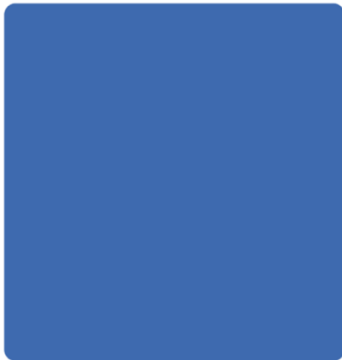


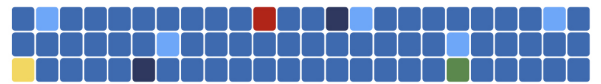
CLIMATEFIT
International best practices research

Research methodology and lessons learned

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The international best practice research was part of CLIMATEFIT's work package 1, Task 1.3: Understand and capitalise on the good practices. The work was performed in preparation of Deliverable 1.1: 'Adaptation Investment Landscape'. This deliverable is available on the [CLIMATEFIT website](#). Task 1.3 focused on benchmarking good practices in local climate financing in the EU and internationally selected based on their 1) transferability to the European context (if international), 2) transferability/relevance for local climate resilience projects, 3) an initial needs assessment among the cases, and 4) presentation of potential champions for a novel financing. In other words, this task searched for international examples of climate financing relevant for the climate and financial context of the 20 CLIMATEFIT territories.

Research methodology

We undertook a rigorous approach to select, analyse, and report about 20 international best practices. The first step included the development of a database of international examples of innovative AFFS by reviewing the numerous recent resources and toolkits on funding and financing climate resilience available in the EU and globally. Second, we developed a sampling procedure to select 20 cases from this database. Third, an analysis framework was developed to guide the analysis of the selected cases, after which data was collected and analysed through document analysis and interviews. Finally, the findings of each best practice were reported in a report, called factsheets. The details of these steps are explained in the following sub sections.

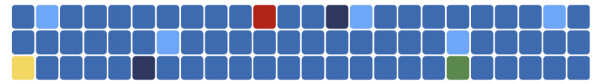
A full report of each best practice will be a downloadable file on the CLIMATEFIT website.

In the CLIMATEFIT glossary, a good practice is defined as "a thread common to most definitions implies strategies, plans, approaches and/or activities that have been shown through research and evaluation to be efficient, sustainable and/or transferable, and to reliably lead to desired results". **In our international best practices research, the term 'best practice' resonates with the definition of good practice, but its scope is limited to successfully and efficiently raising financial resources and channelling them to the implementation of climate adaptation measures (or mitigation in some cases).** In other words, the AFFS in each researched international best practice has successfully enabled climate related investments. AFFS is defined in CLIMATEFIT as "an umbrella term covering individual or combinations of financial instruments, mechanisms, products and vehicles suitable to finance adaptation initiatives and projects". Being a good practice from a financial perspective does not guarantee the cases are good practice from other perspectives, for example, justice and broader socio-economic impacts.

From database to selecting 20 best practices

We adopted a **multi case study research approach** whereby the cases were selected through **purposive case study sampling**, meaning cases are selected with a specific purpose in mind (Ishak & Abu Bakar, 2014). In this situation, the purpose is to find cases that exemplify successful and innovative adaptation funding and financing solutions for climate measures. Data was collected and analysed through a combination of **document analysis** (desk research) and **semi-structured interviews**. "A case study is an empirical method that investigates a contemporary phenomenon in depth and within its real-world context" (Yin, 2018, p. 15). A multiple case study approach means studying two or more cases "simultaneously or sequentially in an attempt to generate a broader appreciation of a broader issue" (Crowe et al., 2011, p. 2). In our research, studying cases of AFFS best practices helps us to learn lessons from multiple cases about how to successfully finance and fund climate measures in innovative ways. By comparing multiple cases, it allows a better understanding of the conditions in which AFFS can or cannot be applied (Clark et al., 2021). Purposive case study sampling is a procedure for selecting cases to research that "uses the judgment of an expert in selecting cases, or the researcher selects cases with a specific purpose in mind" for an in-depth investigation (Ishak & Abu Bakar, 2014, p. 32). We had the specific purpose to find cases that exemplified innovative AFFS with some form of private capital involvement.

To purposively select cases for in depth investigation, we needed a pool of cases from which we could sample 20 best practices. For that reason, we first composed a **database of international examples of innovative AFFS, with special attention to some form of private capital involvement (financing and/or funding).** Multiple sources were used to identify cases for the database, including academic literature (with special attention for recent review papers because they encompass large bodies of literature); grey literature; government documents; deliverables and reports from previous and ongoing EU Horizon projects; and online databases, platforms, and knowledge hubs (e.g. OPPLA, Climate Adapt, Urban Nature Atlas...), suggestions



from other CLIMATEFIT partners. Table 1 gives an overview of the sources used to find examples for the database.

The academic literature includes the recent review papers about finance and climate adaptation, green-blue infrastructure, or nature-based solutions. Review papers capture a large body of existing literature and are thus representative for the state of art in scholarly literature. Grey literature includes recent EU reports about nature or climate and finance, and reports we found through snowball sampling in other sources or examples. The third category of sources includes cases found in previous EU Horizon projects about climate or nature with a finance component, and main European or global platforms that include climate adaptation and mitigation, or nature-based solutions cases. We searched these websites and platforms for cases that mentioned innovative AFFS. We possess a list of other sources that we have not yet explored because of time constraints in WP1. This provides an opportunity to further expand the database in the future. The database provides a collection of innovative AFFS for climate measures, mainly adaptation but also mitigation examples. **As of June 2024, the database contains 260 international examples of innovative funding and financing solutions for climate adaptation, and some relevant mitigation examples from all around the world.**

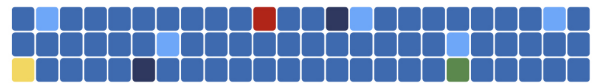
The database itself was not part of the project proposal's description of WP1 and is therefore in its current form not publicly accessible. We developed this so we could purposively select 20 cases for further research, rather than randomly selecting 20 cases without having a better overview of documented cases globally. This database has synergies with P2R's recently published 'catalogue of sources, instruments, and best practice case studies' (P2R, nd), which also includes an impressive roster of 169 case studies, many of them also included in the CLIMATEFIT database. CLIMATEFIT and P2R signed a non-disclosure agreement and are currently exploring the opportunity to merge both databases. **To our knowledge, a joint P2R and CLIMATEFIT database would become the largest climate and nature projects database with a finance perspective.** It became apparent from academic and grey literature, and our WP1 research that the public and private (financial) sectors need good examples to boost climate finance. A joint P2R and CLIMATEFIT database would complement platforms with smaller number of finance-perspective cases (CCFLA, IISD) and platforms that document climate and nature cases but with a lesser focus on finance (Urban Nature Atlas, OPPLA, Climate-ADAPT).

Table 1. Sources used to find cases for the database.

Type of source	Sources
Academic literature	Brears (2022); (den Heijer & Coppens, 2023; Droste et al., 2017; Dyca et al., 2020; Grant, 2018; Jiang, 2023; Liberalesso et al., 2020; Mamedes et al., 2023; Mandle et al., 2019; Peterson et al., 2020; Seyfang & Longhurst, 2013; Thompson et al., 2023)
Grey literature and reports	(Body et al., 2018; Bulkeley et al., 2020; Castellari et al., 2021; EEA, 2017; EIB, 2020; Hudson et al., 2023); Matzdorf et al. (2014); (Merk et al., 2012)
Online platforms and websites, other EU projects	CCFLA , Urban Nature Atlas (Naturevation), Network Nature , OPPLA , Climate-ADAPT , Climate Change Fund (Asian Development Bank), IISD innovative financial instruments , Interlace Hub Atlas .

In the database, we included the types of information listed below for each of the entries. Within the time available to compose the database, we believe these information types allow to understand and compare entries of the database.

- A brief description and general information: timeframe of the best practice implementation, location, source of information
- Sectors to which the case study applies; water management, agriculture, forestry, coastal areas, mountain areas, urban areas (built environment and infrastructure), ecosystem conservation. This will be redefined to Key Community Systems to align the database's terminology with the Implementation Plan of the EU Mission of Adaptation to Climate Change (European Commission, 2021). Although different in terminology, the current database categorisation and the EU's Key Community Systems are very similar in their meanings.
- Climate hazards that were addressed by the case: heat waves, droughts (water scarcity or fires), floods/heavy precipitation, landslides/avalanches, sea level rise/coastal erosion, biodiversity and quality loss. These are based on Castellari et al. (2021).
- AFFS used in the case for financing and funding the climate investment. Because there are many different financial instruments, we made five categories to improve the database's readability, based on den Heijer and Coppens (2023). In a separate column we also describe the main financial



instrument of the AFFS. The five categories are: public budgets¹, debt or equity², land value capture³, market-based & revenue generating models⁴, community or private-party based models⁵. When further developing the database for public use in later stages of the project, we will align the financial terminology with the Catalogue of Sources, Instruments, and Best Practices produced by the EU Horizon project Pathways2Resilience (P2R, nd). This catalogue is currently not available for public use.

- Defining whether the financing and funding comes from public, private, or hybrid (public and private) sources. Financing means providing the resources to make the investment and implement a project. Funding refers to the ultimate payment of the investment.
- The governance level of the climate change investment: local or supra-local. Local means the case only involves one local government. Supra-local means that multiple local governments or governments at different levels are involved.

