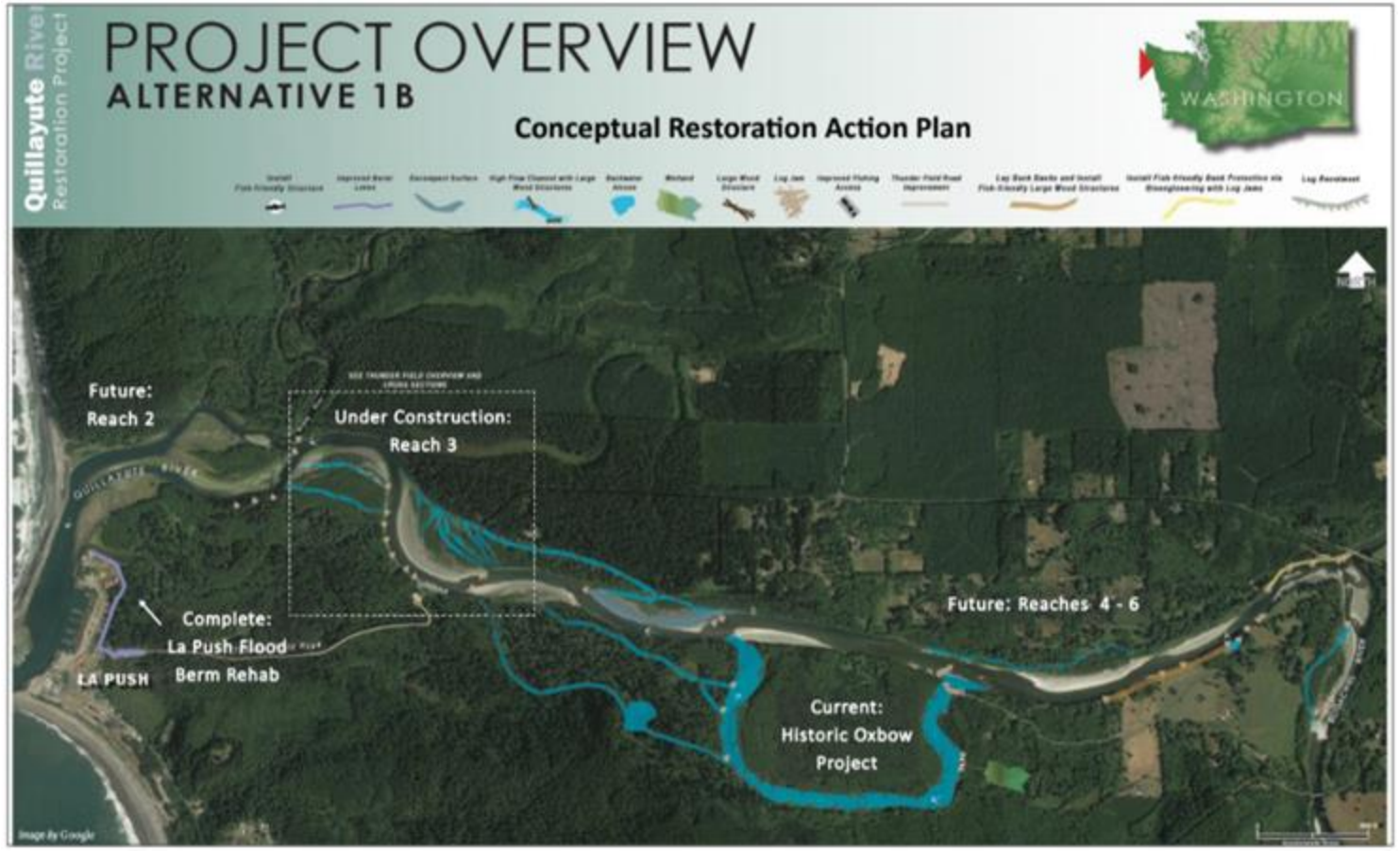
Integrated floodplain management approach:
FbD is transforming how floodplains are managed on a landscape scale to support thriving communities
and a healthy environment.



Washington – Project Examples

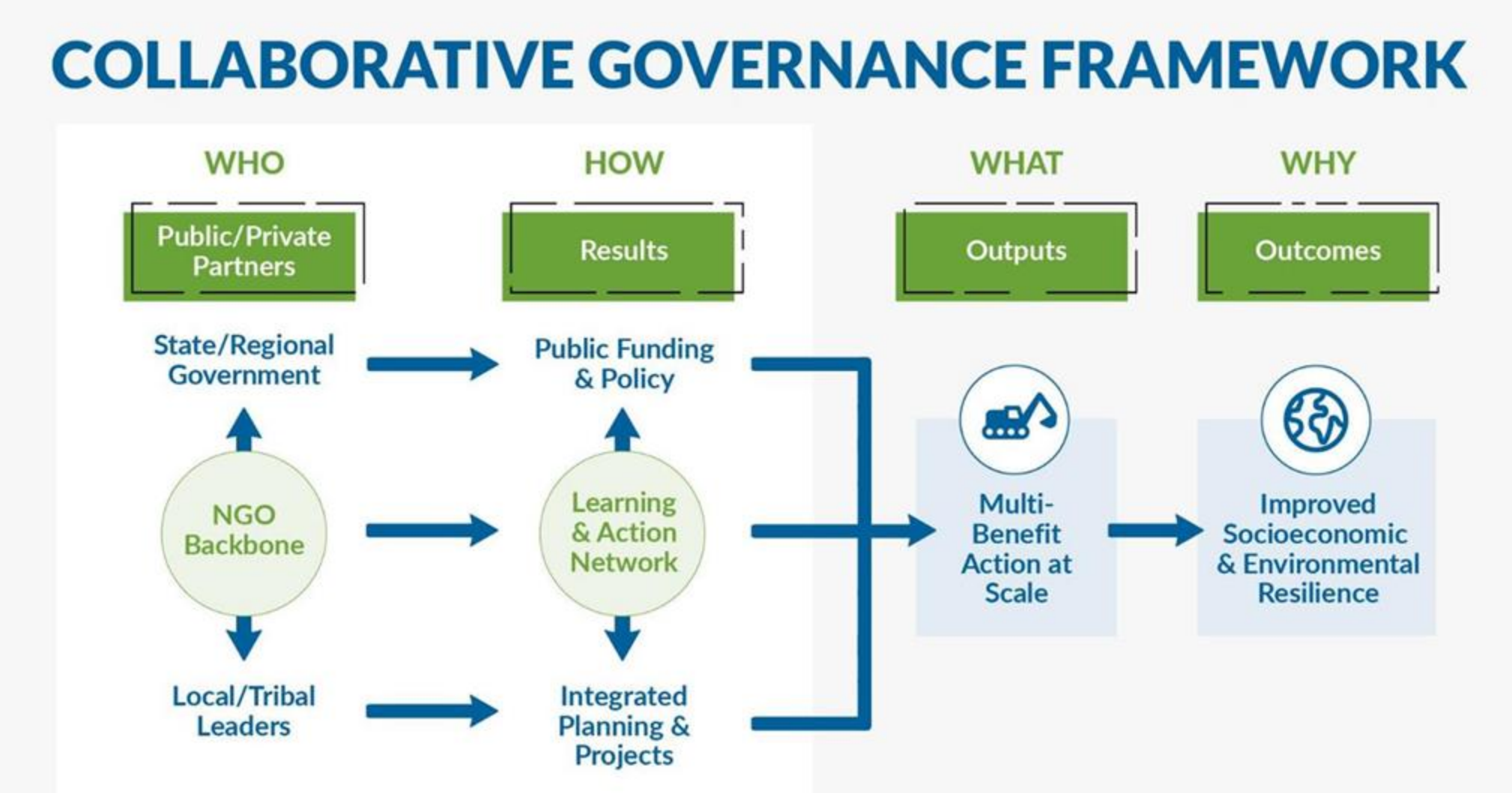
Examples of project components:

- Reconnecting and restoring floodplains
- Improving in-stream habitat
- Restoring historic channels and flow paths
- Tree plantings and establishment in floodplain
- Dam removals and restoring fish passage
- Streambank stabilization and erosion control
- Levee setbacks and improvements
- Agricultural improvements
- Increased recreational opportunities
- Removal of at-risk infrastructure

