



## Approaches to financing nature-based solutions in cities

DRAFT, NOVEMBER 2019

This working document has been prepared by Trinomics with the assistance of IUCN for the Horizon 2020 project GrowGreen. Trinity College Dublin (on behalf of the Horizon 2020 project Connecting Nature) provided one of the case studies. We invite interested parties to add to this document by sending us case studies and suggestions of additional financing options (please send to [kym.whiteoak@trinomics.eu](mailto:kym.whiteoak@trinomics.eu)). We encourage use of the document, accompanied by an appropriate reference: *Trinomics and IUCN, 2019. Approaches to financing nature-based solutions in cities. Working document prepared in the framework of the Horizon 2020 project GrowGreen.*

A final version of this document will be included under the final deliverables of GrowGreen Work Package 4.3.

<b>Deliverable No.</b>	Not a formal project deliverable, but intermediate output of Task 4.3, WP4
<b>Work Package</b>	WP4
<b>Dissemination Level</b>	Project team
<b>Author(s)</b>	Laura Baroni, Graeme Nicholls, Kym Whiteoak (Trinomics)
<b>Contributor(s)</b>	Birgit Georgi (Trinomics); Kate Reilly (IUCN); Siobhan McQuaid (Trinity College Dublin, Connecting Nature project)
<b>Delivery date</b>	
<b>File Name</b>	
<b>Status</b>	Working Document

## DOCUMENT HISTORY

VERS.	ISSUE DATE	CONTENT AND CHANGES
V01	27/11/2018	Trinomics draft shared with IUCN
V02	20/12/2018	First revision IUCN
V03	25/02/2019	Case study addition by Connecting Nature
V04	2/04/2019	Added BID case study suggested by Tom Wild, University of Sheffield
V05	15/07/2019	Revisions by Sophie Sheil, MCC; added Wroclaw case studies submitted by Joanna Kiernicka-Allavena
Final		

The sole responsibility for the content of this publication lies with the authors. It does not necessarily represent the opinion of the European Union. Neither the EASME nor the European Commission are responsible for any use that may be made of the information contained therein.

This document has been prepared in the framework of the European project GROWGREEN – Green Cities for Climate and Water Resilience, Sustainable Economic Growth, Healthy Citizens and Environments (Grant agreement No 730283). This project has received funding from the European Union's Horizon 2020 research and innovation programme.

**CONTACT: Laura Baroni (Trinomics), [laura.baroni@trinomics.eu](mailto:laura.baroni@trinomics.eu)**

## Approaches to financing nature-based solutions in cities

This document provides an overview of **financing approaches that can be used to deliver green infrastructure (GI) or nature-based solutions (NBS) in urban areas**, compiled through literature review. It is intended to provide a basis for more detailed analysis of instruments within Task 4.3, WP4 of the project Grow Green. It focusses on financing mechanisms **from the perspective of city governments**.

The following categorisation of financing mechanisms starts from the premise that a municipality has two main options for increasing NBS in the city:

- 1) Implement NBS projects or maintain existing NBS directly (especially on municipality-owned land); in this situation, the municipality pays for the intervention, either through funds it already has or by obtaining loans and revenues to finance the project.
- 2) Encourage other actors (e.g. residents, utilities, businesses) to implement NBS (especially on their private property) or to contribute to the maintenance of existing NBS in the public domain; in this case, the local authorities provide incentives to other stakeholders, or stimulate private finance by other means.

Types of instruments falling under the first category above include:

- **Innovative use of public budgets**, such as pooling funding from different government departments or making use of previously untapped sources such as the public health budget.
- **Grant funding and donations**, including: EU funding; grants from regional and national public bodies; philanthropic contributions; and crowdfunding.
- **Instruments generating revenue** (including value-capture mechanisms), such as: revenues from land sales or leases; taxes (aimed at cost-recovery); user fees; developer contributions or charges; betterment levies; voluntary contributions from beneficiaries; sale of development rights and leases; funds linked to offsetting or compensation requirements; and other voluntary schemes that generate revenues.
- **'Green finance' (or debt-based instruments)**: loans from public or private financial institutions; green bonds; and the Natural Capital Financing Facility (NCFF).