At the end of project month 1 (September 2024), we stopped adding entries to the database because of time constraints as explained previously and moved on to the next step of purposively sampling 20 best practices from the database. **Figure 1 shows the different steps of the sampling procedure.** We decided from the onset of the procedure that we would create two shortlists. Shortlist A contains 20 cases that are of primary interest for analysis; Shortlist B contains back-up cases if one or more of the cases from shortlist A cannot be properly researched due lack of data, difficulty to contact someone for an interview, or when it appears the case is not a best practice example. The sampling procedure had three steps:

1. Two researchers analysed the cases in the database and each individually assessed the eligibility of the cases for the shortlist. Two criteria were used to assess the cases' eligibility: priority was given to cases about climate adaptation over climate mitigation; and the cases had to be relevant for the CLIMATEFIT territories, meaning the specific context of Eastern, Mediterranean, and Northwestern Europe in terms of climate hazards and main sectors impacted by climate change. Cases were either marked as YES (eligible), or NO (not eligible). Cases marked with a YES by both researchers were considered for selection for the shortlists. This reduced the list to 107 eligible cases.
2. A second round of eligibility assessment was then performed by one researcher, with the aim to select 40 out of the 107 cases for the final selection. Again, two main criteria were used to select cases. The first criteria were to have a diversity of financial models/mechanisms and keep the ratio of financial models in the list of 107 cases. For example, if the list of 107 cases included ten Payment for Ecosystem Services cases, then four or five cases were selected for the selection of 40 cases. A second criteria was a first assessment of the transferability to the CLIMATEFIT territories, meaning whether and how easy or quick the cases' financial models could be applied to the CLIMATEFIT territories. The result of this step was a selection of 40 cases for final consideration for shortlists A and B.
3. In the final step, the 40 cases were divided among shortlists A and B. Again, two criteria were used to perform the final selection of shortlist A and B. Diversity and ratio of financial models was considered similar as explained in the previous step. Additionally, we also ensured different areas (countries and continents) were represented. For example, if the 40 cases contained 4 carbon offsetting cases, of which 2 from the same country, then we would not put them in the same list. Second, we made a first assessment about data availability and the maturity of the case. More mature cases are those that have a longer implementation or operational time, or in which climate change projects have already been realized and financed/funded through an innovative financial model.

This form of sampling is considered a combination of critical case sampling, maximum variation sampling, and criterion sampling. With **critical case sampling**, "researchers choose cases because they display features that are central to the phenomenon of interest. These cases are most likely to reveal the most information with respect to the research questions" (Clark et al., 2021, p. 379). In our research, we looked for cases that would

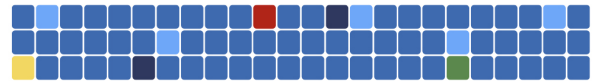
¹ The direct (and creative) use of public budgets for climate adaptation investment: taxation, co-financing, grants, subsidies, endowments, participatory budgeting.

² Loans, green bonds, revolving loan fund, equity finance, insurance-based finance, debt-for-nature-swap, concessional finance.

³ Instruments related to a value increase of land because of climate adaptation investments: developer obligations, betterment levies/taxes, TIF, special assessment districts, BID/NID/CID/PID.

⁴ Instruments make climate adaptation investments attractive because (for private parties) because of revenue generation or financial (dis)incentives: blended finance/leverage instruments (fund, pooled capital; incentives), utility/user fees, commercial exploitation, TDR, offsetting/credit trading systems, crypto currencies, PES, PPP.

⁵ Instruments where initiatives are taken by, or where financing and funding responsibilities are transferred to local communities or (local) private parties, without any direct monetary benefits: community asset transfer, land trusts, community currency, household or business investment, collective private commissioning, crowdfunding, charity, philanthropy, donations.



reveal the most information possible about innovative AFS. With **maximum variation sampling**, researchers "describe common features that exist across a wide variety of contexts, and then select cases or units to ensure as wide a variation as possible in terms of those characteristics that are believed to influence data the most." In our research, we looked for variation in financial models and instruments, and geographical areas (Clark et al., 2021, p. 379). **Criterion sampling** involves sampling cases that meet a particular criteria (Clark et al., 2021, p. 379). In our research, we stuck to the four criteria mentioned at the beginning of this report. Additionally, we considered feasibility criteria such as data availability and maturity of the case. Throughout WP1, we replaced some of the cases from Shortlist A and Shortlist B.

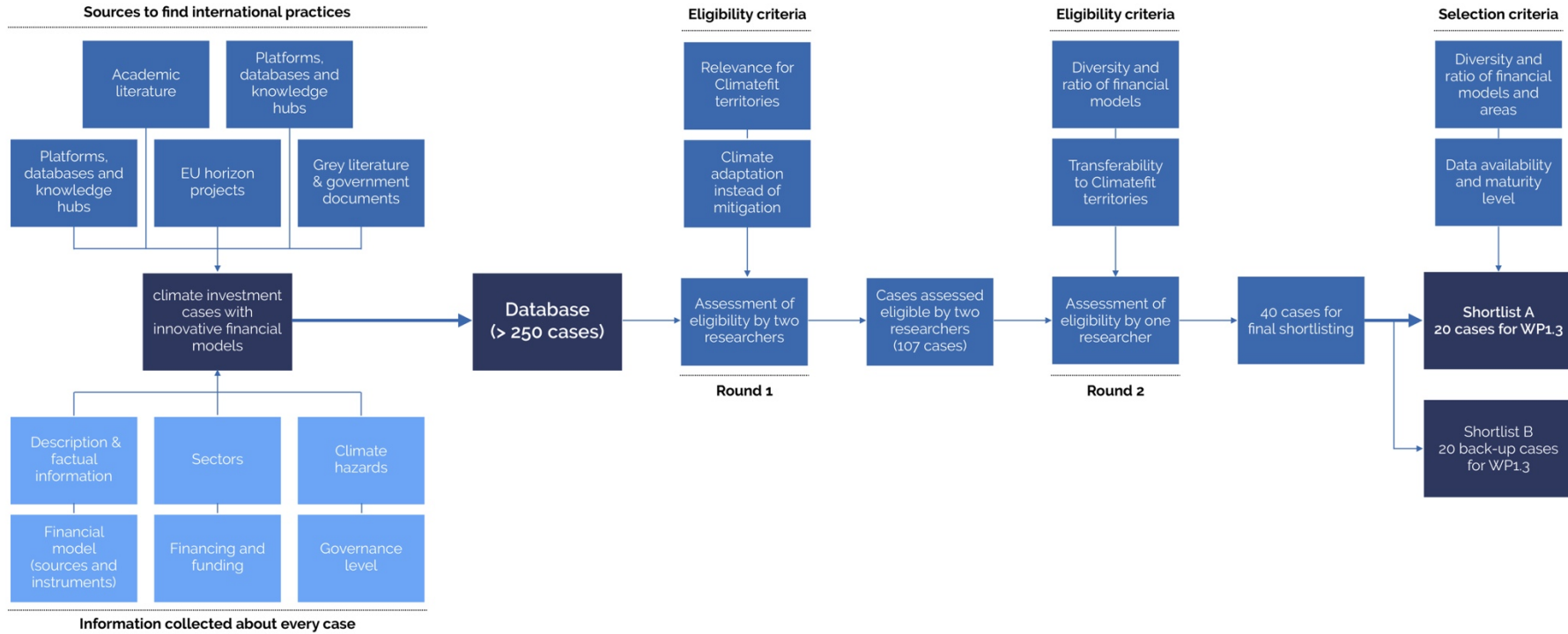
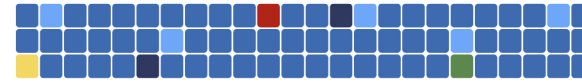


Figure 1. Sampling procedure to select 20 international best practices from a database of 250 cases.

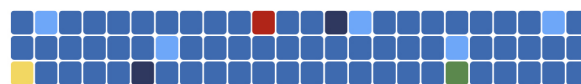


Table 2 contains an overview of the 20 selected best practices. The database contains many interesting cases that would be worthy of further research. almost of the cases are about adaptation, and we included some on mitigation because they have an innovative financing and funding solution that could be applied to adaptation cases too. To comply with CLIMATEFIT's terminology, we use the term AFFS throughout this report, but this can encompass mitigation and adaptation examples. Different shortlists could have been created depending on the researchers doing the process, and the process itself. In the end, we had to make difficult choices and exclude projects in step 2 and 3 that we would have liked to include in shortlist A. Purposive sampling is a common approach to scope research material for qualitative case study research. It inevitably involves (subjective) decisions from the researchers (e.g., personal assessments and interests). The aim was to have a shortlist of 20 cases with financial models that show an initial potential for transferability to different regions in Europe, specifically the CLIMATEFIT territories.

Table 2. Overview of the 20 best practices researched for T1.3.

Name	Location	AFFS
Greater Cape Town Water Fund (GCTWF)	Cape Town, South Africa	Water Fund with contributions from corporates, municipality, philanthropy
Clean Water Partnership (CWP)	Prince George's County, Maryland, USA	Community-based public-private partnership (repayment through bonds and water charges)
Cloudburst Management Plan (CMP)	Copenhagen, Denmark	co-financing from municipal budget, public utility water tariffs, landowner direct investment
Ecomarkets	Victoria, Australia	Offsetting mechanisms used for Payment for Ecosystem Services
NICE GREEN Nagoya	Nagoya, Japan	Greenification certificates system with preferential interest rate on loans
Groenfonds	Midden-Delfland, The Netherlands	Developer contributions fund reimburse farmers for green services (PES)
Washington Stormwater Retention Credit System (Washington SRC)	Washington DC, USA	Stormwater credits
Resilient Hampton	Hampton, Virginia, USA	Environmental impact bond
Paris Climate Bond (PCB)	Paris, France	Climate bond
Flood Buyouts	USA	Public budget: local sales tax increase
Lower Don Valley Flood Defense Project (LDV)	Sheffield, UK	Business Improvement District and public grants
Dorset Heathlands	Dorset, UK	Developer obligations
Project Finance for Permanence (PFP)	North/Central/Latin America	Project Finance for Permanence
RPPNM Program	Curitiba, Brazil	Transferrable Development Rights
Seychelles Debt for Nature Swap (SDNS)	Seychelles	Debt for Nature Swap
Viveracqua Hydrobond	Veneto, Italy	Pooled mini bond
Wetland Mitigation Banking Program (WMBP)	USA	Offsetting mechanism used for Payment of Ecosystem Services
Gothenburg green bond	Gothenburg, Sweden	Municipal green bond
Bilbao Flood Proof District	Bilbao, Spain	Public Private Partnership
Edwards Aquifer Protection Program (EAPP)	San Antonio, Texas, USA	PES program paid by local sales tax and municipal green bond

Analysis framework for the in-depth investigation of best practices

Based on academic and grey literature, we composed a comprehensive analysis framework to research the 20 best practices, as shown in Figure 2. In key literature, we wanted to identify the key elements that are important in climate mitigation or adaptation programmes or projects and research the 20 best practices for those elements.