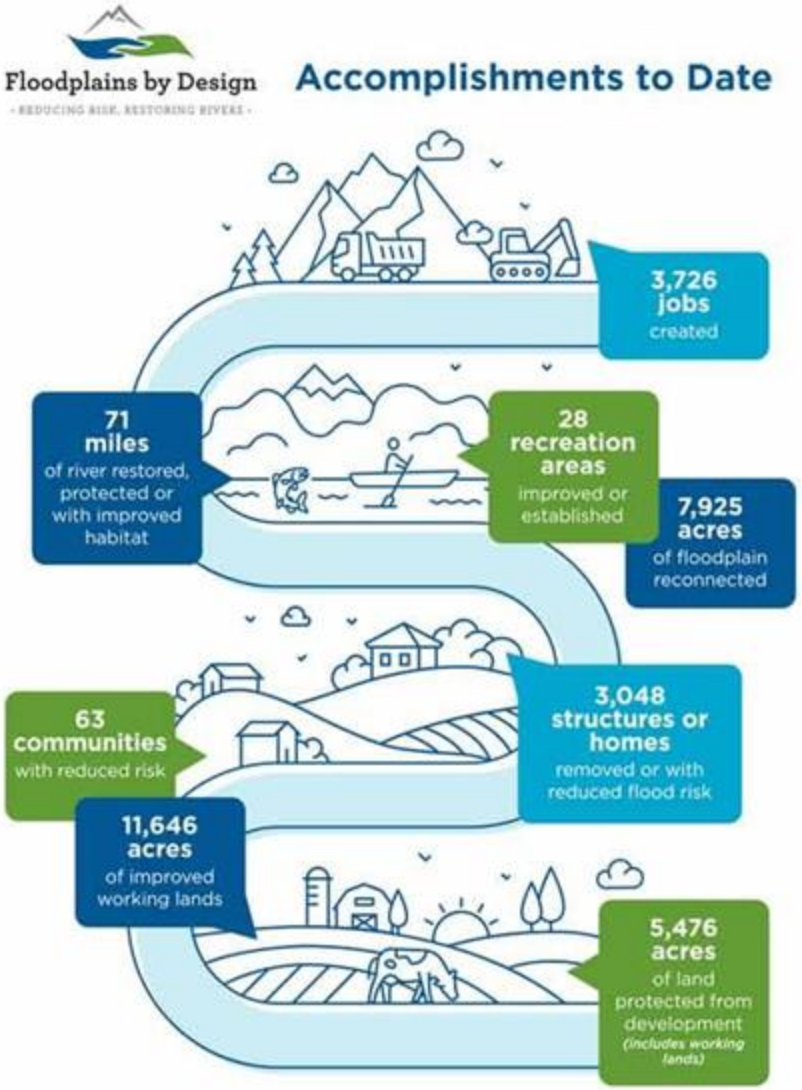


Quillayute River Restoration – Historic Oxbow Project

Washington – Governance



Washington – Impact to Date



- Since 2013, the Washington State Legislature has appropriated $283 million to support large-scale, multiple-benefit projects across the state through the Department of Ecology's Floodplains by Design grant program.
- The investments to date in Floodplains by Design have saved communities across the state nearly $2 billion in recovery costs or damages avoided when the next flood hits.
- For every $1 million invested in integrated floodplain management, $2.2 – $2.5 million in total economic activity is generated with roughly 80% of it staying in the county that the project is based.

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Australia – Context (Melbourne)

Location	Melbourne, Australia
Key beneficiaries	Water utilities, state and local government, city of 5m people
Key challenges	13-year drought with forest fire, flooding, and GFC
Key metrics of success	Safe secure water supplies
Priority co-benefits	World's most liveable city, healthy people and economy

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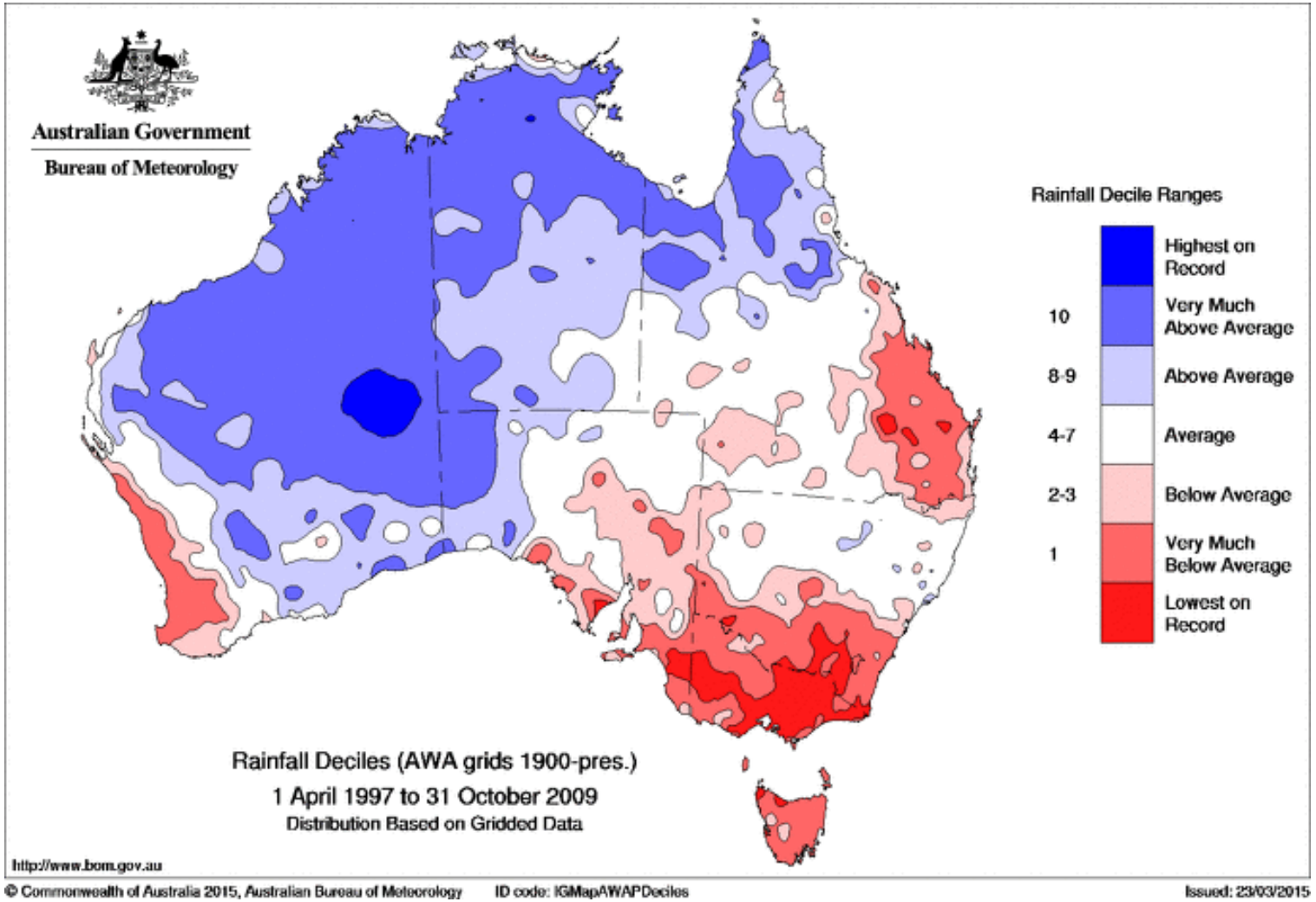
Australia – Geographic context



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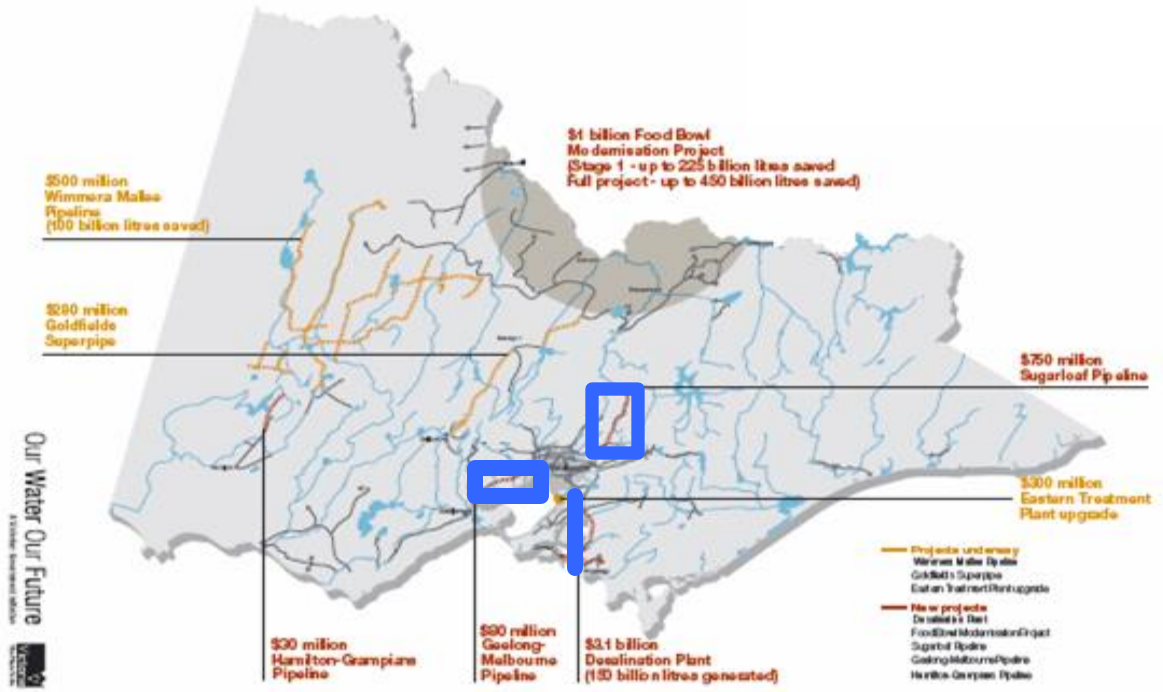
Australia – Responses