Types of instruments covered by the second category include:

- **Market-based instruments**: user charges; taxes (as incentives rather than a cost-recovery mechanism); subsidies; tax rebates; credit-trading systems; offsets for residual impacts on biodiversity/GI; and payments for ecosystem services (PES).
- Developing **'Business Improvement Districts' (BID)**
- Setting up **endowments**
- Creating **Public-Private Partnerships**
- **Revolving funds**
- **Community asset transfers**
- **Regulation and planning standards<sup>1</sup>**
- **Leveraging existing regulatory obligations**

---

<sup>1</sup> Although this is not a financing instrument as such, we consider it in this overview since it is one of the means through which local authorities can trigger GI implementation by private stakeholders, such as infrastructure developers and homeowners.

The following two tables present brief descriptions of each instrument type, highlight the instrument's prerequisites for implementation or limitations, and provide case study illustrations.

Table 1 NBS Financing Mechanisms (1)

Type of instrument	Prerequisites & limiting factors	Case study examples
<p><b>INNOVATIVE USE OF PUBLIC BUDGETS:</b></p> <p>GI creation, improvement and maintenance are often funded from local authorities' own budgets. However, budgets specifically for nature and green space are usually insufficient. A partial solution is for local authorities to find creative ways of channelling funding from other relevant government departments.</p> <p>For example, cities could <b>pool funding from different departments</b> within the city administration to deliver GI projects with cross-sectoral benefits (e.g. urban forest management).</p> <p>One of the options proposed by some authors is to <b>attract funding from the public health budget</b>, given the growing evidence base on the benefits of nature to physical and mental health (Drayson, 2014; Mell, 2016). In the UK, the National Health Service (NHS) and clinical commissioning groups (groups of GPs in an area) fund programmes involving physical activity in green spaces, yet they provide little direct funding for the management of such areas (Mell, 2016). Local authorities could work with the public health services to develop a funding model in which direct capital investments are made into sites that are subsequently used in health programmes involving outdoor activities (Mell, 2016).</p> <p>A hypothetical model of '<b>green prescribing</b>' is described by Drayson (2014): "For example, an overweight patient (with no complicating conditions preventing physical exercise) could obtain a green prescription from their GP for a course of physical fitness classes. The patient would pay the standard prescription charge, if applicable, and the Clinical Commissioning Group would fund the remainder of the cost of the course. Those running the classes would monitor patient attendance and feed this information back to the GP. The class organisers would also pay the local authority a fee, as part of an agreement to hold classes in a public green space. This could then go towards the cost of maintaining the green space." It is unclear whether such a model could generate sufficient funding to cover a significant proportion of green space maintenance costs, but it could potentially cover such costs at least partly.</p>	<p>To tap into public health budgets, there is a need to convince health sector stakeholders of the link between nature-based activities and health outcomes. Although the evidence base is growing, further research is needed to quantify this link.</p> <p>Health budgets are often also quite limited.</p> <p>Similarly, if funding contributions from the police sector are to be sought, there is a need to raise awareness among police officials of the crime reduction benefits of investing in urban green space (Drayson, 2014).</p> <p>Considerable investment in communication is also required to convince educational facilities of the benefits of nature-based solutions.</p>	<p><b>Natural Choices for Health and Wellbeing programme, Liverpool, UK</b> – Funded by the Liverpool Primary Care Trust, the programme aimed to reduce inequality in health and wellbeing, increase engagement with the natural environment and provide opportunities for disadvantaged people. Community groups in disadvantaged areas and areas lacking in green infrastructure were invited to apply for grants to increase wellbeing by improving their local environment. 38 projects were awarded grants of £1,000 to £38,000 in 2012. The programme's evaluation showed an increase in wellbeing among residents of up to 18 per cent (Drayson, 2014).</p> <p><b>Forest Sports Zone, Nottingham UK</b> – A £1.7 million project to improve sports facilities in The Forest recreation ground secured funding of £150,000 from the Nottinghamshire Police and Crime Commissioner (Drayson, 2014). Although it is unclear whether the project had biodiversity or ecosystem service benefits (beyond recreation), it shows how police budgets could contribute to the improvement and maintenance of green space.</p> <p><b>Green Exercise Partnership, Scotland, UK</b> – the partnership is a joint venture between the Forestry Commission Scotland, Scottish Natural Heritage and Health Scotland (part of the Scottish National Health Service (NHS)). It funds projects to show the health benefits that derive from investment and management of the NHS estate. For example, it funded tree planting, active woodland management, pathway improvement and other actions so that hospital staff and patients, and local residents can benefit from exercise and time in nature (Forestry Commission Scotland et al., 2015).</p> <p><b>The "Grey into Green" programme (Wroclaw, Poland)</b> was launched by the City of Wroclaw many years ago. The idea was to transform impervious backyards of schools and preschools into green areas. The goals of the project, originally dedicated to greening public schools and preschools backyards and run by the Department of Education, was shifted towards the use of NBS when the programme management was handed over to the Sustainable Development Department in 2017. Thanks to this programme children can play and spend their free time in a safe, friendly and green area. They also have an opportunity to grow vegetables, learn about rainwater gardens or observe pollinators on meadows and, eventually, get acquainted with NBS and their role in climate change adaptation. Schools and preschools had been provided with guidelines</p>

