Task 3.1 Identify and assess options for adaptation pathways

Task 3.1.2 Assess the effectiveness of options for adaptation pathways

What is this task about?

This task is about appraising and analysing the applicability of each identified option and its potential performance against the identified risks (from Task 1.3.1), including overall benefits, adverse effects, trade-offs and potential synergies. This consists of screening each identified adaptation option to determine its capacity and effectiveness in achieving the multiple planning objectives, as well as its capacity to drive positive system change. It also involves analysing and understanding the key enabling conditions necessary for their successful implementation; essential to achieving the desired transformation. Guided by the Theory of Change (Task 2.4.1), this analysis provides an overview of potential building blocks of the best possible set of interventions, including insights into what works, why it works, and what resources and support structures are required for success.

Assessing adaptation options encompasses the following main activities. These activities should be completed in parallel with Task 3.1 of the Adaptation Investment Cycle.

- **Establish option evaluation criteria**
- **Conduct feasibility assessment (technical, economic, financial and social)**
- **Futures testing and robustness analysis**
- **Stakeholder review and validation**
- **Prioritise options**
- **Prioritize interventions and measures.**
- **Communicate and disseminate decisions.**

Food for thought: While the primary focus should be on adaptation options that are currently available and appropriate, it is also important to remain open to those transformational options that are not feasible at present. These options should be kept under consideration and actively explored for future implementation, provided the necessary enabling conditions are developed. This ensures that immediate needs are met while also paving the way for transformational strategies in the long term, as knowledge, technology, and climate change progress.

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Why is it important?

Assessing adaptation options allows you to craft a win-win strategy, considering not only overall benefits and synergies but also adverse effects and trade-offs. By identifying options that are effective in addressing climate risks (i.e., risk mitigation) as well as contributing positively to other societal goals through wider co-benefits (e.g. job creation, public health, social well-being, economic development, etc.), you can achieve your primary adaptation objectives while also achieving your other objectives relating to your wider regional economic, social and environmental policy goals. This empowers you to prioritise positive impact while unlocking the potential for readily available and transformative options – a critical aspect of the Climate Resilience Strategy.

The prioritised adaptation options form the building blocks for your Climate Resilience Strategy. They are crucial for developing your adaptation pathways (Tasks 3.2.1 & 3.2.2) and innovation portfolios (Task 3.2.3).

How can you complete it?

To appraise your adaptation options, complete the following activities.

- **Establish option evaluation criteria:** identify key criteria (more information provided in Appendix D12) for the characterisation, appraisal, and prioritisation of the adaptation options. This includes the performance metrics to assess the impacts of your adaptation pathways against your planning objectives and progress towards your vision (Task 1.1.2, revised in Phase 2). But it also includes additional criteria relating to, e.g., adaptivity, implementation feasibility, and transitional qualities. It is important to ensure the criteria reflect community values, priorities, and needs, and are suitable for your region's conditions, objectives, and capabilities.
- **Conduct feasibility studies:** undertake the studies necessary to evaluate the technical, economic, financial, social, environmental, and institutional feasibility for the options. This includes analysing the key enabling conditions for each adaptation option and comparing these to the local conditions, capabilities, and resources. To adopt a more transformative lens, we encourage you to consider the Multiple Resilience Dividends framework. This framework helps you to recognise adaptation measures capable of achieving multiple benefits and planning objectives in terms of risk reduction and other sectoral or social goals regardless of a disaster event while guiding your selection towards low-regret options— adaptation efforts that do not lock in unsustainable practices or create new vulnerabilities.