www.ourwater.vic.gov.au/programs/next-stage

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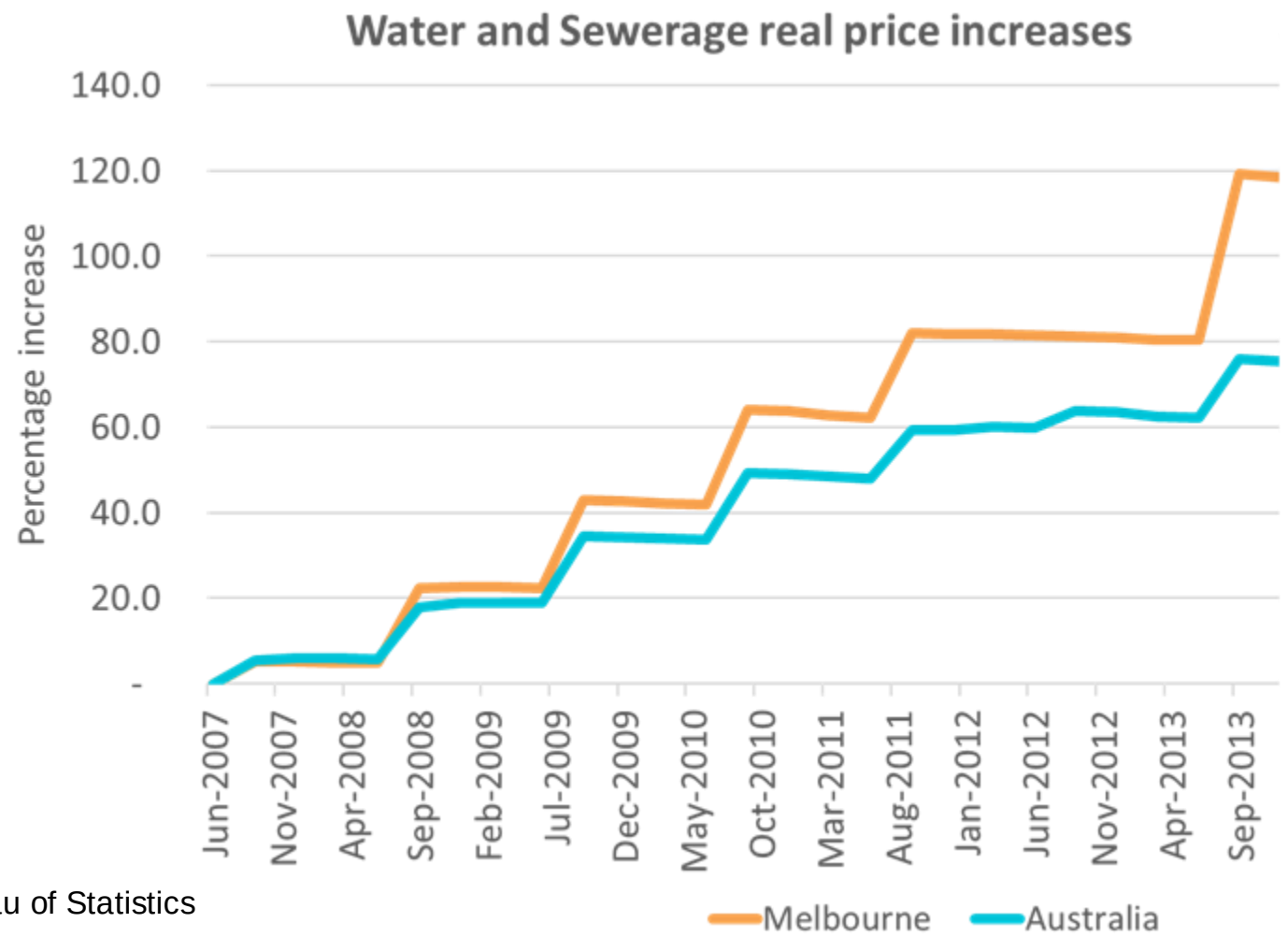
Australia – Price increases

Major investment saw major price increases



Source: Australian Bureau of Statistics

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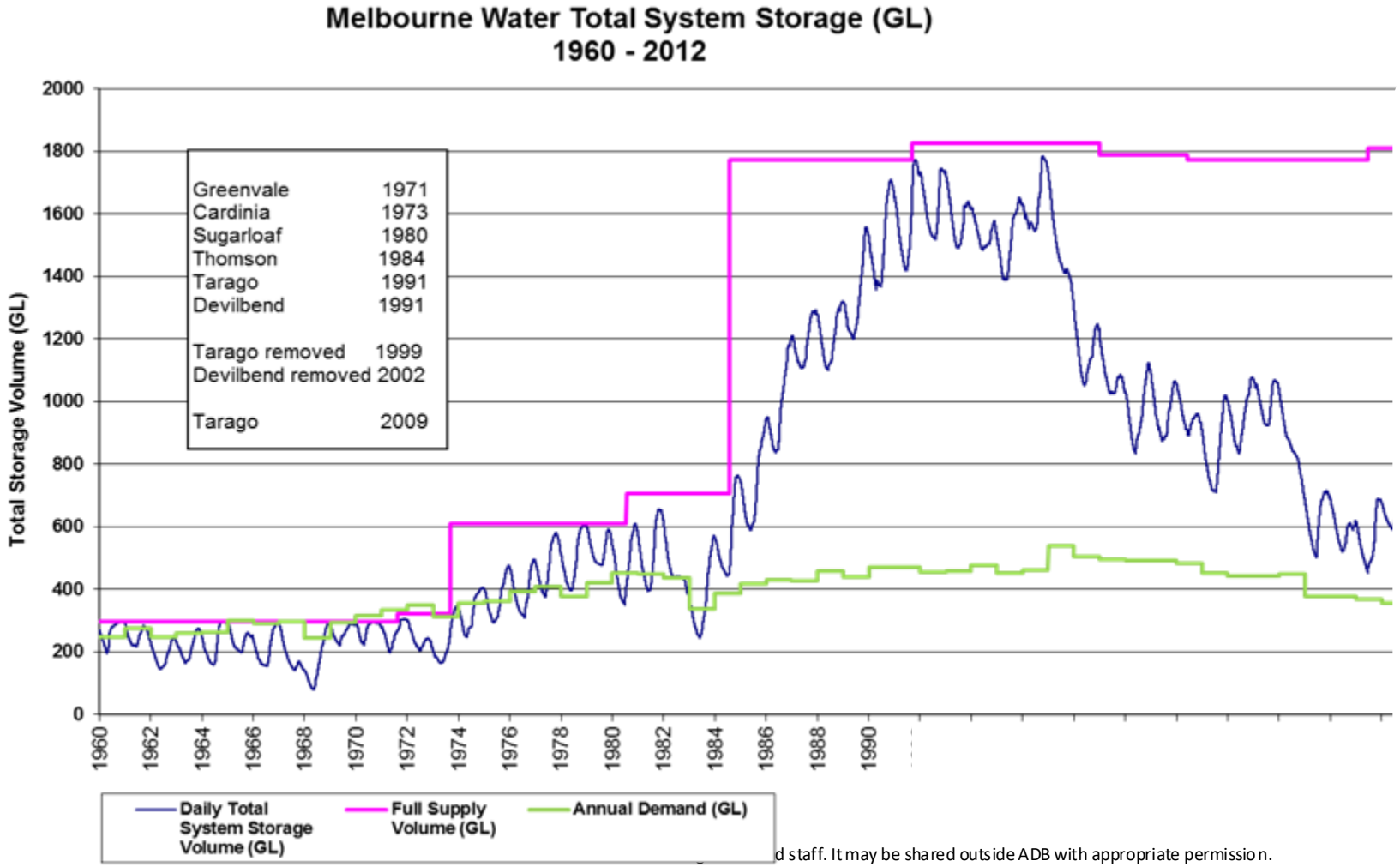
Australia – Dams