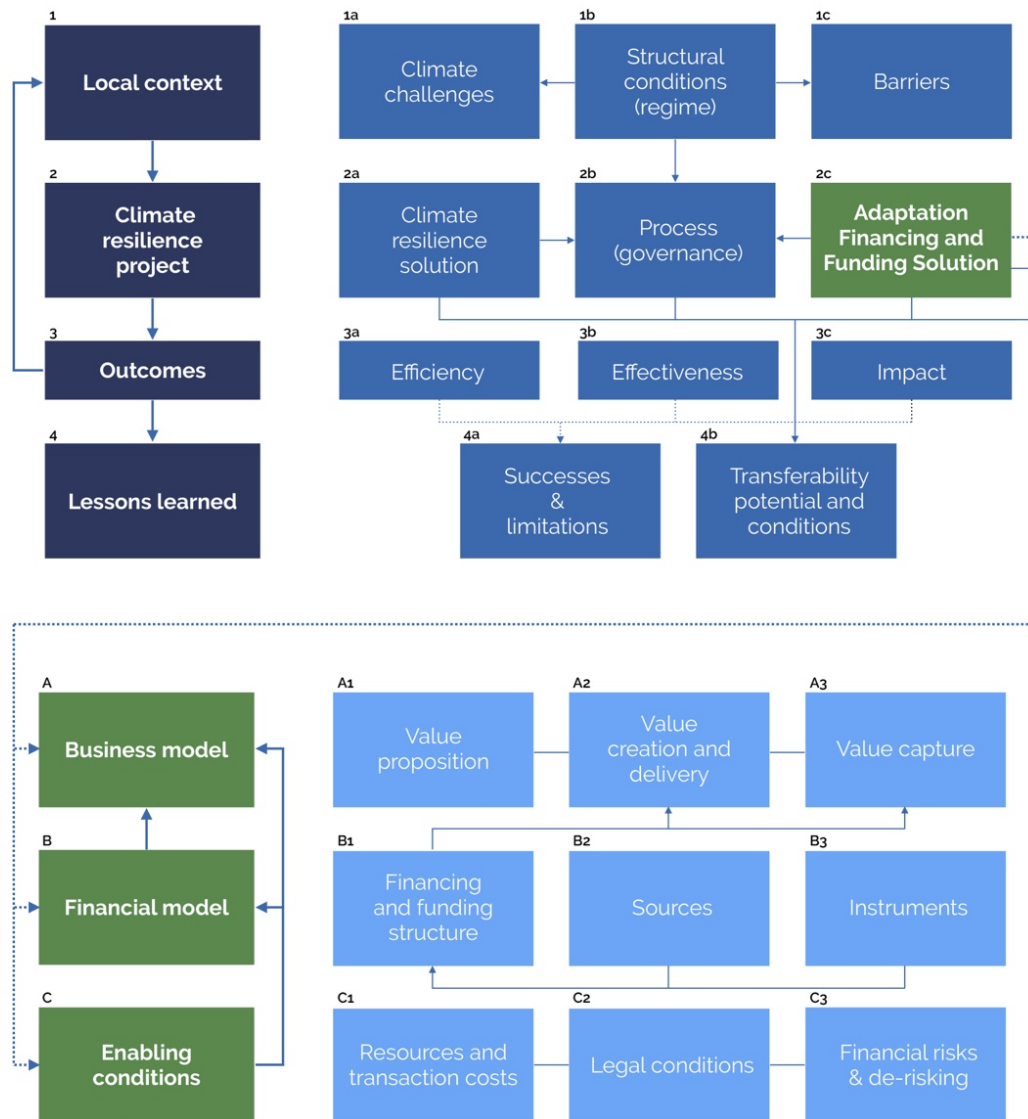
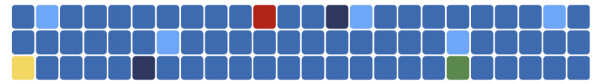
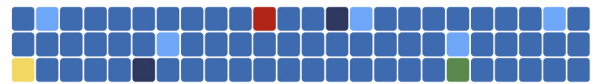


Figure 2. Analysis framework for the 20 best practices. Source: UA

Based on the literature referred to below, we identified elements that can be clustered in four domains:

1. **Local context.** The structural conditions and regime (1b) of an area determine the climate challenges (1a) and the barriers (1c) to the adoption of and investment in climate resilience.
 - o **Climate challenges (1a)**, including climate hazards/risks and the sectors to which they apply, as described in section 2.3.1. (Calliari et al., 2022; Castellari et al., 2021)
 - o **Structural conditions (1b)** that make up the local regime, meaning the cultural, geographical, political, institutional... structures of the case study area. (Dorst et al., 2022; Sarabi et al., 2020)
 - o **Barriers (1c)** that inhibit the adoption of climate resilience projects and investments by public and private parties. (Deely et al., 2020; den Heijer & Coppens, 2023; Dorst et al., 2022; Kabisch et al., 2016; Matthews et al., 2015; Mayor et al., 2021; Moser et al., 2019; O'Donnell et al., 2017; Sarabi et al., 2020; Toxopeus & Polzin, 2021)
2. **Climate resilience project** coming forth from the local context, with the aim to tackle climate resilience challenges, to overcome barriers for climate investments and project implementation. The

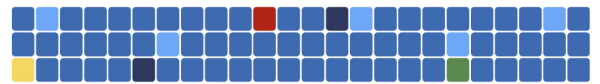


process (2b) is influenced by the structural conditions (1b), the choice of climate resilience solution (2a), and the business case and financial model (2c).

- **Climate resilience solution (2a)**. The measure or strategy to address the climate resilience challenge(s) and to improve climate adaptation (e.g., a NBS, a policy...). (Calliari et al., 2022; Castellari et al., 2021)
- **Process (2b)** is the governance and decision-making process for planning, designing, financing/funding, and implementing the project. This also includes the legal structures and procedures through which the project is implemented. (Thompson et al., 2023)
- **The adaptation financing and funding solution (2c)** describes the rationale of how an organisation creates, delivers, and captures values, including mechanisms used to secure financing and funding for a climate resilience project. This can include one or more sources and instruments. We use the term AFFS because this is a key term in CLIMATEFIT. Some best practices are more about mitigation than adaptation, as explained in section 2.3.1. (Bisaro & Hinkel, 2018; den Heijer & Coppens, 2023; European Commission & DG RTD, 2021; Mayor et al., 2021; Mell, 2018; Thompson et al., 2023)
- 3. **Outcomes** are a direct consequence of the climate resilience solution (e.g., measures, program, one or more projects...). The outcomes can impact the local context (1), altering one or more dimensions (1a, 1b, 1c). If data is available, outcomes can be compared between cases or project types (for example, grey vs green infrastructure)
 - **Efficiency (3a)** relates to the (transaction) costs and time needed to implement and operate a climate resilience project in comparison with other projects (instruments, business models, climate adaptation solutions, process structures)
 - **Effectiveness (3b)** of the climate resilience solution to address the climate resilience challenge, and of the business model to ensure the realisation and financial viability of the project. (Kabisch et al., 2016)
 - **Impact (3c)** is the distribution of costs and benefits among society, determined by place (context), process, and payment (business case and financial model). Environmental, economic, socio-cultural impacts. (Thompson et al., 2023)
- 4. **Lessons learned (4)** with the purpose of upscaling climate resilience projects and AFFS (in an EU context).
 - **Successes and limitations (4a)** determined by the project outcomes. Successes are elements reported as positive, or factors that determined the success of the best practice. Limitations are not failures, but constraints or challenges experienced in the best practices. We focus on successes and limitations with regard to the AFFS.
 - **The potential and conditions for transferability (4b)** of the project's solution, business case, financial model, or process structure for the realization of climate resilience projects in other contexts (within the same or in different area).

Because the AFFS of each best practice is of key interest to CLIMATEFIT, this is further detailed in a second main part of the analysis framework, composed of three domains:

- A. **The business model** as defined in the CLIMATEFIT glossary "describes in detail the services or products offered, the target markets, the cost structures and the resources required in a business or project. Often the business model goes hand in hand with a business model canvas, a visual representation of the business idea". The business model describes how the project works and is organized to create, deliver, and capture value. The business model is made up of three elements, based on the business model canvas for NbS by the EU project Connecting Nature. (McQuaid et al., 2019)
 - **Value proposition (A1)** is the consideration of the environmental, social, and economic values that the project offers to different groups of beneficiaries.
 - **Value creation and delivery (A2)** is composed of five elements:
 - **Key activities** are the key activities required to deliver the value proposition.
 - **Key resources** are the key resources needed to deliver the proposed values and the key activities. Examples are money, expertise, technical advice, etcetera.
 - **Key partners** involved to deliver the value proposition, to deliver the key activities and provide or fulfil resources.
 - **Key beneficiaries** are the key (direct or indirect) beneficiaries of the value proposition.
 - **Governance** is the organisational structure on an ongoing basis.
 - **Value capture (A3)** includes the cost and revenues associated with the activities and delivery of the project.