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- **Analyse opportunities:** Analyse the key enabling conditions under which conditions adaptation options may become more feasible, practical, impactful, or attractive in the future. This involves thorough examination of the technical, economic, financial, social, environmental, and institutional factors that could influence the feasibility/ implementation of these options, considering changes over time such as climate conditions, emerging technologies, societal values, and policy landscapes. This analysis can be especially valuable for adaptation options that seem to be more transformative and innovative but are currently considered less feasible given existing constraints (e.g., due to technological immaturity, financial barriers, or social resistance) or uncertainties, but can still play a crucial role in long-term planning. Take note of any factors influencing their realisation and potential timing as these will feed into the formulation of your pathways, innovation portfolio and Action Plan in later tasks.
- **Stakeholder review and validation:** according to the stakeholder engagement strategy (Task 2.1.2), involve wider stakeholder groups affected directly and indirectly by both climate risk(s) and adaptation options to present the assessment results. Gather their feedback and revise the assessment based on their input. This can support the decision-making process, ensuring that decisions are aligned with the needs and expectations of key stakeholders.
- **Prioritise options:** compare each option's potential capacity to achieve the set of planning objectives and deliver multiple resilience dividends (impacts, i.e., net benefits from adaptation options), as well as their relative adaptivity (e.g. robustness/flexibility), implementation feasibility, and transitional qualities (e.g. transformative power). Rank them according to these aspects against a weighted set of criteria. Prioritise adaptation options that best balance the weighted criteria, concentrating on currently available adaptation options with a higher capacity to drive more profound change.

Insight: Building on the climate-resilient futures developed in Task 2.2.1, analyse how various factors—technical, economic, financial, social, institutional, and environmental—enhance or hinder the feasibility of certain options over time. This analysis may consider changes in current conditions such as the following: upgrades to existing adaptation measures, sudden availability of capital for specific options like Nature-based Solutions (NbS), changes in regulatory and policy frameworks, the emergence of new markets (e.g., ecosystem services) or incentives, advancements in nascent technologies (e.g., artificial intelligence, big data, the Internet of Things), and shifts in public risk perception and tolerance due to the increasing frequency and intensity of climate-related events.

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For the Investment Plan development, Adaptation Investment Cycle Task 3.1 places particular emphasis on identifying the varying benefits of different options and their relative sizes, to help with the economic and financial appraisal and sequencing of options. The assessment undertaken in Adaptation Investment Cycle Task 3.1 should be used as the input to the economic and financial viability criterion for this assessment. Further information on how to complete the economic appraisal is provided in Task 3.1 of the Adaptation Investment Cycle guidance.

Further detailed technical guidance on completing this task can be found in ***Appendix D12.***

What are key inputs for the task?

- Updated problem framing (Task 1.1.2)
- Climate Risk Assessment (Task 1.3.1)
- Capabilities Assessment (Task 1.3.2)
- Shared vision for climate resilience (Task 2.3.1)
- List of identified options (Task 3.1.1)
- The assessment of economic benefits identified in Task 3.1 of the Adaptation Investment Cycle Guidance (completed in parallel)

What are the expected outputs?

- A set of suitable adaptation options to address your planning objectives and deliver the necessary outcomes to build towards your future vision. This consists of a summary including relevant aspects of the assessment process (options characterisation, selection criteria, social preferences, and prioritisation methods).
- A set of suitable adaptation options to address the prioritised current and future climate risk(s) in your region and to achieve the desired changes to climate resilience (vision). This consists of a summary including relevant aspects of the assessment process (options characterisation, selection criteria, social preferences, and prioritisation methods).

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Before moving on, have you...

- [ ] Involved stakeholders in the prioritisation exercise to ensure buy/in?
- [ ] Developed a comprehensive assessment of identified adaptation options?
- [ ] Prioritised a set of adaptation options readily available and locally appropriate for the targeted climate risks?
- [ ] Analysed opportunities for implementing transformative and innovative adaptation options under future conditions?

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Explainer: Multiple Resilience Dividends

The Multiple Resilience Dividends concept illustrates how resilience interventions can yield substantial, multifaceted benefits in our systems and societies. Here, Resilience Dividend refers to the net benefits of investing in resilience-building, where "net" means the differential impact of a resilience intervention compared to a pre-intervention situation and accounts for the full range of benefits, implementation costs, adverse effects, and trade-offs. This balanced analysis of resilience dividends, in which overall positive and negative effects of adaptation actions are considered in the decision-making, can significantly improve adaptation planning. It also better-links adaptation options to integrated sets of planning objectives, such as those envisaged in the Regional Resilience Journey.