Type of instrument		Prerequisites & limiting factors	Case study examples
<p>Another option is <b>greening hospital estates</b> (i.e. land owned by hospitals/health trusts) (as in the example of the Green Exercise Partnership in Scotland).</p> <p><b>Police budgets</b> are another source worth exploring, given emerging evidence that well-designed, well-maintained green infrastructure can help reduce crime (Drayson, 2014). Some of the funding for urban green space maintenance and improvements could thus come from policing budgets.</p> <p><b>Education budgets</b> have also shown to be a potential source of alternative funding for nature-based solutions. In densely populated urban areas, school grounds are often an important oasis of green for citizens and wildlife alike. Collaborating with departments of education to use funding grants for the development of nature-based solutions in school grounds presents win-win opportunities for students and the environment.</p>			<p>and trainings about blue-green infrastructure that should be considered in projects. The programme has become very popular and more and more schools apply each year for municipal “Grey into Green” funding (Joanna Kiernicka-Allavena, personal communication).</p> <p>Within the City Hall of <b>Poznań, Poland</b>, the Project Coordination and Urban Regeneration Office have entered into an innovative collaboration with the Department of Education to introduce nature-based solutions in the gardens of state-run pre-schools in the densely populated city centre area. Each year the Department of Education funds the renovation of up to 10 pre-school gardens (around 120 pre-schools in the city). The Project Coordination and Urban Regeneration Office offered to ‘top-up’ the Department of Education grant with specialised landscape design, technical support and resources to encourage pre-schools to deseal hard surfaces, introduce more biodiversity and create nature-based gardens connecting with other urban green corridors. After a successful pilot in 2018, this programme is now being rolled out from 2019 (Connecting Nature, personal communication).</p>
<p><b>GRANT FUNDING &amp; DONATIONS:</b></p> <p>Local authorities can access external grants for GI creation and maintenance from a variety of sources, including public sector bodies (at various administrative levels) and charitable or philanthropic organisations.</p>	<p><b>European Structural and Investment Funds (ESIF):</b> present several opportunities to finance GI projects, including in urban areas. Within ESIF, the Cohesion Fund and the European Regional Development Fund (including Interreg for transnational projects) are most suitable for urban GI.</p>	<p>Projects are required to meet certain criteria set out in the Common Provisions Regulation (EU) No 1303/2013 and each fund-specific regulation.</p> <p>Co-funding is required (the EU grant covers only 50% to 85% of project costs).</p> <p>The specific opportunities for funding GI projects through ESIF depend on whether the relevant investment priorities provided by the Regulations have been included in Member States’ Operational Programmes and the specific calls for applications.</p>	<p><b>Grey to Green Project, Sheffield</b> - retrofitting of a redundant carriageways into Sustainable Urban Drainage Systems to provide both public space and flood risk mitigation in the area. The project increased permeability in a flood-prone area through the creation of swale cells to reduce water flow rates and filter pollutants from the water before it re-entered the catchment area. Funded through Sheffield City Council and the European Regional Development Fund (Nowell, 2016).</p>
	<p><b>Programme for the Environment and Climate Action (LIFE):</b> provides co-funding for projects in the area of the environment (including nature</p>	<p>Requirements and criteria are set out in the LIFE Regulation (Council Regulation (EU) No 1293/2013).</p>	<p><b>The Urban Adapt</b> project in Rotterdam is a cooperation between the City of Rotterdam, WWF and Rijkswaterstaat (Dutch national agency for public works and water management). The project is demonstrating two measures: a tidal park to improve climate resilience and a neighborhood project to engage local communities in the greening of grey areas to address water and urban heat</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
	<p>and biodiversity) and climate change adaptation and mitigation.</p>	<p>challenges. Total project costs were over €10.3 million, with €2.7 million provided by LIFE (LIFE Urban Adapt, 2018).</p> <p><b>Life Anillo Verde</b> - The project aims to contribute to nature conservation around the Bay of Santander in Spain by restoring ecosystems and creating blue and green infrastructure. The project budget was over €2.5 million, including €1.5 million funding from LIFE. The lead beneficiary is the Provincial Council of Gipuzkoa, a public body which deals with land management, environmental protection and natural species protection (Anillo Verde, 2018).</p>
	<p><b>Horizon 2020:</b> the EU Framework Programme for Research and Innovation can support NBS projects with an innovation or research component</p>	<p>Several NBS projects are currently funded by Horizon 2020, including GrowGreen</p>
	<p><b>Regional &amp; national government grants:</b> local authorities may access grants for environmental projects - including GI - provided by upper levels of government</p>	<p>The <b>Big Lottery Fund</b> and the <b>Heritage Lottery Fund</b> in the UK are public bodies which distribute funds raised by the National Lottery to deliver projects with public benefits, including nature projects.</p>
	<p><b>Philanthropic contributions:</b> GI projects have traditionally relied on charitable contributions from foundations, citizens, private sector donors, etc.</p>	<p>The <b>Royal Parks Foundation (UK)</b> is an independent charity raising funds to cover most of the management costs of the eight Royal Parks in London. Donations from the private sector and individuals are among the Foundation's main funding sources. High-profile philanthropic organisations have also contributed to specific projects. For example, in 2011 the Tiffany &amp; Co. Foundation pledged \$1.25 million for a two-year programme to restore water features across the Royal Parks (Drayson, 2014).</p>