It soon became clear that large dams were no longer enough



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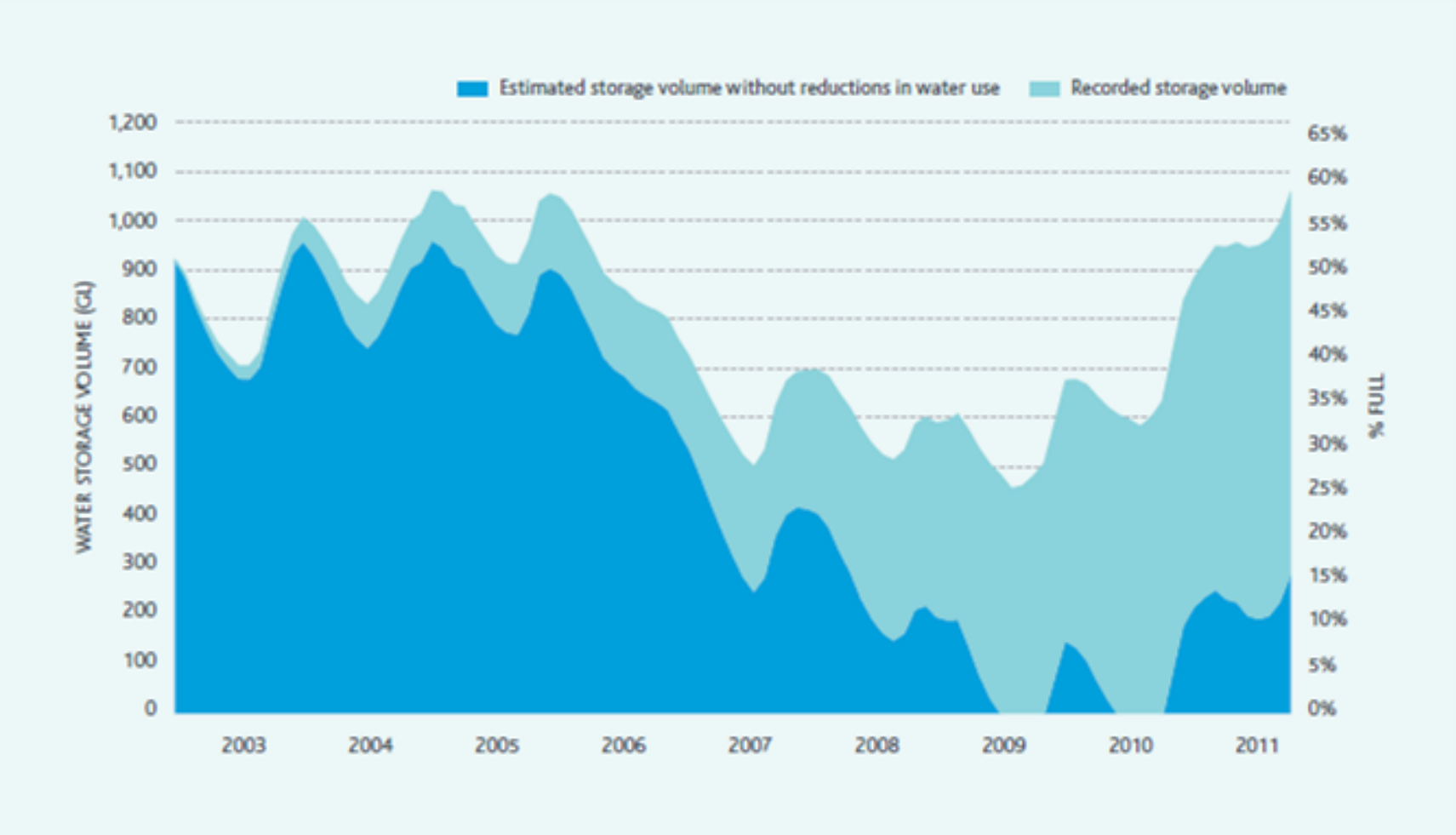
Australia – towards more holistic responses

Demand management was also critical but incurred community cost



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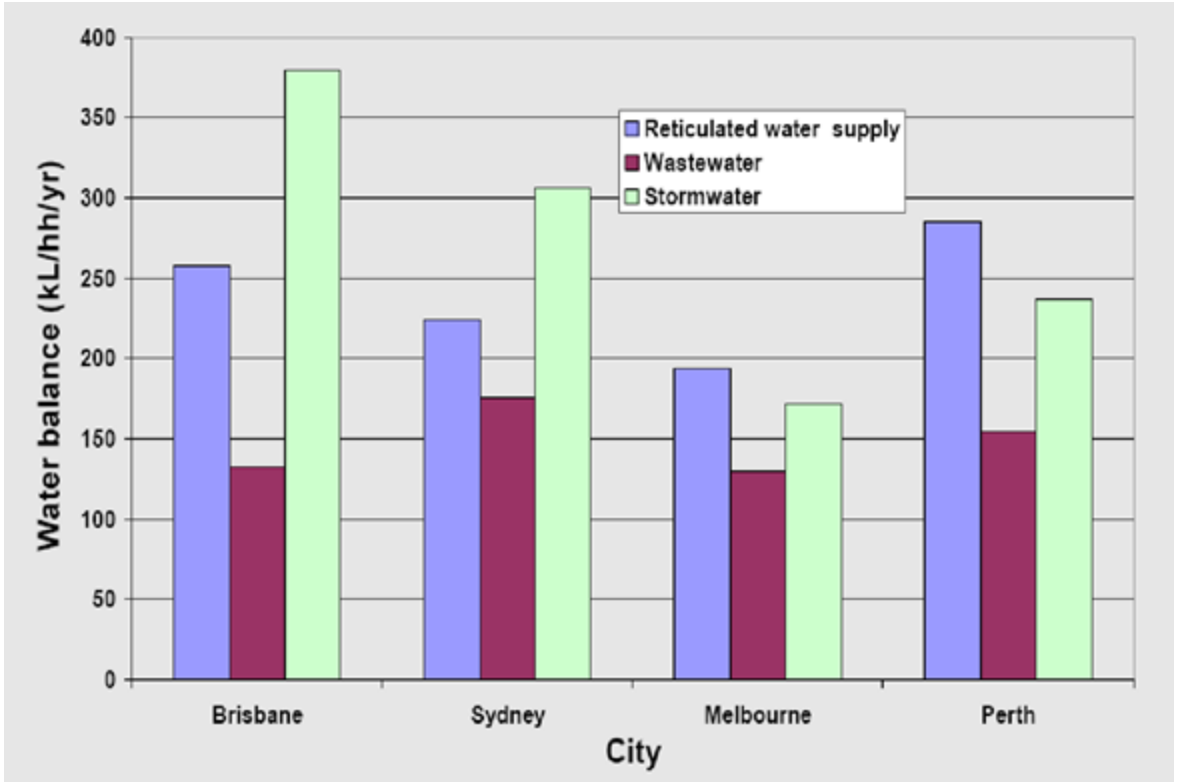
Australia – Towards more holistic responses

The Millennium Drought has seen a greater focus on all water sources and the city as a water supply catchment



Source: Prime Minister Science Engineering and Innovation Council Working Group on Water for Cities (2007)