- **Cost structure:** the costs of delivering/maintaining the climate resilience project.
 - **Cost reduction:** ways in which costs can be reduced through the climate resilience project compared to other or no measures.
 - **Capturing value:** ways in which value can be captured from the climate resilience project in the form of direct or indirect revenues, or public goods with non-monetary value.
- B. **The Financial model** is part of the business model (A). It is the mechanism and strategy to secure financing and funding for the project, including sources and instruments. To define sources and instruments, we rely on the 'Catalogue of Sources, Instruments, and Best Practices' that is developed in the Pathway2Resilience (P2R) project (P2R, nd). The sources (B2) and instruments (B3) determine the financing and funding structure (B1).
- o **The financing and funding structure (B1)** describes how financing and funding is secured, by whom, and how much. This includes a description of the financial flows between two or more actors, from actor(s) to climate resilience solution (investments), or from climate resilience solution to actor(s) (revenue streams). It determines the processes of value creation and delivery (A2), and value capture (A3).
 - o **Sources (B2)** refer to where the financing and funding comes from, and specifically which actor (public sector, private sector, third parties). This goes beyond public financing, to think about the range of private actors and their role in adaptation more broadly.
 - o **Instruments (B3)** are the specific financial mechanisms used to enable the provision of finance from one actor to another, or to a dedicated project which delivers adaptation. Financial mechanisms are used to secure financing and funding.

Enabling conditions required to implement the climate resilience project (2) through the business model (A) and financial model (B). Enabling conditions are **resources and transaction costs (C1)** (e.g. time, staff, expertise...), **legal conditions (C2)** (e.g., legal changes, legal framework, procedures), and **financial risks and de-risking mechanisms (C3)** (i.e., how financial risks are mitigated, shared, allocated, managed). These three broad categories were identified prior to the literature reviews that were performed in T1.1 (public sector) and T1.2 (private/finance sector) about barriers and enablers.

Data collection and analysis: document analysis and semi-structured interviews

Each case was researched by one of the two researchers from UA involved in this task. The research for every case started with collecting sources for **desk research**. Sources include scholarly or grey literature, case study documents, and web pages. Scholarly and grey literature are articles written about the case by one or more authors that were not involved in the case. Case study documents are information sources produced by actors from the case, including a business case, annual reports, information brochures, presentations, etcetera. Websites include web pages about the case usually hosted by one of the key stakeholders, reports about the case on platforms such as Climate-ADAPT or OPPLA, and news articles. The number of documents and level of detailed information available varied from case to case (see more about research limitations in 3.3.4). For the final selection of 20 cases, a minimum of data and information was available to at least describe the AFFS (business model and financial model). The sources obtained were analysed in NVivo, a software for qualitative data analysis. A coding tree was developed in NVivo before the analysis, including all the elements of the analysis framework in the same hierarchy as described in 3.3.2. Additional codes were inductively created to define specific enabling conditions and lessons learned to allow comparison across cases.

When the document analysis of a case was completed, one or more key stakeholders were identified and contacted for a semi-structured interview. Within the time available, the aim was to conduct one interview for every case, involving one or more stakeholders. The purpose of the interview was to obtain additional information that we did not find in the document analysis. We managed to have an interview with at least one person for 16 of the 20 cases (Table 3). In the other four cases, we did not receive a reply after multiple emails or the request for an interview was declined. Interviewees received the interview script (Annex 13) before the interview. The interview script included questions about all elements of the analysis framework. An opening question asked for the interviewees to introduce themselves and to describe how the current AFFS differed from business-as-usual in their case. Questions related to elements of the analysis framework for which sufficient information was obtained in the document analysis, were not asked to keep the interview duration within one hour. Additionally, case-specific questions were prepared by the interviewee to dive deeper into certain details of the case, specifically the AFFS. The interviews were recorded and transcribed. Transcriptions were sent back to the interviewees for proofreading. The transcriptions were analysed in NVivo using the same coding tree as for the document analysis.

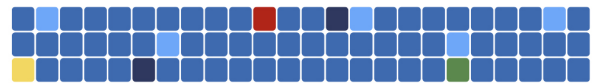


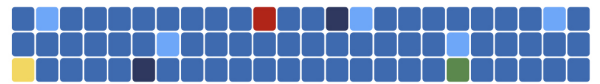
Table 3. Overview of the interview respondents for the 20 international best practices.

Best practice	Interviewee's organisation	Interviewee's role
Greater Cape Town Water Fund (GCTWF)	The Nature Conservancy	Director of TNC in South Africa
Clean Water Partnership (CWP)	Corvias Solutions	Managing director
Cloudburst Management Plan (CMP)	City of Copenhagen	Project manager CMP
	City of Copenhagen	Copenhagen ambassador
	Aarhus University	Senior researcher
Ecomarkets	Department of Energy, Environment and Climate Action	Biodiversity officer
NICE GREEN Nagoya	/	/
Groenfonds	Midden-Delfland	Groenfonds secretary
		Groenfonds treasurer
Washington Stormwater Retention Credit System (Washington SRC)	Department of Energy and Environment	Branch chief of the Green Infrastructure Incentives and Assessment Branch
		Lead for the off-site compliance portion of the SRC program
		Lead of the SRC Price Lock program
Hampton Environmental Impact Bond (EIB)	City of Hampton	Senior planner (former)
	Quantified Ventures	Team leader
Paris Climate Bond (PCB)	City of Paris	Head of Cash Management Fund
Flood Buyouts	University at Albany	Researcher
Lower Don Valley Flood Defense Project (LDV)	Sheffield Chamber of Commerce	CEO
Dorset Heathlands	Dorset Heath Partnership	Team manager
Project Finance for Permanence (PFP)	WWF	Landscape finance director
		Senior director strategic planning and finance
RPPNM Program	Municipality of Curitiba	Retired urban economist
Seychelles Debt for Nature Swap (SDNS)	/	/
Viveracqua Hydrobond	Banca Finint	Manager
Wetland Mitigation Banking Program (WMBP)	National Resources Conservation Service	Senior Biologist
Gothenburg green bond	/	/
Bilbao Flood Proof District	/	/
Edwards Aquifer Protection Program (EAPP)	City of San Antonio	Project Manager

The full reports written for every case, available on the CLIMATEFIT website, follow the structure of the analysis framework. The reports were sent back to the interviewees for proofreading and were also reviewed internally by our consortium partner Stockholm Environment Institute, Oxford office.

Research limitations

It is important to understand that this research was done with a specific purpose, i.e., to research best practices of innovative AFFS, whereby, as explained at the beginning of section 3.3, the best practice scope is limited to successfully raising financial resources for financing and funding of climate adaptation, or other climate-related investments or initiatives. We purposively sampled for best practices of innovative AFFS, which leads to two first important limitations. First, we did not research unsuccessful attempts of AFFS. When comparing the 20 best practices, we were able to find a correlation between success factors and outcomes in certain types of AFFS and best practices, but we cannot determine if there is a causal relationship. This would require comparative research between best practices and unsuccessful practices, to determine which elements contributing to success are exclusively present in best practices or not. We believe this would be a difficult task nonetheless, since the success of the best practices depended on the combination of multiple factors.



Second, a successful innovative AFFS does not mean that the case is also a best practice overall. The AFFS does not guarantee positive societal or environmental impacts. If data was available, we disclosed as many outcomes as possible about the efficiency or effectiveness of the AFFS, but also the effectiveness of the climate (adaptation) intervention in a case, and broader impacts. However, broader societal and environmental impacts were not the purpose of this research. In some of the best practice factsheets, we disclose limitations that point at negative externalities as a direct or indirect consequence of the AFFS. Due to time constraints, the desk research for each case was limited to analysing documents about the cases themselves, and we did not do in depth research about the positive or negative consequences of specific financial instruments or mechanisms used in each AFFS. We only conducted one interview for each best practice, which nearly always included interviewees that were somehow actively involved in the best practice. These interviewees were recruited because they were best suited to give additional information about the best practice and the AFFS that was missing in the documents. Because of their role within a best practice, we are aware that their views were largely positive, which made it difficult to identify many limitations overall.

Because of these limitations, the individual best practice factsheets present an overall positive story of each case, but that story must be understood within the defined scope of an innovative AFFS, not broader societal or environmental impacts of the best practice. The lack of critical standpoints and limitations is more present in a few best practices where we were not able to recruit an interviewee, or where data was limited. We believe these best practices remain valuable cases because we were still able to describe the innovative AFFS with only desk research.

Lessons learned across the 20 best practices

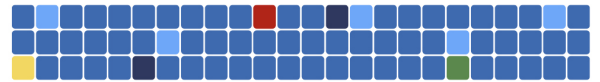
We performed a comparative analysis of the 20 international best practices on five topics that we will discuss:

- **Key barriers** to climate adaptation finance that were overcome by installing a new AFFS, or that led to choosing to adopt a specific AFFS. This means barriers that inhibited climate adaptation finance prior to the AFFS discussed in each case.
- **Key barriers** to climate adaptation finance that were overcome by installing a new AFFS, or that led to the choice of adopting a specific AFFS. This refers to barriers that inhibited climate adaptation finance prior to the AFFS discussed in each case.
- **Success factors** that contributed to the establishment and operation of the AFFS. These can be considered as elements that helped increase positive outcomes as much as possible, or they can be seen as conditions that should preferably be present, or if not present, could be met first before the AFFS can be successfully developed, implemented, and operated. In addition to these, we discuss some specific **transferability conditions** that can be deduced from the cases but were not explicitly identified as success factors or enabling conditions. These are conditions that are advised to be present in territories interested in adopting one of the cases' AFFS. Taken together, these elements help determine whether an AFFS, as applied in one of the 20 best practices, is a good match for a territory, or which preparatory steps may be needed to ensure the conditions are met to adopt an AFFS.
- **Limitations** or challenges experienced related to the AFFS. These are elements that did not inhibit the development and operation of an AFFS, but rather limited the potential to finance climate adaptation or related measures.

As we will show, these elements are not isolated and are often intertwined with one or more other elements. We only focus on elements that appeared in multiple cases and are not exclusively bound to a particular AFFS. Success factors, enabling conditions, transferability conditions, or limitations that are specific to an AFFS or a financial instrument are detailed in the individual best practice reports. We illustrate each identified element with a few examples from one or more best practices. As the section becomes too extensive if we discuss every best practice related to an element, Tables 4, 5, and 6 provide an overview of the best practices in which each element was discovered by referring to their IDs, indicating reports where you can find more information about each element. It is likely that some elements were present in certain cases, but we did not explicitly uncover them due to lack of data.

