



# Natural and Nature-Based Features Planning Framework

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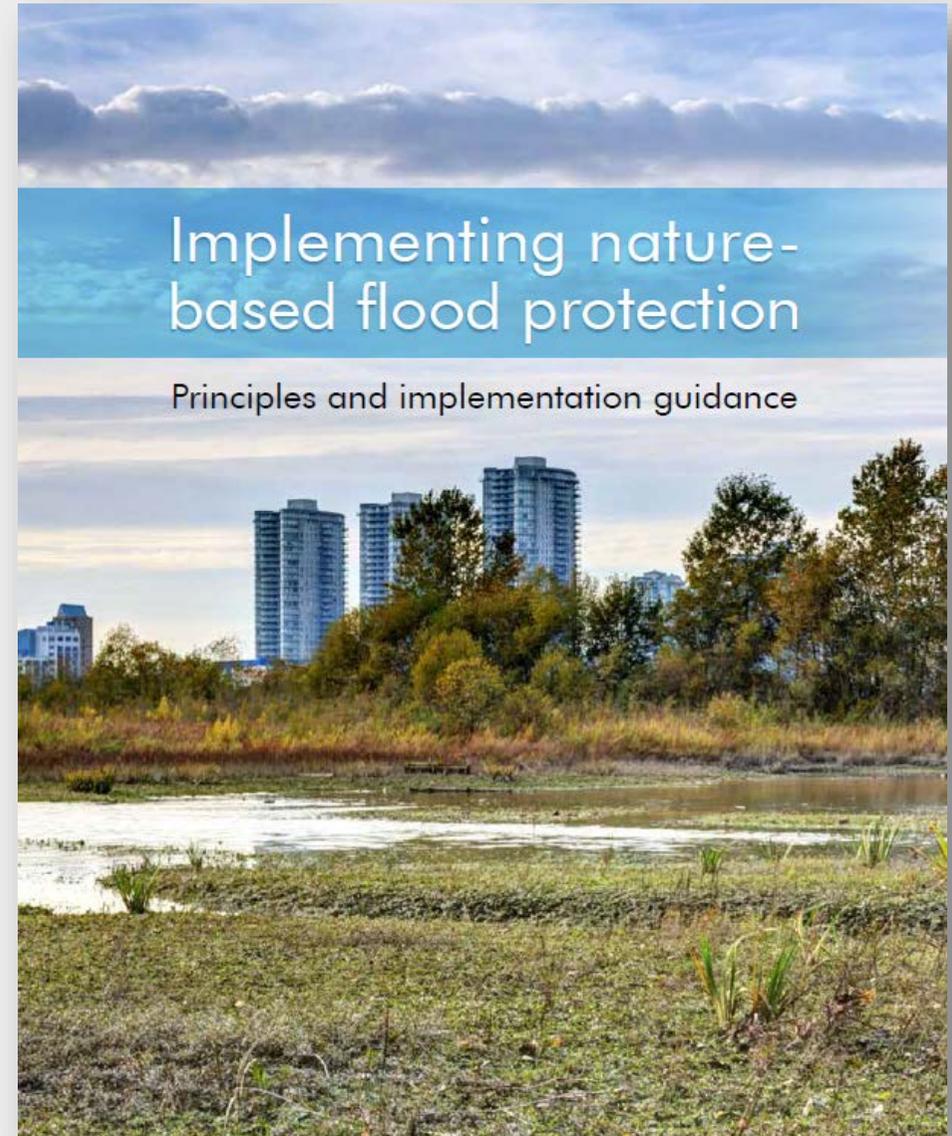
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# World Bank Principles and Implementation Guidance



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[https://www.gfdrr.org/sites/default/files/document/s/Brochure%20Implementing%20nature-based%20flood%20protection\\_voor%20web.pdf](https://www.gfdrr.org/sites/default/files/document/s/Brochure%20Implementing%20nature-based%20flood%20protection_voor%20web.pdf)

## World Bank Principles:

- WB1. System-scale perspective
- WB2. Risk and benefit assessment for a full range of solutions
- WB3. Standardised performance evaluation
- WB4. Integration with ecosystem conservation and restoration
- WB5. Adaptive management

## Additional NNBF guidelines team thinking.

1. Innovative and creative solutions using diverse partners and teams
2. Risk and uncertainty embraced when considering NNBF options [WB2]
3. Scope for values and benefits greater with NNBF solutions [WB2]
4. Portfolio solutions involving both NNBF and traditional infrastructure [WB2 and WB5].

## In summary ...

- Think **systems** and, therefore, **adaptive management**
- **All options** on the table: NNBF, traditional and combination,
- **Innovative and creative** teams
- Multiple **values and benefits** identifiable flood risk management and ecosystem services
- Clear and limited number of (common) **performance metrics** needed, with common definitions and approaches.