Co-benefits also became highly valued as part of a healthy, liveable city

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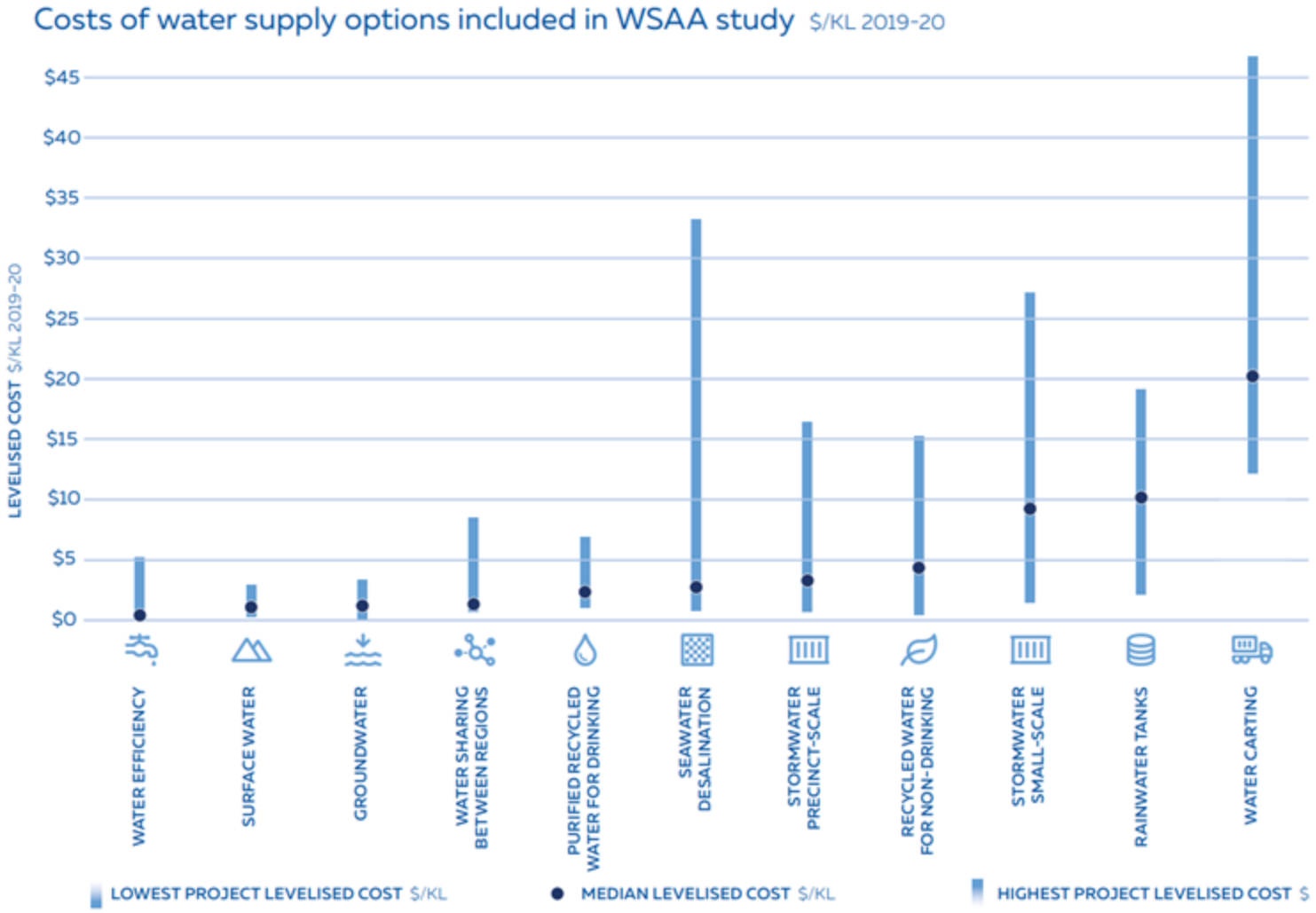
Australia – Towards more holistic responses



Source: FINAL Urban water supply options for Australia.pdf (wsaa.asn.au)

The range of water supply options being considered has increased across Australia

But the right mix of solutions will be different for each location and the cost of different options vary significantly from place to place

Cost is also not the only consideration.

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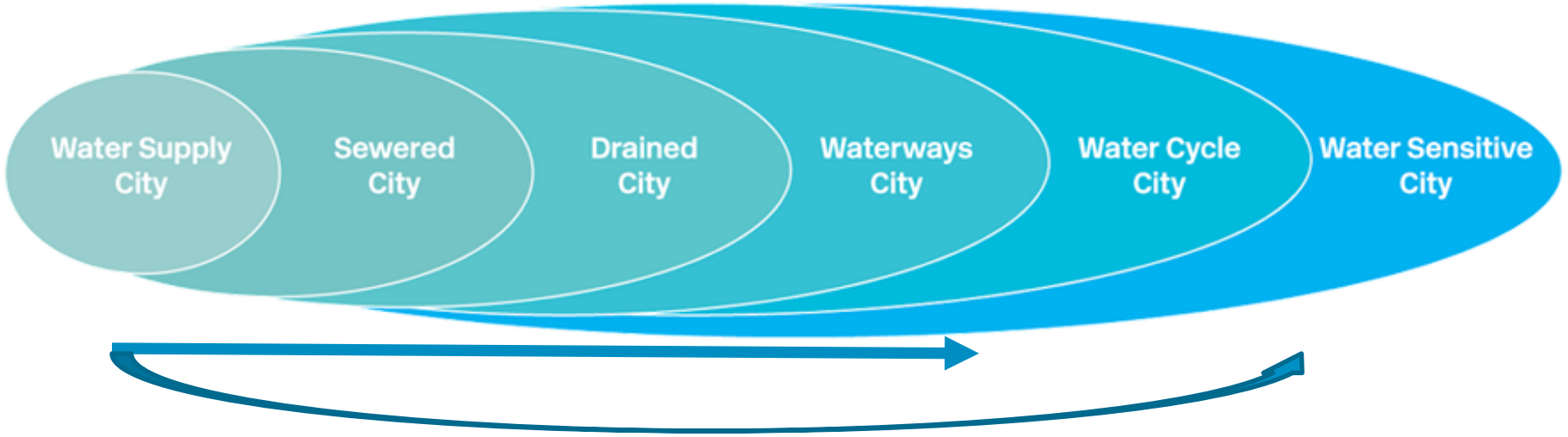
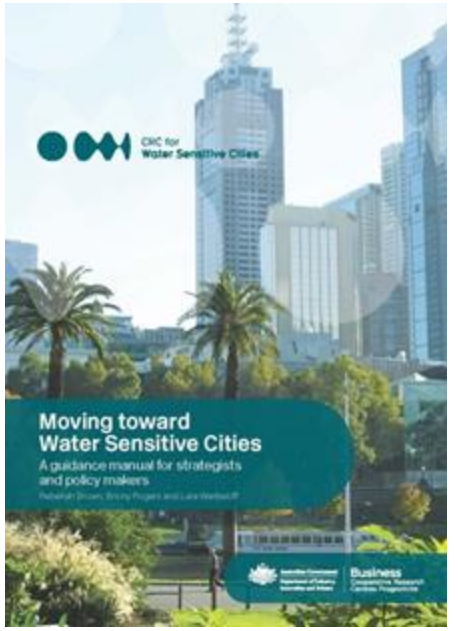
Australia – Towards more holistic responses

Cities often transition through a number of stages





Key enablers of change:

1. **All water** sources considered
2. **Ecosystem services** valued
3. Different **scales of action** are integrated
4. **Communities** are informed and empowered

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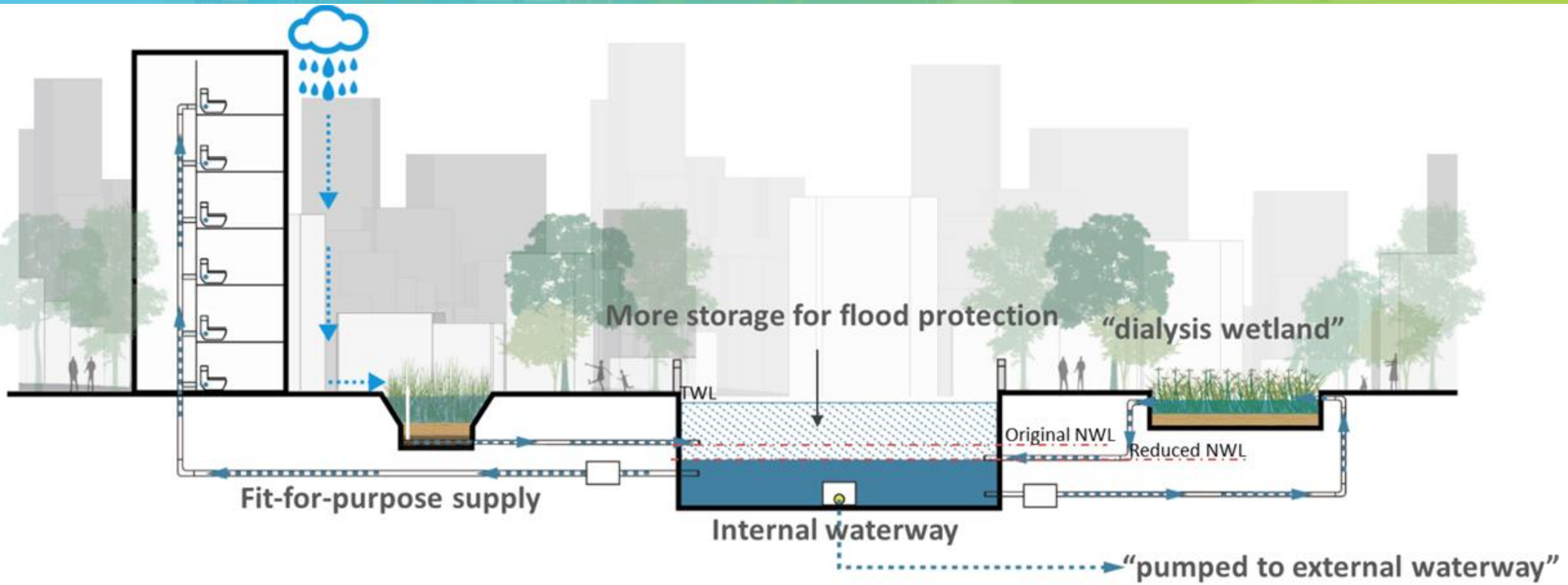
Kunshan – Overview