Type of instrument		Prerequisites & limiting factors	Case study examples
	<p><b>Crowdfunding:</b> raising funds for a project (usually of public interest) through the donation of small amounts from a large number of individuals. Suitable especially for supporting small-scale projects that are not necessarily suitable for other financing instruments.</p>	<p>receive fewer donations, and that larger parks attract a greater number of potential donors than smaller GI by virtue of their geography (Drayson, 2014).</p> <p>Requires financial resources to build and maintain the platform, as well as promotional/awareness-raising activities (Climate-ADAPT, 2016a). Unpredictable source of funding for longer-term projects; may require funding to be complemented by other, more sustained, sources.</p>	<p><b>Ghent crowdfunding platform for climate adaptation, Ghent, Belgium</b> - The City of Ghent has established a crowdfunding platform to support the co-creation of climate change adaptation measures. The platform allows citizens to share their ideas and raise the necessary funds to realise them. The minimum donation on the platform is €5 and the submitted project ideas are reviewed by the platform manager (appointed by the city). Furthermore, the city has offered a municipal subsidy for the projects (up to 75% co-funding), which citizens can apply for during the application process. If applicants indicate they wish to receive municipal funding, a pre-defined funding goal needs to be achieved (for example, a project that has applied for 50% municipal funding with a funding goal of €1000 needs to raise at least €500 in donations by supporters) (Climate-ADAPT, 2016a; EEA, 2017).</p> <p><b>MyParkScotland</b> (<a href="https://www.mypark.scot/">https://www.mypark.scot/</a>), a charity raising funds for Scotland's public parks, includes a crowdfunding platform where donors can support various park projects.</p>
<p><b>INSTRUMENTS GENERATING REVENUE:</b></p> <p>City governments can raise revenues to develop NBS through land sales or leases, taxation, developer charges, or through a range of 'value capture' mechanisms. 'Value capture' mechanisms seek a funding contribution from the beneficiaries of</p>	<p><b>Land sales/leases:</b> Government-owned land can provide upfront capital from land sales or leases. The revenues can then be used to develop GI projects. This can be used in conjunction with a trust/endowment (see below) whereby an organisation is entrusted with the management of revenues from the land sales by setting up a specific fund (Mell, 2017).</p> <p><b>Taxes</b> (for cost-recovery / revenue raising): Municipal income can come from taxes that are completely or partly under the authority of municipalities, or from taxes collected at other administrative levels and redistributed to the local level (Droste et al., 2017).</p>	<p>Most useful if part of the revenues from land sales or leases are earmarked for GI/nature projects, otherwise such projects would still compete with other city priorities requiring funding from local budgets. Land sales draw on a finite source of resources (Mell, 2017).</p> <p>Municipalities' tax competences are usually limited. Unless certain tax revenues are earmarked for GI/nature projects, such projects would still compete with other city priorities requiring funding from local budgets.</p>	<p><b>Renaturalisation of the Wesser river's coast</b> - The project aimed to increase river shore protection and manage water resources, in addition to providing a public recreation area and supporting biodiversity in the area. The project removed river bank structures such as canals and steep bank attachments, allowing the river to naturally create a beach for recreational purposes, whilst encouraging flora and fauna back into the area (Naturvation, 2018a). The</p>