Key barriers to climate adaptation finance before the AFFS

It will not come as a surprise that, in most cases, an innovative AFFS was developed because **public resources were insufficient**. Budget constraints and priorities in other sectors are widely researched and acknowledged barriers among public authorities to climate adaptation finance. This was an explicit barrier in 11 best practices. The RPPNM (**ID14**) initiative in Curitiba, Brazil, marked a change in strategy to protect urban forests on private



lands. Initially, the local government used expropriation to take ownership of the land. Although it worked well for a long time, it was time-consuming and expensive. By allowing transferable development rights among private actors instead, the monetary pressure on the municipality itself was alleviated. The City of Copenhagen (IDo3) developed a strategy with the water utility company HOFOR to use water tariff incomes for co-financing stormwater projects because the city itself did not possess the capacity nor the financial resources to implement the Cloudburst Management Plan.

Strongly related to, and often because of, limited public resources is the lack of a **long-term (financial) strategy**. In the Groenfonds (IDo6) case, green services management in the countryside of Midden-Delfland is a patchwork of public and private organisations and actors, with financing being rather project-based or incidental rather than structural and long-term. Similarly, in the City of Cape Town (IDo2), prior to the instalment of a water fund, there was a lack of a coherent and long-term ecological infrastructure restoration strategy. Additionally, the **legal framework** prevented the City of Cape Town from playing a more active role and taking ownership of its water resources because the sub-catchments are outside the jurisdictional boundaries of the City of Cape Town.

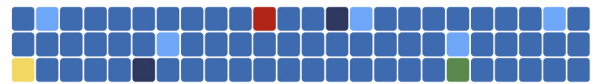
There are some cases where green area management or conservation practices must take place on privately owned lands, but **private landowners lack resources or incentives** to do it. EcoMarkets Australia (IDo4) was a way to offer private landowners financial rewards for conservation practices on their land because landowners may lack the time or resources to readily adopt new conservation practices. In Midden-Delfland, even before the instalment of the Groenfonds (IDo6), the dairy farming industry active in the area became responsible for maintaining valuable landscape elements in Midden-Delfland's agricultural areas. Since maintaining landscape elements is not a legal obligation for farmers and not part of a farmer's core business, it is not prioritised as an activity. Consequently, many farmers do not have the resources to voluntarily maintain the valuable landscape in agricultural areas.

Success factors

We identified multiple key factors or conditions that enabled the successful development, implementation, and operation of an AFFS for climate-related policies or investments (Table 4, page 14). Some of these ten elements include sub-elements that are strongly related.

(1) Stakeholder involvement. Successful stakeholder involvement is by far one of the most important conditions for developing and operating an AFFS successfully, as found in the best practices, and often mentioned by interviewees as the most important success factor. Stakeholder involvement, as researched in the 20 best practices, takes four different forms:

- **Collaborations between public and private partners.** Climate programmes or projects initiated by public authorities may require collaboration with private partners to acquire private sector expertise, obtain financing and funding from multiple public and private sources, or share risks between public and private actors. In many best practices, interviewees pointed to this as the crucial success factor. The Sheffield Lower Don Valley Flood Defence project (ID11) was a collaboration between the Environment Agency, the City of Sheffield, and the Chamber of Commerce. The three partners were prepared to work on it together quickly on a solution that would offer benefits to both the municipality and the businesses that faced flood risks. Seychelles' debt-for-nature swap (ID15) is also an example of a successful collaboration between governments, creditors, NGOs, and philanthropic foundations for debt management and environmental challenges. Particularly, the support from the Paris Club ensured favourable terms were offered to Seychelles for buying the debt.
- **Collaboration between public partners.** A frequently cited barrier to climate finance is siloed government structures whereby departments each have their own projects but do not collaborate with other departments. Because climate adaptation projects usually transcend the responsibility or boundaries of one sector, siloed governments inhibit climate adaptation investments. Some of the best practices successfully overcame that barrier. Resilient Hampton (IDo8) is a city-wide interdepartmental sustainability initiative with the objective to improve residents' quality of life in the face of water-related challenges by increasing the city's ability to withstand and recover from them. Overall, within the City of Hampton, there are strong relationships across city departments, including the finance department. The management of Copenhagen's Cloudburst Management Plan (IDo3) relies on the successful horizontal integration of all relevant departments and administrations.
- **Community support and involvement** has been an explicit contribution to success in half of the best practices and can take different forms. It could mean active involvement of partners with a stake in the project, such as landowners, or involvement could take place through community-wide support for decisions made by public authorities. Engaging communities is important to raise awareness about



climate challenges and to find support for climate programmes and the mechanisms required to finance and fund them. The Edwards Aquifer Protection Program (**ID20**) has since its inception been financed through mechanisms that were voted for by the citizens of the City of San Antonio. The most successful flood buyout programmes (**ID10**) involve ongoing conversations with the community to ensure their needs and concerns are addressed. This includes defining community boundaries and ensuring an inclusive process. The latest audit (2023) of Groenfondts (**ID06**) showed that participant numbers have remained stable and even increased for the period 2018-2023, meaning dairy farmers participating in the programme and delivering green services in return for financial compensation are overall satisfied with the system.

(2) Legal framework and legal compliance. Appearing in almost all the cases, the legal conditions in an area are, together with stakeholder involvement, one of the key elements to ensure that an AFFS is allowed and that it complies with the legal framework. In some instances, significant legal changes were required to adopt an innovative AFFS. To finance its Cloudburst Management Plan (**ID03**), the City of Copenhagen had to lobby the national government to enforce a legal change to the water sector law that allows utility companies in Danish municipalities to co-finance surface stormwater management measures for drainage systems from water tariffs. In other best practices, legal changes were not needed, but at least legal approval was required from a local council. In Nagoya, the implementation of the Greenification Certificate System (**ID05**) required some legal changes. The national level implemented the System of Greening Area as a legal instrument, which was adopted by the city of Nagoya. The city then further complemented this regulatory framework with the voluntary framework of the GCS. In the Clean Water Partnership (**ID02**) best practice, Prince George's County's legal framework already allowed for public-private partnerships under the state of Maryland, but legal compliance had to be checked and council approval was needed because the CBP3 approach was a relatively new PPP approach.

As a specific example of legal compliance, **fiscal regulations** can be an important factor to enable the use of tax-based instruments by different government levels. In countries like the UK and the US, local authorities have a larger autonomy on local taxes than other countries that are more dependent on the state or national government for collecting taxes. This is exemplified through the Edwards Aquifer Protection Program (**ID20**), where the City of San Antonio used a voter-approved sales tax increases to fund aquifer protection measures for almost 20 years.

(3) Political support or political buy-in was found to be an explicit enabling condition in about a third of the best practices to speed up or facilitate climate investments and their accompanying AFFS. The green bond proposal for the City of Gothenburg (**ID18**) in 2013 quickly found consensus among city employees and policymakers. There was little political debate, and everyone believed it was a good idea, also because private investors quickly jumped at the opportunity. In the Seychelles debt-for-nature swap (**ID15**), the Seychelles Government created the ideal preconditions for debt conversion: a government interested in pushing forward climate adaptation, especially at the opportunity of alleviating some of its national debt. In the City of Paris (**ID09**), the political will to push for ambitious climate policies has been continuously strong, especially since green and left parties have formed the local government for multiple terms in a row, which eased the implementation of the green bond.

(4) Public and/or private resources. In almost all the cases, specific public and/or private resources were important to enable the proper development and management of the AFFS and the project or programme. From a public authority perspective, resources can either be readily available or must be acquired by hiring new staff or by partnering with private sector actors. Resources can mean different things, such as staff, time, expertise, or financial resources to prepare or run a programme. In most cases, financial expertise was important to work out the financial technicalities of the AFFS. Similarly, legal expertise was often important to ensure the AFFS or the programme complies with local and supra-local legal frameworks. Because of the large scale of Project Finance for Permanence (**ID13**) programmes, each PFP case has 50 people with different expertise who work around three to five years half-time or full-time for only the development and preparation of the PFP. Copenhagen is a large city that can manage the Cloudburst Management Plan (**ID03**) itself, but it requires significant resources in terms of staff, time, and money. Smaller public authorities like the City of Hampton (**ID08**) could not have developed the Environmental Impact Bond without the help of private partners, being Quantified Ventures and the Chesapeake Bay Foundation in the Resilient Hampton best practice. The issuance of a bond requires the involvement of banks or, in the case of green bonds, a third-party validator, regardless of the resources available within a public authority.

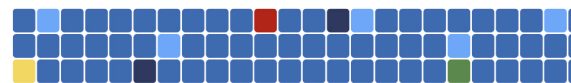
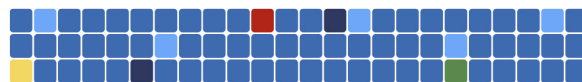


Table 4. elements that were explicitly identified as success factors in the 20 best practices.

Success factors / ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Collaborations between public and private partners	X	X	X		X		X	X	X		X	X			X	X	X		X	X
Collaborations between public partners			X					X	X			X				X				
Community support		X			X	X		X		X	X		X	X				X		X
Legal compliance	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X	X		X
Political support			X					X	X				X		X			X		
Public resources			X	X	X	X	X	X	X	X	X	X	X		X		X	X		
Private resources		X		X		X		X	X						X	X	X	X		
De-risking mechanisms	X	X		X			X	X				X				X				
Business case	X		X					X			X		X							
Accountability, transparency, reporting	X			X			X	X	X					X		X		X		
Financial incentives	X	X		X		X	X				X			X						
Multiple sources/instruments	X	X	X			X				X	X		X			X	X			X
Long -term strategy	X	X	X			X		X	X			X	X					X	X	X
Sustainable finance			X	X		X	X						X			X				
flexibility		X		X		X	X						X							



The next four elements (5-8) are strongly related because they all contribute to gaining trust from investors and can help convince partners to participate in a climate program or project.