Location	Kunshan, China
Key beneficiaries	Kunshan government and community
Key challenges	Flooding, water supply quality cost and security, population growth, heritage polder city
Key metrics of success	Flood damage, water quality incidents, water supply costs, positioning city as economic hub, demonstrate sponge city principles
Priority co- benefits	Economic development, heathy people environment and economy, protect and enhance heritage values

Kunshan – Multi-functional, hybrid NBS

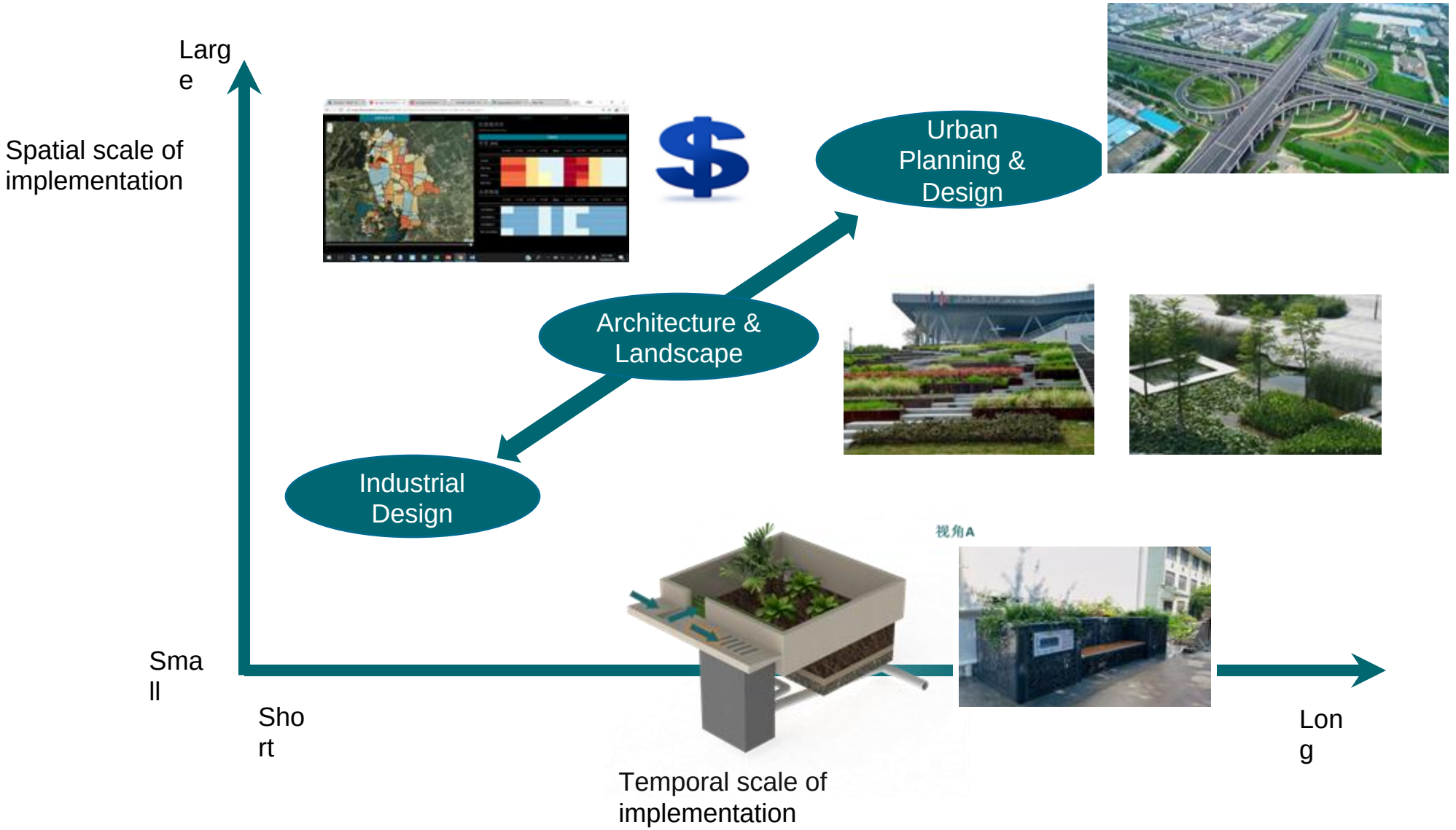


1. Recirculation scheme through **multi-functional public open space**
2. **City as a water supply catchment** through fit-for-purpose re-use
3. **Flood mitigation** through increased storage

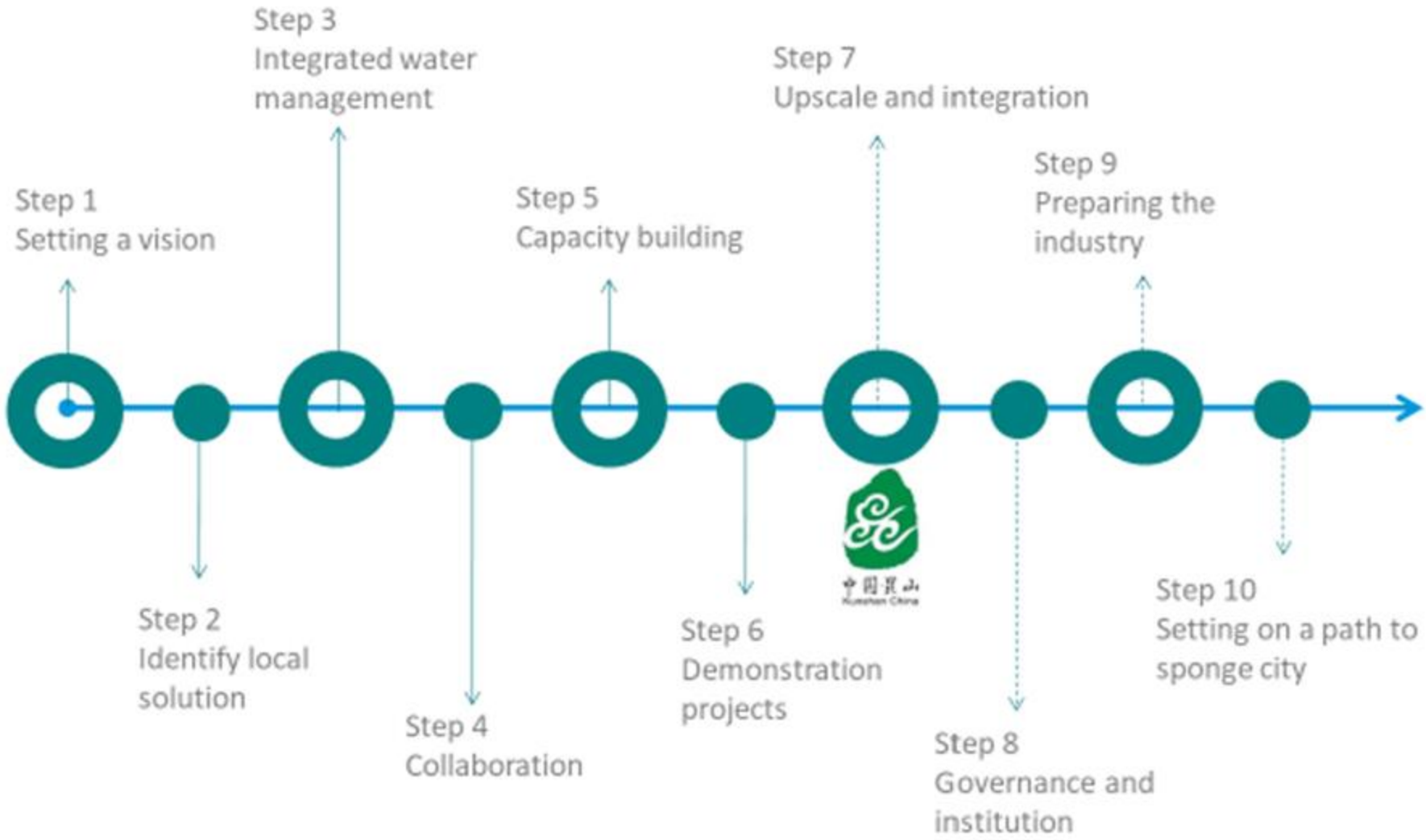
Kunshan – Action at multiple scales

Credit: CRC for Water Sensitive

Kunshan – Action at multiple scales



Kunshan – Collaboration, capacity, and upscaling



Sponge city demonstration zone of 23 KM2

Provincial Demonstration zone

- 22.9 KM2 with 157 projects planned
- 103 land development and road
- 54 are water infrastructure
- 91 completed projects by the end of 2018
- 35 projects being built
- 31 projects to be built

Structure of this session

- **NBS in practice**
  - Camboriu, Brazil
  - Norfolk, UK
  - Kruger, RSA
  - Washington, USA
  - Australia
  - Kunshan, China
- **Key considerations for implementing at scale**
  - Program-level approach
  - Multiple step process
  - Recap

Questions and discussion – Menti

- Please go to Menti code 2532 5067 to rate these six examples in terms of how compelling and how surprising they are to you.
  - Why did you rank them that way?
  - What other reflections do you have about the examples?