Type of instrument	Prerequisites & limiting factors	Case study examples	
<p>government investment or planning decisions in order to 'capture' some of the private value generated (Infrastructure Victoria, 2016).</p>	<p><b>User fees:</b> charging a fee for the use of green space facilities such as sports pitches, hiring out parks for private events, or introducing a nominal park entrance fee can raise revenues for their maintenance.</p>	<p>Introducing mandatory fees for sites which were previously open-access is likely to be unpopular with residents. An alternative would be to introduce voluntary fees or donations, following e.g. the model of most museums in the UK where entrance is free but visitors are encouraged to make donations.</p> <p>There is a trade-off between raising funds for maintenance through user fees and encouraging public use of green space such as outdoor physical activity.</p> <p>It may also make certain sites ineligible for public grants (Drayson, 2014).</p> <p>Hiring out public parks for events contributes to the 'wear and tear' of parks and may reduce public enjoyment of the park (e.g. if certain areas are closed off to the public) (Searle, 2013).</p>	<p>project was financed (50%) with EU funding, with the remaining finance drawn from sewage taxes (Janz, 2012).</p> <p>In Australia, the Botanic Gardens and Parks Authority (Perth) and the Royal Botanic Gardens and Domain Trust (Sydney) received 7% and 12% of their revenues, respectively, from user charges from events and functions in 2011-2012 (Searle, 2013).</p>
	<p><b>Developer contributions/ charges:</b> one-off compulsory charges paid by property developers as a condition of receiving development approval or as a condition of rezoning prior to development (Infrastructure Victoria, 2016)</p>	<p>Introduction of the mechanism requires regulatory changes.</p> <p>Developers would usually be resistant to the introduction of additional charges.</p> <p>Charges need to be carefully designed to reduce the risk of duplicating existing taxes and user charges (Infrastructure Victoria, 2016). (This</p>	<p>In <b>Vancouver, Canada</b>, property developers are required to pay a <b>Development Cost Levy</b> as a prerequisite for receiving the building permit. If the new development also involves rezoning, developers also pay a <b>Community Amenity Contribution</b>. The revenues are used by the city to fund public facilities, including parks (City of Vancouver, undated).</p> <p>In the UK, <b>Section 106 (S106) agreements</b> and the <b>Community Infrastructure Levy (CIL)</b> allow local authorities to charge developers a fee for new infrastructure works (including green spaces) (Drayson, 2014).</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
	<p>also applies to betterment levies – see below.)</p> <p><b>Betterment levies:</b> payments by landowners or beneficiaries in an area to capture a portion of the land value gains or improvements resulting from public projects (Infrastructure Victoria, 2016). The payments can be one-off or recurrent.</p> <p>Applicable when investments lead to material land value gains for new and existing properties in a defined area (Infrastructure Victoria, 2016). The ‘amount of value uplift’ attributable to the project/public investment must be measured (i.e. the value of the gains received by beneficiaries due to the intervention has to be established), in order to determine the level of the levy (Infrastructure Victoria, 2016). “Consideration needs to be given to whether there are negative financial consequences for landowners who may not have the capacity to pay a levy or who are ‘asset rich, but income poor’. The potential impacts on businesses also need to be considered. Adjustments may need to be made to the design of the mechanism for those who cannot afford to pay” (Infrastructure Victoria, 2016). There is a risk of gentrification if the instrument leads to poorer individuals being priced out of a neighbourhood.</p>	<p>The <b>Melbourne Metropolitan Parks Charge</b> is collected once every year to raise funds for Victoria’s parks, zoos, trails and gardens, including management and maintenance. The charge captures some of the value Melbourne’s parks provide to residents and businesses. The level of the charge is determined through valuation by the local council (Infrastructure Victoria, 2016). There are several examples from other sectors, in particular transport infrastructure where costs were recovered partly through levies on businesses and developers expected to benefit from the project (see, e.g. London Crossrail and other case studies cited in Infrastructure Victoria, 2016). In the UK, <b>levies on residents in proximity to parks</b> has been proposed as an option to fund parks’ maintenance (Drayson, 2014). This model is already applied in parts of London; Wimbledon and Putney Commons are maintained through a levy on residents (additional to council tax) within a short distance of these green spaces (Drayson, 2014).</p>
	<p><b>Voluntary beneficiary contributions:</b> negotiated payments sought from private parties that would receive a major benefit from public development/ investments (e.g. businesses, landowners), in order to recoup some of the project costs (Infrastructure Victoria, 2016)</p> <p>Applicable if specific beneficiaries can be identified; not suitable if the expected benefits are largely ‘public goods’</p>	