The MRD conceives adaptation measures as interventions that impact various sectors, such as food, land-use, water, health, energy, or ecosystems, on different domains (e.g., social, economic, cultural, environmental, institutional, political, and technological). Given the interconnected nature of systems, resilience dividends are delivered via direct, cascading, and spillover effects extending across the system and result in synergies with other societal objectives and needs (e.g., job creation, gender equality, biodiversity conservation). Under this perspective, climate adaptation itself yields a spectrum of effects beyond the scope of disaster risk reduction, and thus, can be considered as a cross-cutting developmental aspect. For example, ecosystem restoration as an adaptation measure can yield a wide range of environmental benefits, such as biodiversity conservation, habitat creation, carbon sequestration, prevention of soil erosion and land degradation, and socio-economic benefits, which may include secure livelihoods, social cohesion, recreation areas, increased water security, enhanced food security, and tourism. When combined, these benefits can surpass the avoided losses and damages and, most importantly, the costs incurred in the rehabilitation process.

Assessing adaptation options against MRD is important for building a broader value proposition for investing in adaptation. By embracing the MRD concept, it is possible to achieve multiple goals (or planning objectives) while addressing and managing risks effectively and sufficiently. This thinking offers an alternative to the traditional appraisal of adaptation options that includes often single-sector approaches that do not consider wider system interdependencies (i.e., synergies and trade-offs between different sectors). Hence, decision-makers in the region can transcend the traditional focus of disaster reduction and build a strong business case for investing in climate adaptation, presenting it as an opportunity to leverage broader development objectives; a catalyst for growth and shared prosperity.

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Establish option evaluation criteria:

Identify key criteria for the characterisation, appraisal, and prioritisation of the adaptation measures. This includes the primary and secondary performance metrics set to assess the impacts of your adaptation pathways against your planning objectives and progress towards your vision (Task 1.1.2, revised in Phase 2). But it also includes additional criteria relating to, e.g., adaptivity, implementation feasibility, and transitional qualities. It is important to ensure the criteria reflect community values, priorities, and needs, and are suitable for your region's conditions, objectives, and capabilities. Table outlines several potential criteria for assessing adaptation options in your region through a systemic perspective:

Table D12.1: Suggested additional criteria for assessing adaptation options in the Pathways2Resilience context.

Criteria	
Impacts	
Adaptation effectiveness: the capacity of each adaptation option to address the identified risks and their drivers sufficiently (primary adaptation objectives). This also includes aspects of deployment (the time an adaptation option will take to show initial benefits and reach full adaptive capacity) and coverage (the geographic area that may benefit from it) (Task 1.1.2).	**Potential to deliver integrated impacts:** the capacity of each adaptation option to deliver integrated co-benefits. This requires a comprehensive overview of benefits, adverse effects, trade-offs, and potential alignment with other relevant goals specified in the secondary resilience objectives (e.g., poverty alleviation, inclusion, water and food security) for each adaptation option (refer also to the Multiple Resilience Dividends concept in D6.5). To understand the extent to which the implementation of one adaptation option facilitates or hinders the achievement of other goals in other sectors/areas/projects (synergies and trade-offs), it is necessary to consider its dependencies within the system (Tasks 1.2.1 and 1.2.2). This allows you to compare options and determine 'what', 'how much' and 'when' benefits will be delivered, mapping the overall resilience gains across the system.

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Table D12.1: Suggested additional criteria for assessing adaptation options in the Pathways2Resilience context.

Criteria		
Adaptivity		
Robustness: analyse the capability of each adaptation option to deliver resilience gains in whatever conditions emerge and thereby be sustained in the long run. This includes considering factors like maintenance needs, and the potential to perform against a wide range of potential conditions (climatic and non-climatic). Along with the flexibility criterion, this allows you to evaluate the option's performance under different futures.	Flexibility: analyse the capability of each adaptation option to adapt to the conditions that emerge in order to achieve resilience gains. This includes considering how easily the option can be modified or supplemented with additional options in response to new information or changing conditions. Along with the robustness criterion, this allows you to evaluate the option's performance under different futures.	Potential regret: determine the degree to which an adaptation option minimises risks of counterproductive irreversible changes (maladaptation) that lead to path-dependencies, critical trade-offs, lock-ins, or whether adaptation options create or exacerbate environmental impacts like pollution, biodiversity loss, and resource depletion. This ensures that adaptation efforts do not create new challenges for future generations, particularly by not limiting future populations' ability to adapt to evolving climate conditions.
Implementation feasibility		
Technical feasibility: determine whether specific adaptation options can be implemented or not. This involves analysing the technical requirements of each adaptation option in comparison to the available technological resources, local expertise, and infrastructure. Doing so allows you to prioritise those adaptation options that benefit from the existing conditions by being ready for implementation without the need for major further investment.	Economic and Financial viability: estimate the upfront costs, maintenance, potential future upgrades, and broader economic effects on local economies and communities (e.g., employment, economic stability) that adaptation options bring individually. Also evaluate the option against its potential financing structures and attractiveness from an investment perspective. This involves analysing the composition of funding sources and available capital, how funds will be raised, allocated, and managed, a financial risk profile, potential revenue streams, cost recovery mechanisms, and expected returns to investors.	Relevance (stakeholder priority): evaluate adaptation options in regard to the level of urgency of the targeted risks and its ability to reduce these risks within the needed time frame, as well as its contribution to achieving the desired change, or 'vision' (Task 2.3.1).