- Remember to submit your questions and discussion points at Menti code 2532 5067 for us to return to at the end of the session.

Questions and discussion – Menti

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- Remember to submit your questions and discussion points at Menti code 2486 9344 for us to return to at the end of the session.

Questions and discussion – Open format

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Discussion

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Discussion

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Importance of program-level approach

NBS often need to be **delivered at scale** in order to achieve meaningful impacts.

Several technical and social viewpoints are important in designing and implementing NBS.

NBS usually require **long-term maintenance and management** to be (cost-)effective.

Trust, motivation, and funding for NBS can benefit from a multi-stakeholder approach.

For these reasons it is often important to think about, coordinate, and manage investments in NBS in a **programmatic** way**.**

For example, watershed NBS are often structured into “watershed investment programs” or “catchment management programs”.

Flexibility remains important

WIPs can be driven by a variety of **SPONSOR TYPES**

- Local, Regional, and National Government Agencies
- River Basin Authorities
- Direct Water Users
- Development Finance Institutions
- NGOs

WIPs can be delivered via different **TYPES OF GOVERNANCE ARRANGEMENTS**

- Hosted program (e.g. Edwards Aquifer; MMSD)
- Umbrella agreement (e.g. Sebago; Rio Grande)
- Dedicated vehicle (e.g. Medellín; Nairobi)

Many forms of arrangement can employ collective action

WIPs can leverage various **INVESTMENT FUNDING SOURCES**

- Government agencies
- Water users
- Development Finance Institutions
- Donors
- Financial markets

Key considerations

What are some of the key things you'd keep in mind when setting up a program like the ones we've been talking about?

Quantify, evaluate, and report where possible

Involve 'downstream' stakeholders and beneficiaries

Maintain focus on long-term impact

Involve 'upstream' and/or nearby stakeholders

Use best-available science and modelling

Think about long-term management of NBS

Involve relevant governance and resource management organisations

Be adaptable and flexible based on stakeholder needs and analytical results

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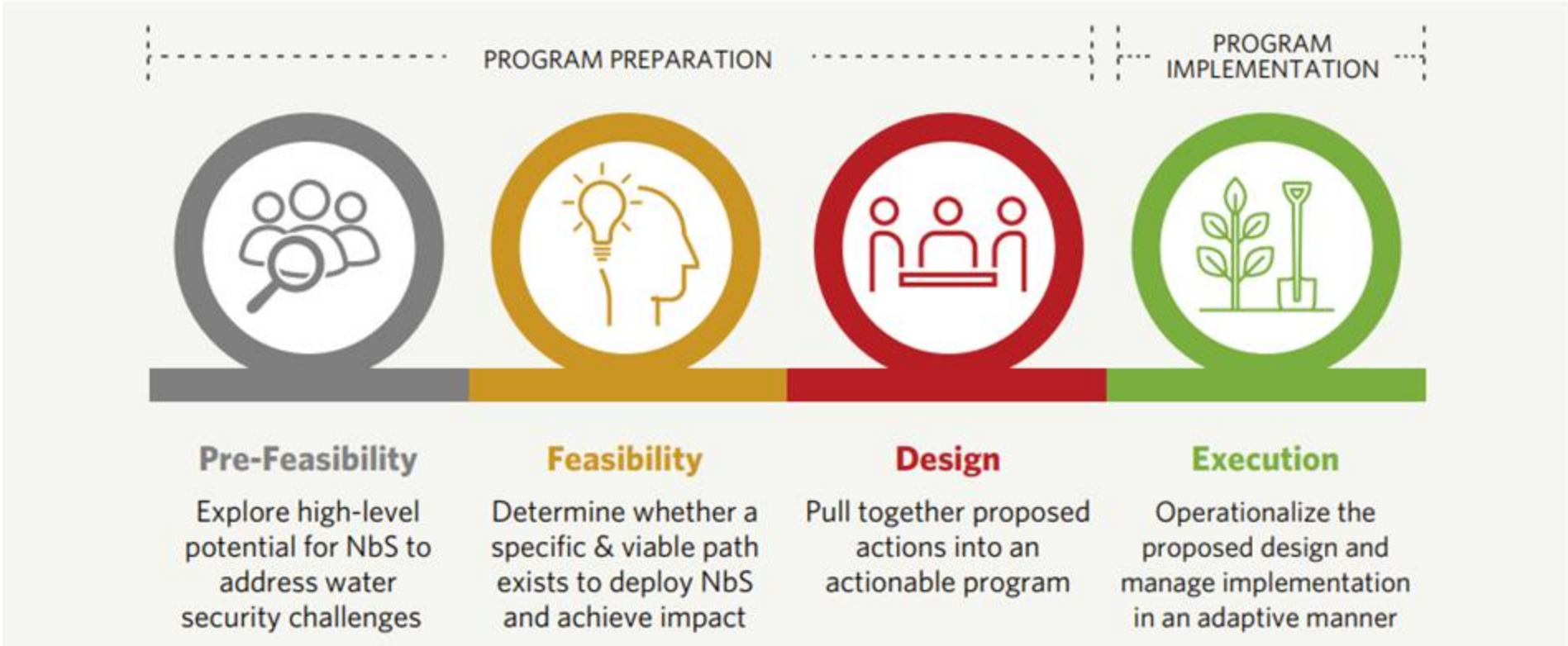
Multi-step process



Understand the watershed

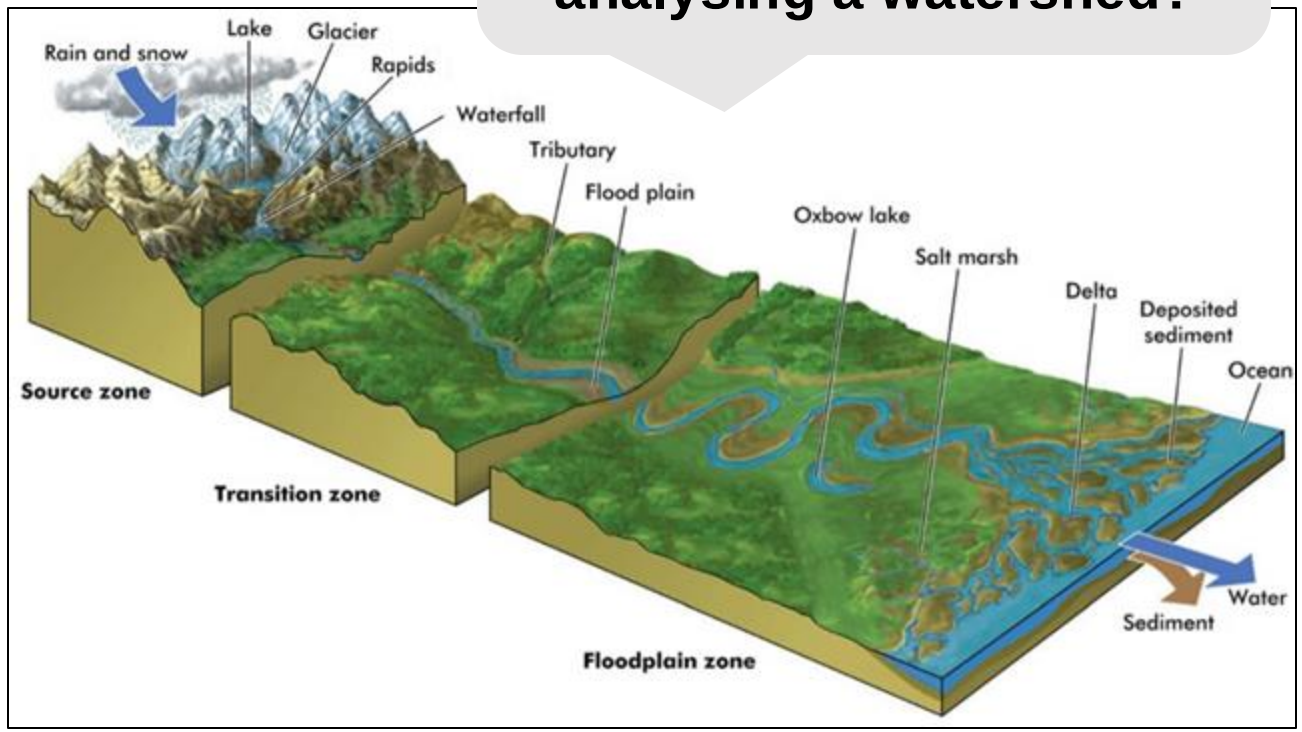
Determine how to implement and monitor

Develop a cost-effective portfolio of NBS

Scale up, report impacts, adaptively manage

Understanding the watershed

What questions might you ask yourself when analysing a watershed?