Type of instrument	Prerequisites & limiting factors	Case study examples
<p><b>Sale of development rights and leases:</b> commercial opportunities can be integrated with the project/infrastructure being delivered (Infrastructure Victoria, 2016). For example, revenues for a new park could be raised partly by leasing certain areas to vendors or similar.</p>	<p>Applicable when the project creates opportunities to commercialise the use of government land or other assets (Infrastructure Victoria, 2016)</p>	
<p><b>Funds linked to offsetting/compensation requirements:</b> where compensation is required for developments detrimental to nature, the compensation payments could be pooled into a fund which is then used to finance nature projects</p>	<p>Applicable if compensatory payments are legally required</p>	<p><b>Ruhr river renaturation, Arnsberg, Germany</b> - Since 2003 the city of Arnsberg has renatured more than 12 km of the river Ruhr and smaller tributaries to improve flood protection and the area's ecological status and attractiveness. The measures were financed through an 'eco-account' funded by contributions paid by developers as compensation for interventions in nature (Scheja, undated).</p>
<p><b>Other voluntary schemes</b></p>		<p><b>Carbon footprint compensation scheme to finance tree planting in Bologna, Italy</b> - The 'Green areas inner-city agreement' (GAIA), an outcome of a LIFE project, allows businesses to calculate their carbon footprint and compensate for it (voluntarily) by making donations towards tree planting. The council agrees to plant the trees, cover any unexpected maintenance costs for the first 3 years and provide project progress updates. The private entity agrees to pay the chosen contribution, which covers the purchase, planting and ordinary maintenance of the trees for 3 years. By April 2016, GAIA had secured the planting of 1,405 trees in the Bologna city area (Climate-ADAPT, 2016b).</p>
<p><b>'GREEN FINANCE' (DEBT INSTRUMENTS)</b></p> <p><b>Loans:</b> cities can apply for loans from public or private financial institutions. Some public financial institutions offer low-interest loans for projects delivering environmental and/or social benefits.</p>	<p>In general, only projects that can be expected to generate revenues would be of interest to lenders, especially private banks.</p>	
<p><b>Green bonds:</b> Bonds are an instrument for raising capital through the debt capital market (UN-Habitat, 2017). They are essentially a type of loan. The bond issuer (debtor) borrows a fixed amount of capital from investors (creditors) over a defined period of time (the "maturity" of the bond), repays the capital (the "principal") when the bond matures, and pays an agreed-upon amount of interest ("coupons") during that</p>	<p>In some countries, legislative change may be needed to allow local governments to issue bonds.</p> <p>The establishment of such bonds can be a complex and long-term process, hence collaboration with organisations with financial expertise is usually necessary. It also requires knowledge of what is expected or</p>	<p><b>City of Gothenburg Green Bonds</b> – The City of Gothenburg has been issuing green bonds since 2013. The city uses the proceeds for environmental projects such as green housing, green transport, tree planting and water treatment (S &amp; P Global, 2017). Investments in the green bonds are transferred to a special budget account that supports the city's lending to eligible projects (CICERO, 2015). Projects are selected by the City Office (Urban Development and Treasury Departments) and the City Council. The Environment Administration then verifies the selection of proposed projects, and the City Office presents the verified projects to the City Executive Board for a final approval before</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
	<p>period (UN-Habitat, 2017). In the case of a 'municipal green bond', the issuer (the city) commits to use the bond proceeds exclusively for projects with an environmental benefit (UN-Habitat, 2017).</p>	<p>valued by investors (Climate-ADAPT, 2016c).</p> <p>The process may require new procedures or tools (e.g., for budget monitoring) within the administration (Climate-ADAPT, 2016c).</p> <p>Creditworthiness of the issuer is important (Climate-ADAPT, 2016c).</p> <p>As with other types of loans, bonds are most suitable for projects that can be expected to generate financial returns.</p> <p>The scale of projects can also be a limitation, if certain NBS projects are too small-scale for bonds.</p> <p>Aggregating several small-scale NBS projects could be a solution to this limitation.</p>
	<p><b>Natural Capital Financing Facility (NCF):</b> a financing facility set up by the European Commission and the European Investment Bank (EIB) to support projects focusing on nature and biodiversity and ecosystem-based adaptation to climate change. The NCF provides funding in two main ways: direct lending or setting up intermediated structures (such as funds or credit lines) via a financial intermediary. The facility is currently in a pilot phase and can sign projects until the end of 2019 (EIB, undated).</p>	<p><b>Climate adaptation bond, Paris</b> – In 2015, the City of Paris issued a €300 million climate bond with an annual interest rate of 1.75% to finance climate and energy projects. Of the €300 million, €60 million is reserved for climate change adaptation measures. The bond will run until 2031. The bond currently finances two projects involving the planting of 20,000 trees and the creation of 30 hectares of new parks in the city by 2020. The bond covers the cost of implementing adaptation projects, with maintenance costs covered by the city itself (Climate-ADAPT, 2016c).</p> <p><b>Awarding the green bonds (City of Gothenburg, 2015).</b> The City Office is then tasked with monitoring the project's economic development and several environmental indicators, and communicating to investors (City of Gothenburg, 2015).</p> <p><b>Athens Resilient City and Natural Capital</b> - The EIB provides a EUR 55 million loan to the City of Athens to support investments totalling EUR 190 million in transport, waste, energy efficiency, culture and urban rehabilitation schemes across Athens. This includes EUR 5 million from the NCF to invest in green and water-related infrastructure. This will support the Municipality of Athens Resilience Strategy for 2030. European Structural and Investment Funds will provide additional grant financing. The NCF contribution to the bigger portfolio allows Athens to improve its overall investment plan by including more innovative GI solutions that would otherwise have been considered as too risky (EIB, 2018).</p> <p>Another project currently in the NCF pipeline focusses on the <b>restoration of the Alzette River in Luxembourg</b>. It aims to re-instate some of the watercourse's natural dynamics in support of biodiversity, recreation, flood management and landscape development. The project will also apply a nature-based solution to reduce the amplitude and frequency of flooding events which affect some downstream locations (EIB, 2017).</p>