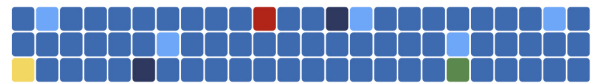
(5) De-risking mechanisms (risk sharing and allocation). De-risking mechanisms are important to convince actors to invest by safeguarding their financial interests, especially in situations where innovative AFFS or climate measures are implemented. De-risking mechanisms can take different forms or serve different purposes. For example, de-risking can mean certainty for investors over a longer period. In the Dorset Heathlands best practice (ID12), where mitigation measures are financed from developer obligations, the Supplementary Planning Document describes the rates that project developers in the vicinity of the heaths must pay for a five-year period. The predefined rates ensure transparency and accountability. The simplicity of this approach avoids unnecessary delays in the determination of planning applications, and it offers developers who prepare applications for developments certainty about contribution rates. In the Greater Cape Town Water Fund (ID01), the City of Cape Town contributes to the water fund through performance-based contracts, which means that it only needs to pay if the programme meets its performance targets. In the case of the Viveracqua Hydrobond (ID16), the water utilities involved addressed the issue of mini-bonds being unattractive for investors by pooling their mini-bonds, thus enhancing their creditworthiness.

(6) A business case with quantifiable outcomes. Climate measures increasingly involve green-blue infrastructure or NbS to replace traditional grey infrastructure investments. There is a consensus that green-blue interventions have multiple co-benefits, but it remains more challenging to quantify these benefits and determine the cost-efficiency compared to grey infrastructure. Examples of co-benefits of urban green-blue infrastructure projects can include increased biodiversity and improved habitats, reduction of atmospheric pollution, more recreational space that encourages healthier lifestyles, aesthetic values and city attractiveness, rainwater recycling, and reduced urban heat island effects. Many benefits are long-term and cannot be expressed in direct revenue streams, which decreases attractiveness for private sector parties to invest.

Several best practices exemplified that it is possible to prepare a strong business case that can convince both public (mainly politicians) and private sector actors to participate. The Sheffield Lower Don Valley Flood Defence project (ID11) could only secure national funds if a part of the investment costs would be funded by other sources. After exploring multiple alternatives, the solution became to collect the remaining 17% of the LDV budget through a business improvement district (BID). The Sheffield Chamber of Commerce allocated resources to develop a BID business plan. This plan included data and information from the Council and the Environment Agency's work, comparing damage costs and high insurance premiums in case of no flood protection with a relatively minor contribution from businesses to the flood defence project. This business plan proved vital in convincing businesses and resulted in an overwhelming majority vote in favour of the BID. In the case of the Greater Cape Town Water Fund (ID01), the design and implementation of the water fund required a strong narrative backed up with scientific evidence that the proposed nature-based solutions would be effective. The business case was therefore an important resource to secure public and private financing.

(7) Accountability, transparency, reporting. These elements are required to convince investors and gain trust from investors or other partners. Accountability and transparency are facilitated by reporting the outcomes of the AFFS or climate measures in terms of efficiency, effectiveness, or broader impacts, depending on the reporting structure that is set up. The green bond best practices have a green bond framework based on the Green Bond Principles developed by the International Capital Market Association (Gothenburg Green Bonds, ID18; Paris Climate Bond, ID09). The fourth and final part of the framework describes procedures for reporting and disclosure of green finance investments, which are vital to building confidence that green finance is contributing towards a sustainable and climate-friendly future, both among investors and in society. Transparency, reporting, and verification of impacts are important for investors. The Resilient Hampton's Environmental Impact Bond (ID08) can be considered a next step in disclosing investment impacts, whereby impacts must be disclosed once the projects become operational. Using an environmental impact bond means committing to a quantitative prediction, post-implementation evaluation, and disclosure to both bond investors and the community of actual project outcomes. Compared to a standard green bond, this requires extra resources and thus implies higher transaction costs, which should be weighed against the EIB's greenium.

(8) Financial incentives for all partners involved. In several cases, successful partnerships depended on the ability to offer a financial incentive for all key partners involved, ensuring everyone benefited from participation and/or investing. The most straightforward types of AFFS that require this element are market-based mechanisms that have supply and demand sides, such as offsetting, payment for ecosystem services, or transferable development rights. The Washington SRC Trading programme (ID07) is beneficial for multiple involved partners. Property developers and owners can reduce the cost of stormwater management requirements by purchasing stormwater credits while maximising the buildable area on-site. Developers of green infrastructure projects can get financial compensation from selling stormwater credits. Landowners that allow green infrastructure projects to be developed on their land can receive a reduction on their water bill. Similarly, the RPPNM programme (ID14) in Curitiba, Brazil, required minimal or no expenditure from the side of the municipality to protect urban forests. Landowners of urban forests could sell their development rights to



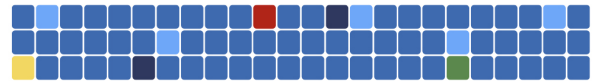
developers, which was an attractive option since many landowners did not like living near or in the forest. Finally, developers could acquire additional development rights to increase the maximum buildable size of their projects in other areas. With this element, we want to show that financial incentives can be a reason for potential partners to participate, but we are convinced that AFFS must also consider broader non-financial, or indirect financial impacts. Some of the best practices are examples of community involvement or support for an AFFS because the climate project offers community-wide benefits without direct financial gains, such as water security (Edwards Aquifer Protection Program, **ID20**), more green spaces (Copenhagen Cloudburst Management Plan, **ID03**), or flood protection (Resilient Hampton, **ID08**).

(9) An AFFS with multiple sources and instruments. In almost half of the best practices, the AFFS relied on the inclusion of funds coming from multiple sources, and/or through multiple instruments. This can significantly improve the robustness and financial sustainability when a programme does not rely solely on a single source of financing or funding. It is therefore also related to the success factor about sustainable finance. Also, combining multiple sources and instruments can increase the investment volume available and upscale climate investments. This element can take different forms, either through cost-sharing between different sources, by pooling multiple sources into a single entity, or by transitioning from one source and/or instrument to another.

In the Wetlands Mitigation Banking Program (**ID17**), a cost-sharing approach is used to cover up-front costs. Mitigation banks contribute a portion of project funding and government agencies can allocate resources to support staff overseeing the banks. In a Project Finance for Permanence programme (**ID13**), the objective is to become financially sustainable by transitioning from reliance on donation-based funding to ensuring sufficient recurrent in-country funding to also cover needs beyond a programme's implementation period, and PFP programmes combine multiple sources and instruments. Theoretically, any financial instrument could be employed as a sustainable finance mechanism to ensure recurrent in-country funding. Some instruments mentioned in the PFP guide include public funding/budgets, entrance and user fees, debt-for-nature swaps, concessions and easement payments, taxes and levies, compensation payments, payment for ecosystem services, microfinance, and fees on licences and permits. The Viveracqua Hydrobond (**ID16**) pooled multiple mini-bonds from eight water utilities into an Asset-Backed Security (ABS) to enhance investment attractiveness and diversify funding sources.

(10) Long-term strategy and sustainable finance. The upscale of climate finance can be inhibited by the lack of a clear long-term strategy and having sustainable financing or funding streams, two related elements. BPs that relied on these elements communicated them as part of official plans, or study documents like a business case. Among public authorities, investments are often tied to election cycles and political terms, which are usually only around five years. The negotiation of budget allocation at the start of a new term or to determine annual budgets can slow down climate investments. Grant or subsidy programmes are usually project-based and require each time to go through application and reporting procedures. Having a long-term strategy or structure in place is a first important condition to overcome short termism. Additionally, sustainable finance means that an AFFS is put in place that ensures a reliable income stream over a longer period that can be allocated to climate investments. Both long-term strategies and sustainable finance are related but are not always present at the same time. A long-term strategy, such as a climate plan, can form the basis of identifying and selecting projects or investments, without necessarily having secured financing. Conversely, financial mechanisms can be available that offer regular income streams, such as levies on private properties or water bills, without these being allocated already to investments as part of a long-term strategy. Some best practices exemplify this point and at the same time illustrate what these elements entail:

- **A long-term strategy** can take the form of a climate plan, a specific institute or a vehicle such as a partnership. In Paris (**ID09**), the first Climate and Energy Action Plan was adopted in 2007 and has been renewed three times, with the latest version published in 2024. The latest plan also includes an adaptation strategy. Developing a long-term plan eased the implementation of a bond framework because the green mitigation and adaptation projects that the bond will finance are readily available through the plan and can be communicated to potential investors. Copenhagen's Cloudburst Management Plan (**ID03**) has an implementation period of 20 years, totalling more than 300 prospected projects across the city. The Greater Cape Town Water Fund (**ID01**) has a long-term strategic plan, although financing secured at the beginning does not yet cover the cost of the whole duration of the plan.
- **Sustainable finance** is one of the key objectives of PFP programmes (**ID13**). In PFP programmes, this means transitioning completely from donations to ensuring in-country financial resources by the end of the implementation period so that financial mechanisms are also in place to keep financing conservation protection when a PFP programme ends. In Groenfonds (**ID06**), developer contributions are not directly used to pay farmers for delivering green services. Instead, they are invested first, after



which only the return on capital is used to reimburse green services. This way, the fund steadily grows each year, making Groenfonds less and less dependent on contributions from future developments. This decouples the maintenance of green areas from development demand because Groenfonds must not rely on new developments in the future once green services can be paid 100% with the return on capital from their investments. That way, Groenfonds slowly becomes financially self-sustainable.

(11) Flexibility. In some best practices, the AFFS or the content of the programme was flexible, allowing learning and adaptation based on experience. In the Clean Water Partnership (ID02), the contract of the private partner in the CBP3 can be renewed every three years upon meeting predefined performance targets. This allowed changes in the scope of the projects that will be implemented in the next three years, as long as the projects related to water management, stormwater quality, or water volume. In EcoMarkets (ID04), the Department of Energy, Environment and Climate Action of the state of Victoria first performed pilot trials to demonstrate the value of innovative management schemes. This allowed the creation of a first level of commitment while also addressing challenges or risks that arose, prior to enrolling the entire programme. In Washington D.C., as the SRC market matured (ID07), the Department of Energy and Environment adjusted its incentives and rules governing credit trading, thus adaptively managing the programme.