How does the watershed behave, and why? How is this expected to change in the future?

How are different aspects interconnected? Activities in one area will affect others.

What are the main water users, population centres, and pieces of infrastructure?

What activities might be relevant based on what we can observe, and what has been done before?

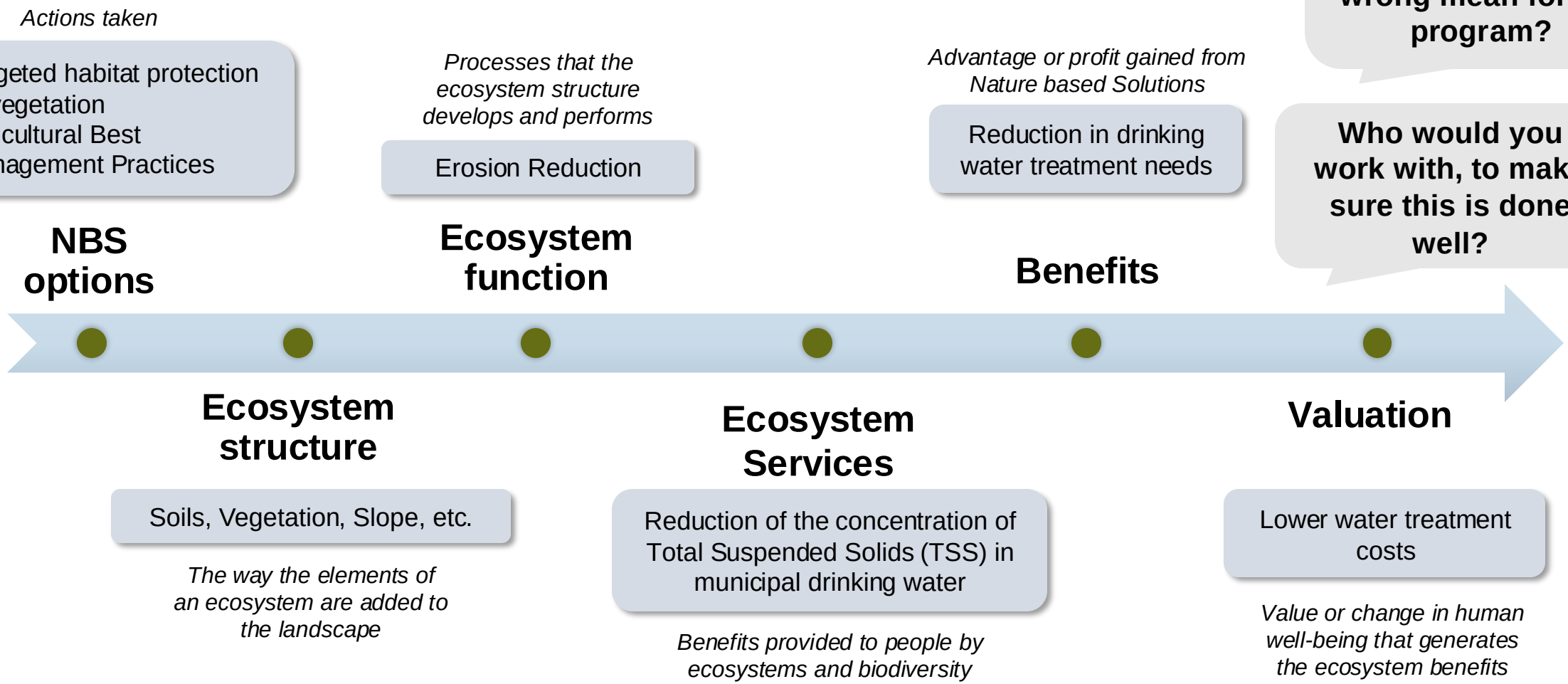
How is the resource governed, and by whom?

Developing a portfolio

There are multiple, interconnected steps to assess NBS options. This is one worked example. We will explore this in more detail tomorrow.

Where might this go wrong? What would this going wrong mean for the program?

Who would you work with, to make sure this is done well?



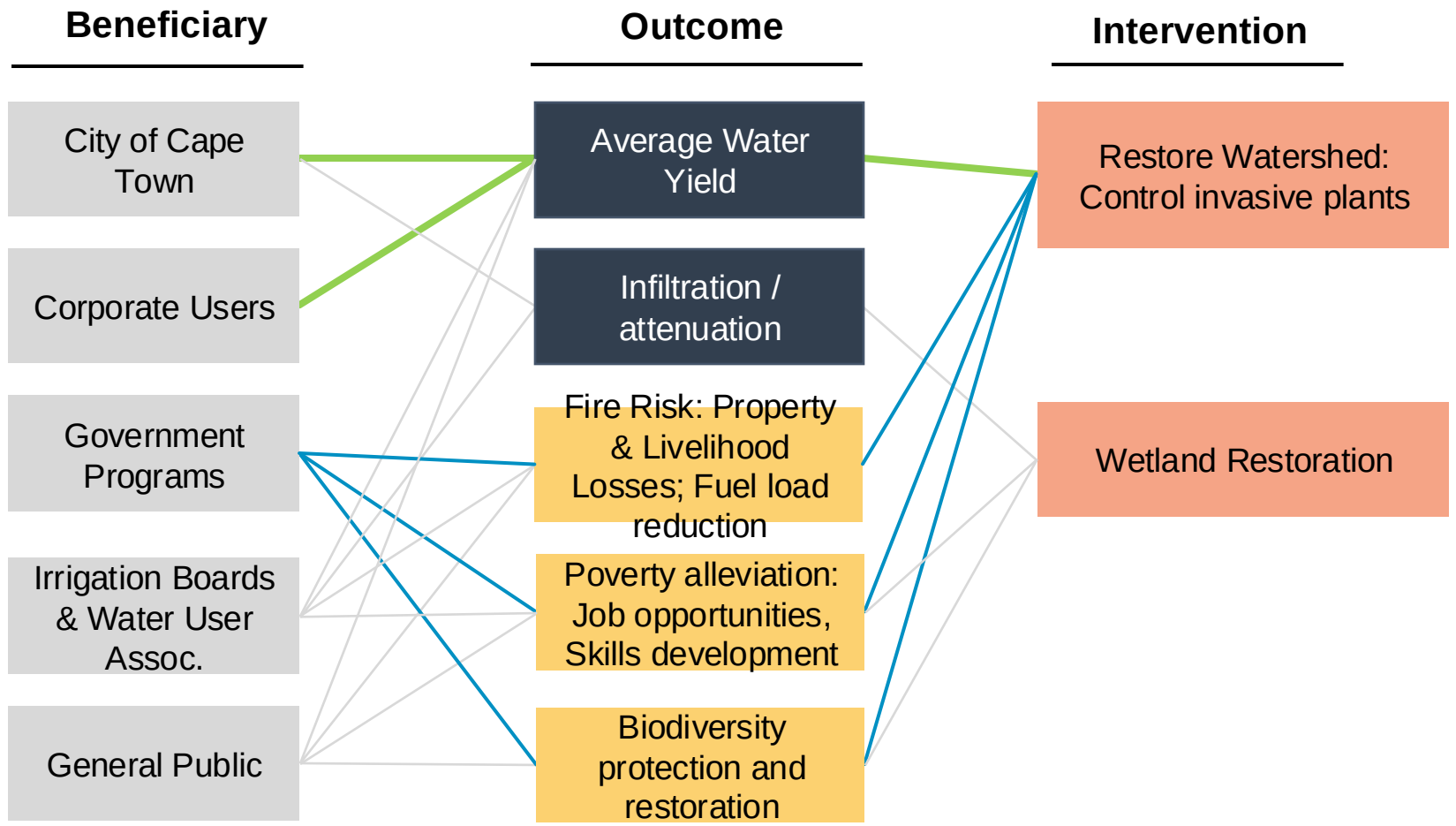
Theory of change

Developing a holistic theory of change can help clarify which beneficiaries might care about and/or pay for which outcomes, to be delivered by which activities.

Example: Greater Cape Town Water Fund (GCTWF)

Legend

- = new funding potential
- = opportunity to align resources with existing mandates
- = interest but unclear direct funding potential



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Recap

It is often necessary to approach NBS in a programmatic way to deliver successful long-term impact.

That can be achieved with the following steps.

1. Understand the **challenges and drivers of change** in your focus area.
2. Approach analysis with **holistic, interdisciplinary thinking**, and involve a **wide range of voices and experts**.
3. **Underscore programs with impact goals** which are meaningful for you and your stakeholders.
4. Don't forget about **long-term funding and program structure**.
5. Be **flexible** – each context is different!

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Questions and discussion – Menti

- Please return to Menti code 2486 9344 and submit any remaining questions or discussion topics. We will then have a short voting period, and then run through the topics, starting with the most popular.

Questions and discussion – Open format

THANK YOU