Table 2 NBS Financing Mechanisms (2)

Type of instrument		Prerequisites & limiting factors	Case study examples
<p><b>MARKET-BASED INSTRUMENTS:</b> a range of instruments that use markets or price mechanisms can be used to create incentives for private parties to invest in NBS, and/or to ensure a more efficient allocation of resources</p>	<p><b>User charges:</b> Charges on the use of ‘grey’ infrastructure can act as an incentive to reduce use by implementing green infrastructure. At present, this mechanism is being used in some cities to encourage the implementation of Sustainable Drainage Systems (SuDS) on properties; water utilities charge customers for sewage treatment according to the amount of stormwater their property adds to the sewage treatment network (the property’s sealed surface or the size of the area draining into the sewage system is used as a proxy for this). This should encourage property owners to install SuDS in order to reduce their charges.</p>	<p>Requires accurate calculation of the fee, in order for it to reflect stormwater treatment costs.</p> <p>Imposing fees that go beyond cost-recovery may conflict with existing legislation or meet stakeholder resistance. At the same time, the fee will only act as an incentive if the costs of implementing SuDS do not outweigh the stormwater charge savings. This also requires awareness-raising among property owners of the expected savings over several years.</p>	<p>In <b>Hamburg</b>, the utility responsible for wastewater drainage and treatment, HAMBURG WASSER, introduced in 2012 a new pricing system which involves calculating stormwater management charges (separate from the general wastewater charge) based on the amount of sealed area connected to the sewer system of each property (Bertram et al., 2017). Similar charges exist in other German cities (Bertram et al., 2017).</p> <p>In <b>Manchester</b>, the water utility company, United Utilities, charges business customers for surface water drainage on the basis of the surface area of their site that drains into the wastewater system. By using SuDS to disconnect areas of a site from the wastewater system, business customers can move down a charging band. Recent economic modelling shows that installing SuDS on 576 schools and 22 National Health Service (NHS) sites throughout the city would result in savings (avoided treatment charges) of more than £800,000 per year, over a 15-year return period (Business in the Community, 2018). As a pilot project, Moorlands Junior School in Manchester constructed in 2018 a rain garden which absorbs rainwater that was previously carried via drainpipes to the waste water sewers. Disconnecting 497 m<sup>2</sup> of hard surfaces from the sewers allowed the school to move down a charging band, making an annual saving of GBP 1475. The area also provides aesthetic and biodiversity benefits, as well as opportunities for outdoor lessons (Business in the Community, 2018).</p>
	<p><b>Taxes</b> (as incentives): Similarly to user charges, taxes on ‘grey’ infrastructure or activities detrimental to GI can act as an incentive to replace the ‘grey’ solution with GI alternatives or to reduce pressures on GI</p>	<p>As in the case of taxes for cost-recovery, the city’s competences in this field are usually limited.</p> <p>New taxes are generally met with stakeholder resistance.</p> <p>Relevant only for few types of GI.</p> <p>Difficult to determine which tax rate would achieve a set target for GI implementation.</p>	
	<p><b>Subsidies:</b> Governments can provide a subsidy to cover (part of) the costs of installing GI on private property. This can leverage off the private benefits to landowners from green</p>	<p>Requires authorities to have the funds necessary for paying the subsidy.</p>	<p><b>Scheme for the purchase of rainwater management installations, Bratislava –</b> As part of the ‘Bratislava Turns Green’ project, the municipality encourages households to contribute to protecting the city from pluvial flooding through a subsidy scheme for the purchase of stormwater management systems. Since</p>