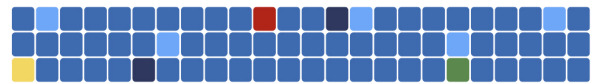
The above-discussed factors contributed to the successful development, implementation, and operation of the AFFS in the best practices in which they were explicitly uncovered. This does not mean that the absence of one or more factors would have led to an unsuccessful AFFS. It is possible to see a correlation between success factors and outcomes in certain types of AFFS and best practices, but we cannot determine if there is a causal relationship, also because best practices with a similar AFFS do not (explicitly) have the same success factors. This would require more research, explicitly comparing successful and failed practices of similar AFFS. Regardless, these insights remain valuable considering every success factor appeared in multiple best practices and were not bound to a particular context or AFFS. Territories can consider these factors as conditions that, if present, can positively influence the AFFS' potential.

Limitations

As described in the research limitations, we purposively sampled best practice examples of AFFS, and did not actively research limitations or negative externalities or impacts. Also, the stakeholders that we interviewed in 16 of the 20 best practices were actively involved in the best practice and are expected to have a positive perspective. We did not target possible critical voices due to time constraints. In each case, we were able to identify at least one limitation or challenge experienced that inhibits the maximisation of the potential of an AFFS, or that leads to constraints regarding the scale or scope of climate (adaptation) investments. The overview below is therefore not exhaustive but still contains valuable information about elements that should be considered when adopting innovative AFFS. We only discuss the limitations that were identified in at least two best practices. Case-specific or AFFS-specific limitations are not included here but can be consulted in the individual reports.

Table 5. Elements that were explicitly identified as limitations or challenges in the 20 best practices.

ID	Voluntary mechanisms	Unsustainable mechanisms	Supply and demand imbalance	Quantification of ES	Transaction costs	Negative externalities
01	X	X		X		
02						
03				X		
04	X		X			
05	X					
06	X					
07	X					X
08						
09					X	
10	X	X		X		X
11		X				
12		X				



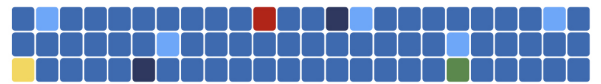
13		X			X	
14		X	X			
15		X				
16						
17			X		X	
18					X	X
19						
20		X		X		

(1) Voluntary mechanisms. The use of voluntary mechanisms can be considered as limiting the effectiveness of a programme or an AFFS. Voluntary participation or investment in a programme, such as the Greater Cape Town Water Fund (ID01), relies on contributions from the City of Cape Town and corporations. This requires a constant effort from The Nature Conservancy (TNC) as the leading partner to secure financing. Fortunately, TNC can rely on experience with securing financing in more than 30 water funds in different countries and continents, through different instruments. In flood buyout programmes (ID10), homeowners approached to sell their homes in flood-prone areas can choose whether they participate. If enough residents do not sell their properties, this can lead to incomplete mitigation and flood protection for local governments. The voluntary nature is also a limitation of the Washington SRC trading programme (ID07). While compliance with stormwater regulations is required, choosing to have an off-site retention requirement by purchasing credits is optional. The district's Department of Energy and Environment encourages project developers to purchase stormwater credits from the MS4 areas to incentivise green infrastructure construction where it is most needed. Currently, 14.7% of regulated developments meet retention requirements off-site instead of on-site. DOEE is exploring incentive mechanisms to increase that number.

(2) The lack of sustainable financial mechanisms can inhibit long-term plans or initiatives or make initiatives vulnerable to changing conditions if they are dependent on a single source or instrument. The Dorset Heathlands (ID12) approach to mitigating the effects of new developments is paradoxically dependent on new developments. Development is needed to ensure available funds for the DHP's implementation group; otherwise, there is no funding for mitigation measures, but these mitigation measures are only required because of those developments. In many cases of flood buyouts (ID10), whereby homes are purchased from flood victims after a disaster and the home is destroyed, the land remains vacant because the local governments do not have enough money for restoration or conservation (although an empty lot offers more flood protection than a developed one). The Sheffield Lower Don Valley Flood Defence project (ID11) is a successful example of an innovative AFFS for flood protection, but only for a single project. The available national funding, in combination with the BID, placed constraints on the design dimensions of the LDV project. The total amount of funding available made a larger project unaffordable and undeliverable. After that project, the City of Sheffield developed a long-term Flood Investment Programme, but as of 2017, there was still a shortfall of £70 million to implement all the flood schemes.

(3) Imbalance between supply and demand. AFFS that rely on market-based mechanisms with a supply and demand side (e.g., transferable development rights, PES, offsetting) can face the challenge of an imbalance between supply and demand. One of the major challenges associated with EcoMarkets (ID04) programmes lies in the concept of like-for-like offsets. This principle states that developers clearing a specific habitat type must compensate by providing an offset of equivalent ecological value. However, suitable offset areas may not always be readily available. Recent developments in national offsetting policy at the Australian Government level introduce compensation payments as an alternative option. Under this approach, developers can pay a sum of money instead of directly providing an offset. The responsibility of finding a suitable offset location then falls to the government, with no guarantee of success or even sufficient funding available. Similarly, a big challenge for mitigation banks part of the US Wetland Mitigation Banking (ID17) is securing suitable restoration sites to offset the transformation of other wetlands in agricultural plots. Certain wetland types, such as linear wetlands in Nebraska, are very desirable for irrigated agricultural expansion but are particularly difficult to locate for restoration. In Curitiba, Brazil, the RPPNM programme (ID14) has been successful in the sense that many landowners of urban forests want to participate in the transferable development rights scheme, but due to a declining birth rate in the city, the demand for building rights is not as high as it was a few decades ago.

(4) The quantification of ecosystem services appeared as a challenge in some best practices or was indicated as a possible challenge but addressed through a business case, as was the case in the Greater Cape Town Water Fund (ID01). In the implementation of the Copenhagen Cloudburst Management Plan (ID03), grey infrastructure and green-blue infrastructure project alternatives must be compared, and the most cost-



efficient one in economic terms (avoided flood damage) must be selected. The limitation here is that the changed Water Sector Law does not allow the consideration of co-benefits of green-blue infrastructure projects in the comparison, which may also reflect the general difficulty of quantifying and monetising wider benefits of nature-based solutions that could strengthen the business case. Inclusion of such benefits in the case of the Cloudburst Management Plan would be possible if more flexible economic costing and appraisal methods were used.

(5) transaction costs and scale of projects/programs. In some cases, the AFFS only enabled investments in projects or interventions of a particular scale, meaning the investment volume and transaction costs related to the size of the intervention (large versus small scale). The Paris Climate Bond (ID09) cannot be used for projects of less than €1 million because the time and effort (transaction costs) spent collecting data on a project's impact for reporting becomes more costly relative to the project investment cost if a project is smaller. There is no minimum area size that a Project Finance for Permanence Programme (ID13) must have before it becomes worthwhile to invest in the expensive and multi-year phases designing the PFP before implementation. It warrants evaluation on whether there are other approaches that are more cost-efficient given that there are high transaction costs in terms of time and the investment at the beginning to develop a PFP. The smallest PFP that is currently prepared is for an area of 500,000 hectares. On the contrary, the Wetland Mitigation Banking Programme (ID17) targets small and low-level wetlands. If a farmer wants to drain a semi-permanent or a large wetland on their field, that is outside the scope of the programme. In that case, a farmer is not permitted to drain the wetland.

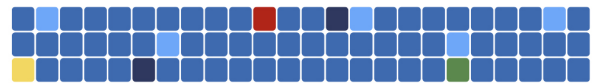
(6) Negative externalities or societal impacts. While understanding the broader impacts was not within the scope of researching the 20 best practices, in some cases, we found that AFFS (potentially) lead to negative externalities or societal impacts. The Gothenburg Green Bonds (ID18) have received some criticism because green buildings in public housing projects paid for with green bond proceeds have increased local rents due to higher construction costs, making them unaffordable for single-parent and/or low-income households. Flood buyout programmes (ID10) have been critiqued because there can be significant human consequences that are not always considered. Many residents who accept buyouts experience regret later. Studies have shown that many homeowners have said yes to buyouts under emotional distress that can lead to rushed decisions. Some buyout recipients report a decline in well-being after relocation. The long-term impact on individuals remains largely unexplored. While evidence of negative impacts was not reported for the Washington SRC Trading Programme (ID07), a guide for stormwater credit mechanisms warns that green infrastructure investments may potentially contribute to increased property values, and associated gentrification and displacement of established, lower-income residents. This risk applies to other best practices that include urban greening projects, such as the Copenhagen Cloudburst Management Plan (ID03), the Bilbao Zorrotzaurre flood-proof district (ID19), the Paris Climate Bond (ID09), the Greenification Certificates System in Nagoya, Japan (ID05), or the Clean Water Partnership (ID02).

Transferability conditions

We end this chapter by presenting some elements that were specifically identified as transferability conditions, i.e., conditions that are preferably present before specific AFFS can be transferred. In any case, an AFFS must always be tailored to the local context. Although it was not within the scope of our research, tailoring the AFFS could mean considering whether it's possible to rescale the AFFS to better match the scale of a territory, or resources available in a territory.

Table 6. Elements that were explicitly identified as transferability conditions in the 20 best practices.