## Resilience to water:

- Resistance to erosion / instability
  - Fragility relationships
- Time (and cost) for recovery
  - Regrowth (natural components) and replanting
  - Maintenance (artificial components)

## Influence on water:

- Geometry:
  - height, width, shape,
  - storage
  - surge attenuation
- Roughness/rugosity
  - Wave attenuation
  - Slowing flow/ reducing shear stress
- Absorption
  - Infiltration
  - Evapotranspiration

## Ecosystems

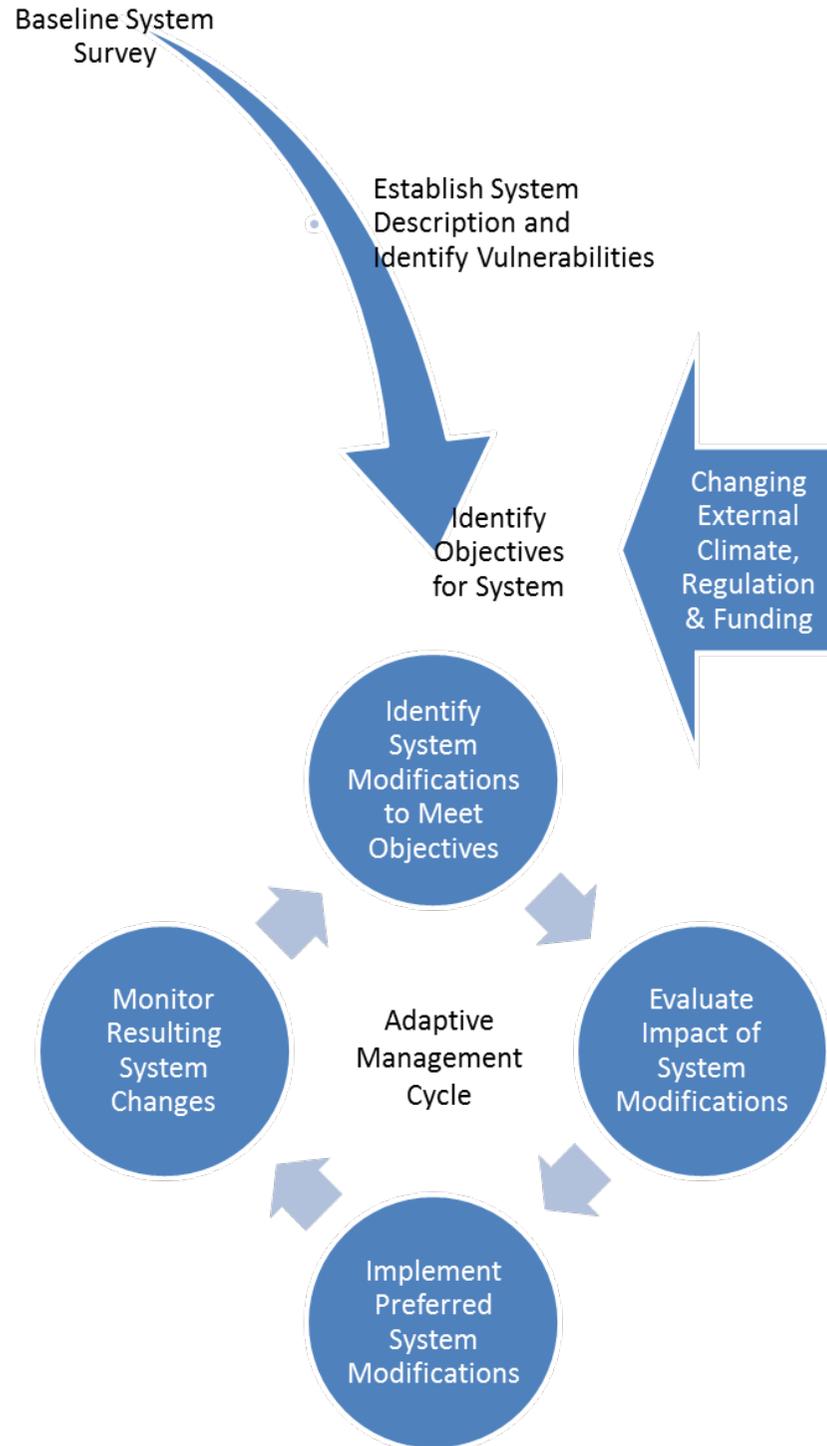
- Geometry:
  - height, width, shape,
  - area
- Roughness/rugosity
  - Species density
  - Species diversity
  - Habitat for fauna
- Absorption
  - Infiltration
  - Evapotranspiration

Social values also link to above





# Framework cycle



Strategic

### Scope (Qualitative phase)

- 1. **Initial planning and problem definition:** identify, organize, and assemble stakeholders and partners; define problems and opportunities; set objectives and develop metrics; define the system
- 2. **Funding strategy:** identify funding mechanisms and opportunities; prepare preliminary cost estimates

### Plan (Quantitative phase)

- 3. **Risk and vulnerability assessment:** develop an understanding of the system; compile or collect existing data; conduct hazard, vulnerability, and risk analyses
- 4. **NNBF alternative formulation:** identify conventional, NNBF, and hybrid options to meet objectives; develop conceptual designs
- 5. **Evaluation of alternatives:** analyze economic, social, and ecological costs and benefits

### Decide (Decision phase)

- 6. **Preliminary selection:** work with decision-makers to select an option, engage with interested parties

### Implement (Action phase)

- 7. **Refinement of the selected alternative:** design alternative and develop construction plan; develop monitoring and adaptive management plan; revise cost estimates and finance strategy; submit permit applications
- 8. **Finalization of design and authorization:** finalize designs, plans, and specifications; obtain permits; award construction contract
- 9. **Construction:** construct alternative; communicate with interested parties; supervise and monitor activities; complete punch list; verify construction (as-built); notification of completion to funding source and regulators

### Manage (Operational phase)

- 10. **Adaptive management:** monitor and report performance and outcomes; adaptively manage; develop and execute long-term asset management strategy
- 11. **Asset management:** develop and execute long-term strategy for system management

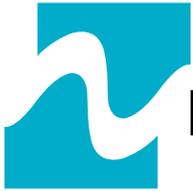
Possible form of cycle

Tactical

Long-term iteration relative to on-the-ground conditions and shifting values

Iterative process to identify practical and preferred alternatives

Operational



**HR Wallingford**  
*Working with water*

**International NNB  
Guidelines**



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