D12. Task 3.1.2 Assess effectiveness of options – Technical guidance on how to complete

Table D12.1: Suggested additional criteria for assessing adaptation options in the Pathways2Resilience context.

Criteria		
Implementation feasibility		
Local suitability: examine the appropriateness and social acceptance of adaptation options given the local conditions and dynamics. It integrates stakeholder perceptions and priorities as part of the options evaluation, taking into account what benefits are relevant to whom and to what degree. Thus, it helps map specific communities, KCS, or areas where adaptation options are (more) suitable, considering both the local biophysical and climatological characteristics, as well as the socio-economic and cultural aspects.	Policy relevance (coherence, institutional support): analyse the coherence and compatibility of each adaptation option with existing governance structures (e.g., roles, responsibilities, and mandates), legal framework (e.g., compliance of regulations, and norms), and other development initiatives (e.g., sectoral strategies, regional development plans). It also includes the assessment of institutional support and political will, as well as the institutional capacity to implement and maintain a particular option.	Regional capabilities: analyse the ability of local institutions, stakeholders, suppliers, etc. to implement and maintain each adaptation option. Are there sufficient regional skills and resources available to initially deliver and sustain the option in the long term? This also includes an assessment of whether there is sufficient will to acquire the necessary skills and resources to implement the option.
Transitional qualities		
Facilitates Just Resilience: Examine the extent to which an adaptation option will contribute to delivering just resilience. This means assessing each option through an equity perspective to evaluate how the benefits and burdens of the adaptation option will be distributed across different groups.	Transformative power: examine the extent to which an option brings significant and lasting changes or reconfigures existing systems, processes, or practices within a given context. It can be expressed in terms of scalability (whether the adaptation option can be scaled up if successful or if conditions worsen), replicability (whether the adaptation option can be standardised and/or replicated in other areas) and leverage (whether the adaptation option can induce deep forms of change by intervening most structural causes of risks and vulnerability).	

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Conduct feasibility studies:

undertake the studies necessary to evaluate the technical, economic, financial, social, environmental, and institutional feasibility for the options. This includes analysing the key enabling conditions for each adaptation option and comparing these to the local conditions, capabilities, and resources. To adopt a more transformative lens, we encourage you to consider the Multiple Resilience Dividends framework. This framework helps you to recognise adaptation measures capable of achieving multiple benefits and planning objectives in terms of risk reduction and other sectoral or social goals regardless of a disaster event while guiding your selection towards low-regret options— adaptation efforts that do not lock in unsustainable practices or create new vulnerabilities. Also, this allows you to identify potential adverse effects and trade-offs from your option.

Analyse opportunities:

Analyse the key enabling conditions under which conditions adaptation options may become more feasible, practical, impactful, or attractive in the future. This involves thorough examination of the technical, economic, financial, social, environmental, and institutional factors that could influence the feasibility/ implementation of these options, considering changes over time such as climate conditions, emerging technologies, societal values, and policy landscapes. For each measure, you may consider whether it could become more feasible, practical, impactful, or attractive in the future (Table) by applying the climate-resilient futures developed in Task 2.2.1.

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Table D12.2: Conditions that may change the feasibility of adaptation options.