ID	Public resources	(re)payment capacity and risk rating	Objectives and governance structure	Outreach and awareness	Public or private champions	Established models or mechanisms
01						X
02	X	X	X	X		X
03	X				X	
04	X		X			X
05				X		
06						X
07	X			X		
08		X		X	X	



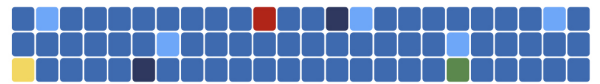
09	X	X	X	X		X
10	X	X	X	X		X
11			X			X
12						X
13	X		X			
14			X	X		
15		X	X		X	
16	X	X				
17	X		X	X		
18	X	X			X	X
19						
20	X			X		X

(1) Public resources. One of the most important things a territory must consider is whether it possesses the right resources or has the (financial) means to acquire the necessary resources externally. This also includes considering whether the territory has the right scale to adopt an AFFS. In some best practices, resources required from the public authority were limited, but mainly thanks to partnerships with private sector actors. The Clean Water Partnership (**ID02**) did not require many resources from the county, but there was still staff required that are knowledgeable about PPP approaches for follow-up and collaboration with the private actor(s). Cities like Paris, Gothenburg, and Copenhagen are large and have sufficient public resources to run large-scale programmes like the Paris Climate Bond (**ID09**), the Gothenburg Green Bonds (**ID18**), and the Cloudburst Management Plan (**ID03**) respectively. Copenhagen, the Danish capital and city with the highest capacity and resources, is to date the only Danish municipality that benefited from the water sector law change, exemplifying the importance of having sufficient public resources. Some AFFS, like the Washington SRC Trading programme (**ID07**), will be more efficient the bigger it can become. This means that the success of this mechanism may be limited in small geographical areas or in areas with low development pressure. Likewise, the development of a stormwater credit programme requires specialised skills that are usually not available in smaller municipalities.

Smaller territories that lack public resources to manage an AFFS on their own should try to **cooperate with higher-level government agencies or other territories**. The Viveracqua Hydrobond (**ID16**) is a good example where multiple small and medium-sized enterprises, in this case, water utility companies, pooled their resources (mini bonds) into a larger vehicle to attract wider interest from investors. By American standards, Hampton (**ID08**) is a smaller city but still managed to develop an Environmental Impact Bond through the help of a research project about EIBs initiated by the Chesapeake Bay Foundation. Furthermore, the Hampton Environmental Impact Bond had a value of €12 million, proving that bonds of this type can also be successful with a small investment volume.

(2) (Re)payment capacity and risk rating. Related to public resources, a territory must consider its (re)payment capacity and accompanying risk rating when adopting an AFFS with debt-based instruments, as in the Paris Climate Bond (**ID09**) and the Gothenburg Green Bonds (**ID18**) best practices. Payment capacity is also important when a public authority wants to hire private sector services, for example, through a public-private partnership as in the Clean Water Partnership (**ID02**). In flood buyout programmes (**ID10**), funding must be readily available, especially after a flood event, to avoid delays that can cause hardship. It is possible to alleviate some of the (re)payment obligations by creatively combining multiple sources and instruments. Prince George's County pays the Clean Water Partnership (**ID02**) run by Corvias with the county's Watershed Protection and Restoration Fund. The Fund is supplemented with bond proceeds from general obligation bonds and loans from the Stormwater State Revolving Fund. Income from the Clean Water Act Fee levied on private property owners is used to repay the bonds and loans. What seems like a complex structure is just a creative combination of fairly standard instruments like municipal bonds and water fees or property taxes.

(3) Predefined objectives and organisational structure (governance). It is important that the objectives and organisational structure are defined before deciding on the financial sources or instruments to be included in the AFFS. This helps determine which sources or instruments may be relevant, and it may speed up the overall process of securing financing and funding. In the case of P3 approaches like the Clean Water Partnership (**ID02**), or other governance structures that involve public and private partners, knowing the preferred governance structure means understanding how the risks are shared between the public and private partners. If these are prepared well, the programme can be communicated clearly to the community, allowing them to understand what's in it for them and who bears the risks. Alternatively, objectives can be captured in policy



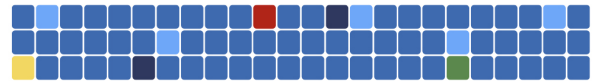
plans, as was the case with the City of Paris' Climate and Energy Action Plan (ID09). In best practices like the Greater Cape Town Water Fund (ID01) and the Sheffield Lower Don Valley Flood Defence project (ID11), the organisational structure of the water fund and the business improvement district respectively were already thought out as part of the business case.

(4) Outreach and awareness prior to launching and during the programme can help gauge public perceptions, gain support from communities, politicians, or administrations, and upscale initiatives. This can involve raising awareness about climate challenges to increase the likelihood of support for climate policy plans. If an innovative AFFS is used, it can be valuable to familiarise communities and potential participants through outreach and capacity building activities. Outreach and awareness-raising activities can also continue when the AFFS is operational. In Washington D.C. (ID07), the Department of Energy and Environment has staff dedicated to engagement activities with the real estate development sector, landowners, and SRC Aggregators to encourage market participation in the SRC trading programme. Early in the development of the Hampton Environmental Impact Bond (ID08), the finance team was involved early in the process to familiarise them with the concept of an EIB. In Curitiba, Brazil (ID14), the Municipality of Curitiba, in partnership with the Society for Research in Wildlife and Environmental Education, held meetings with landowners of urban forests to train them on the conservation of the Araucaria Forest and RPPNs. Because of these meetings, many owners became interested in participating in the RPPN programme and selling their development rights. As a final example, the landowners around the Edwards Aquifer were apprehensive about collaborating with a government entity in the Edwards Aquifer Protection Programme (ID20). The City of San Antonio educated the landowners on conservation easements. The time and effort spent to foster a long-term partnership resulted in positive relationships with landowners. The programme has a good reputation among landowners, and it helped to receive a majority vote for the local sales tax increase.

(5) Public or private champions. Support from **public or private champions** in the early (development) phases of an AFFS can help to get the right political decisions or to receive initial financial support that demonstrates investor interest, which may lead to trust and confidence from other investors. In the Seychelles debt-for-nature swap (ID15), an early funding commitment from one foundation of USD 1 million was useful in demonstrating that there was significant funder interest behind debt restructuring and debt conversion for increased money in climate adaptation. In Sweden, the SEB is considered a green bond champion, which, combined with the political commitment from the City of Gothenburg (ID18) government to sustainability, encouraged the issuance of green bonds and successful investor interest. High-ranking politicians from the City of Copenhagen (ID03) were important to successfully lobby the national government for a change to the water sector law. Finally, in the City of Hampton (ID08), high-ranking champions within a public authority were important to create trust among the city staff, the community, investors, and other partners about the environmental impact bond.

(6) Use established or tested financial models and mechanisms. A final important lesson learned from the AFFS that were developed and implemented is that in many of the best practices, established or already tested financial models or mechanisms were adopted and tailored to a specific context, or once a model was developed, it has been further upscaled and replicated in other contexts. There are many AFFS available that use financial instruments or mechanisms that have been tested and successfully applied in numerous cases. Often, guidelines and manuals that are publicly available can serve as inspiration. This means that searching for innovative solutions to boost climate (adaptation) finance does not require territories to reinvent the wheel, but rather to learn from how existing instruments have been combined and applied in other territories as we did with this research. In cases where more innovative AFFS were developed, the mechanisms used are not bound to their specific context and can be replicated in other territories. Some examples illustrate these points:

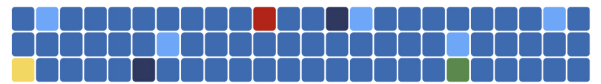
- Since 2000, The Nature Conservancy has implemented more than 30 water funds in North America, Latin America, and Africa, like the one in the City of Cape Town (ID01), and more will be initiated in the future. In 2024, The Nature Conservancy published the business case of the first water fund in Europe, the Norfolk Water Fund in the UK.
- The Clean Water Partnership's CBP3 approach (ID03) is a relatively new form of public-private partnership but is not context-bound and thus has the potential to be applied in other contexts as well, specifically in areas that are already experienced with public-private partnerships. Corvias has replicated the CWP's CBP3 approach in other areas in the US, including Milwaukee, Seattle, and Chester (PA).
- The emergence of programmes like EcoMarkets (ID04) around the world suggests their potential for successful implementation.
- Groenfond (ID06) is a non-profit public benefit institution, which is a common entity form in the Netherlands that did not require legal changes. This form was allowed under existing legislation, including the fund financing and how the fund is managed.



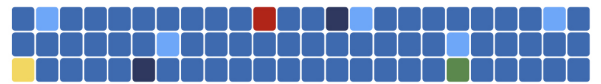
- While the flood buyouts (**ID10**) are a federal programme, there is no single unified approach. Local governments generally must identify the most appropriate funding source based on the specific circumstances of each buyout effort.
- The pre-existing legal framework for BIDs in the UK allowed the BID to be voted for and established on short notice in the Sheffield Lower Don Valley Flood Defence project (**ID11**). At that time, more than 120 BIDs were in operation in the UK, underpinned by the Local Government Act 2003 and Business Improvement District Regulations 2004. It simply became the first to be used for co-financing a flood protection project.
- The choice to fund mitigation measures in the Dorset Heathlands (**ID12**) with developer obligations was immediately possible because of Section 106 (S106) of the Town and Country Planning Act 1990, which allows a local planning authority to enter into a legally binding agreement or planning obligation with a landowner in association with the granting of planning permission. At that time, it was innovative to use developer obligations for measures in nature areas, but legally possible.
- A green bond or an environmental impact bond is a straightforward instrument that can be used by municipalities to raise financing for climate adaptation and mitigation (Resilient Hampton, **ID08**; Paris Climate Bond, **ID09**; Gothenburg Green Bond, **ID18**). Green bonds and traditional bonds are similar financially and technically. This means that the low credit risk is the same for both, and the repayment ability of the issuer must be assessed for green bonds in a similar way. A green bond does not entail an extra risk for investors compared to traditional bonds. The main difference between a green bond and a traditional bond is the green bond framework. Municipalities that have experience with municipal bonds would only need some additional resources to establish and manage a green bond framework.
- The City of San Antonio has a large tax base to enable the Edward Aquifer Protection programme's (**ID20**) funding through voter-approved sales tax increases.

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