Conditions	Examples of key considerations
Planned maintenance and/or end-of-design life of current measures	are there adaptation options which would become much more feasible when implemented during maintenance, upgrades or repairs of existing measures? Imagine, for example, how you could plan the repair of an existing dike as an opportunity to heighten it
Sudden availability of resources (including, financial, input, raw material, or labour)	are there any options whose feasibility is mostly limited by the availability of resources? What adaptation options would become much more feasible if, for instance, financial constraints are overcome due to a new funding scheme, policy investment priority, or private capital available for particular measures (e.g. NbS)?
Institutional and/or political support	are there adaptation options that could become significantly more feasible with increased institutional or political backing? How might changes in policy or leadership incentivise early adoption of adaptation measures? Consider how specific adaptation policies, new or updated targets, changes in regulatory frameworks, institutional capacity building, or the establishment of new governance structures might enhance the feasibility of certain measures from a governance perspective.
Public support	in the form of increased social acceptability of some of the options due to e.g. changes in societal values and priorities, perceived risk and its acceptance. How would the feasibility of specific adaptation options change if communities placed greater value on sustainable outcomes rather than short-term gains? And how would the public demand for a particular option change when communities experience climate-related events (e.g., floods, heatwaves, or wildfires)? or with the intensification of these events over time?
Technological development	Are there adaptation options that may appear unfeasible given today's conditions but may become more viable in the future considering the development of emerging technologies? Are certain technological developments (e.g., artificial intelligence, big data, internet of things, 3D printing, building information modelling) that can decrease costs, enhance implementation, or ease the scalability and replicability of some adaptation options?
Market conditions	Are there adaptation options whose feasibility could be significantly enhanced by changes in market conditions? Consider how shifts in supply and demand, changes in the cost of materials? or the emergence of new markets (e.g., ecosystem services markets) might make certain adaptation options more economically viable? How could market incentives, such as subsidies or tax breaks, affect the feasibility and attractiveness of specific measures

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This analysis can be especially valuable for adaptation options that seem to be more transformative and innovative but are currently considered less feasible given existing constraints (e.g., due to technological immaturity, financial barriers, or social resistance) or uncertainties, but can still play a crucial role in long-term planning. Take note of any factors influencing their realisation and potential timing as these will feed into the formulation of your pathways and innovation portfolio in later tasks.

Stakeholder review and validation:

ased on your stakeholder engagement strategy (Task 2.1.2), involve groups affected directly and indirectly by both climate risks and adaptation options to present the assessment results. Gather their diverse input, including perspectives, preferences, priorities, and concerns regarding the adaptation options or the way they were evaluated (e.g., accuracy, relevance, completeness, alignment). Revise the assessment results based on stakeholder feedback to ensure they reflect community needs and priorities. This helps not only shape the options' prioritisation and make well-rounded decisions that address the most critical concerns of key stakeholders, but also secure the social buy-in of the appraisal process by taking into account a variety of viewpoints and interests. Seeking stakeholder validation can ultimately reduce the likelihood of conflicts or resistance, build trust in the adaptation process, and thus, increase the chances of success and achieve your desired outcomes.

Prioritise options: use decision-support tools such as multi-criteria analysis (MCA) to (qualitatively and/or quantitatively) benchmark the adaptation options. Determine the weights of each defined criterion. Which criteria you will find most important will depend on your adaptation objectives (Task 1.1.2), future vision (Task 2.2.2) and local priorities. Compare their capacity to deliver impacts (i.e. net benefits from adaptation options), as well as their adaptivity (e.g. robustness/flexibility), implementation feasibility, and transitional qualities (e.g. transformative power). Rank them in terms of local capacity (Task 1.3.2), appropriateness to address the framed problem (Task 1.1.2), and ability to reach your region's ambition (Task 2.3.1). Prioritise adaptation options that offer the best balance of the weighted criteria, concentrating on currently available and appropriate adaptation options with a higher capacity to drive more profound change.

An example of a nominal rubric for prioritising adaptation options is shown in Table below.

While the primary focus should be on adaptation options that are currently available and appropriate, it is also important to remain open to those transformational options that are not feasible at present. These options should be kept under consideration and actively explored for future implementation, provided the necessary enabling conditions are developed. This ensures that immediate needs are met while also paving the way for transformational strategies in the long term, as knowledge, technology, and climate change progress.

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Table D12.3: Nominal rubric for prioritising adaptation options

	Key Criteria (indicator)	Adaptation Option 1	Adaptation Option 2	Adaptation Option n
Impacts	Adaptation effectiveness (i.e. risk reduction)*	High/ Medium/ Low	High/ Medium/ Low	High/ Medium/ Low
	Potential to deliver integrated impacts (i.e. co-benefits)**	High/ Moderate/ Low	High/ Moderate/ Low	High/ Moderate/ Low
Adaptivity	Robustness (future proof)	High/ Medium/ Low	High/ Medium/ Low	High/ Medium/ Low
	Flexibility (adaptive)	High/ Medium/ Low	High/ Medium/ Low	High/ Medium/ Low
	Potential regret (risk of maladaptation)	Low Risk/ Moderate Risk/ High Risk	Low Risk/ Moderate Risk/ High Risk	Low Risk/ Moderate Risk/ High Risk
Implementation Feasibility	Technical Feasibility (technical readiness)	Ready/ Needs Adjustment/ Not Ready	Ready/ Needs Adjustment/ Not Ready	Ready/ Needs Adjustment/ Not Ready
	Economic & Financial viability (from Adaptation Investment Cycle step 3.1)	Favourable/ Neutral/ Unfavourable	Favourable/ Neutral/ Unfavourable	Favourable/ Neutral/ Unfavourable
	Relevance (stakeholder priority)	Essential/ Important/ Non-Essential	Essential/ Important/ Non-Essential	Essential/ Important/ Non-Essential
	Local Suitability (community support)	Strong/ Moderate/ Weak/ Contested	Strong/ Moderate/ Weak/ Contested	Strong/ Moderate/ Weak/ Contested
	Policy Relevance (coherence, institutional support)	Aligned/ Partially Aligned/ Not Aligned	Aligned/ Partially Aligned/ Not Aligned	Aligned/ Partially Aligned/ Not Aligned
	Regional capabilities (local skills and resources)	Sufficient/ Needs development/ Not Ready	Sufficient/ Needs development/ Not Ready	Sufficient/ Needs development/ Not Ready
Transitional qualities	Facilitates Just Resilience (equity of impacts)	Positive/ Neutral/ Negative	Positive/ Neutral/ Negative	Positive/ Neutral/ Negative
	Transformative Power (potential to stimulate systemic change)	High/ Moderate/ Low	High/ Moderate/ Low	High/ Moderate/ Low

** Note that this criterion could be separated out into multiple criteria according to your specified primary adaptation objectives (e.g. addressing flood risks, heat stress, etc.).*

*** Note that this criterion could be separated out into multiple criteria according to your specified secondary resilience objectives (e.g. job creation, public health, biodiversity restoration, etc.).*

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Case studies: **Rebuild by Design (RBD)**

The Rebuild by Design (RBD) competition was launched by the U.S Department of Housing and Urban Development after the devastating impacts of Hurricane Sandy on the greater New York City area in 20212. Its aim was to address flood risk and increase urban resilience by providing innovative design ideas which would result in multi-purpose flood risk management solutions across scales. The vision was to catalyse transformation of the affected region towards being flood resilient.

Seven international teams were selected to come up with designs that will transform urban areas, increase flood resilience while offering a number of ancillary co-benefits. One of the winning designs was Resist, Delay, Store, Discharge (RDSD): a comprehensive strategy for a city of Hoboken, New Jersey. The project envisioned urban transformation of Hoboken through a combination of coastal infrastructure, green areas to store excess stormwater, and green infrastructure on private and city properties. Sakic Trogrlic et al. (2018) researched the outcomes of RBD in Hoboken, and found that the RDSD was perceived as alleviating flood risk but also unlocking transformational change by providing many co-benefits (i.e., dividends). These included a new visual identity of a green city, recreational opportunities, decrease in combined sewer system overflows thus complying with federal environmental laws, and enhanced social capital. Most importantly, RDSD provided a structured vision for the city government through enhanced spatial planning. Although its initial objective was building flood resilience, the proposal tackled other recognised issues in the city, such as community need for more open space in the urban area.

Supporting resources:

- The Economics of Climate Change Adaptation: Insights into economic assessment methods
- NOAA's Feasibility of Adaptation Options
- Multi-criteria analysis: a manual
- Methods and Tools for Adaptation to Climate Change: A Handbook for Provinces, Regions and Cities
- Deltares' Adaptation Catalyst
- RIBASIM – River Basin Planning and Management