Type of instrument		Prerequisites & limiting factors	Case study examples
	<p>infrastructure assets, to stimulate additional investments and increase public benefits.</p>	<p>Involves administrative costs (e.g. to process applications for the subsidy). Can have the undesired consequence of keeping the costs of marketed technologies (e.g. green roofs) high (suppliers can keep the costs high if there is sufficient demand driven by the subsidy, even if the costs of production decrease). Hence its introduction should be based on a robust economic assessment to determine the size and duration of the subsidy.</p>	<p>2016, private organisations and households are eligible to apply for a subsidy covering 50% of total costs of the installation, for small-scale projects with a maximum cost of €1000. The scheme also offers consultancy to applicants on their project's implementation, and disseminates information about the projects to raise awareness. Subsidy applicants are assessed by the Steering Committee of the subsidy scheme (consisting of the Vice Mayor, Office of the Chief Architect, the Department of Strategies and Projects and the Department of the Environment). The majority of successful applicants installed rain water catchment tanks, created rain gardens, replaced impermeable surfaces with permeable materials or installed green roofs (Covenant of Mayors, 2017). <b>Green Roof Subsidy, Rotterdam</b> - The City of Rotterdam and the Water Boards encourage the installation of green roofs by granting a subsidy of €30 per square metre of installed green roof. Initially, the subsidy was restricted to roofs of at least 40 square metres, but this threshold was subsequently reduced to 10 square metres, making it possible to install green roofs on garages and garden houses (Rotterdam Climate Initiative, 2010). A similar subsidy scheme is in place in <b>Hamburg</b>: building owners can receive subsidies from the Hamburg Ministry for Environment and Energy to cover up to 60% of green roof installation costs. The programme will provide subsidies totalling € 3 million until the end of 2019 (Climate-ADAPT, 2016d).</p>
	<p><b>Tax rebates:</b> similar to a subsidy, tax rebates have been suggested as a means of incentivising the management of green space by private individuals or landowners</p>	<p>Involves administrative costs (e.g. to process applications for the rebate). Requires some monitoring to ensure that those receiving the rebate are indeed contributing to GI management. Requires awareness-raising to promote uptake of the incentive.</p>	<p>Drayson (2014) suggests that local authorities should offer council <b>tax rebates for active members of volunteer organisations</b> that contribute to the maintenance or improvement of public parks. The rebate could be calculated, for example, based on the hours spent volunteering. In <b>France</b>, tax reliefs have been used to promote <b>management of Natura 2000 sites on private land</b>. Tax exemptions are available for: property taxes for undeveloped property on Natura 2000 sites; inheritance taxes when unbuilt property on a Natura 2000 site is gifted or inherited; and income taxes for Natura 2000 management costs. To benefit from these exemptions, land owners are required to enter a contract with local authorities which sets out specific site management requirements. Commitments are for long time periods to ensure the continued management of the land (5 years in the case of property tax exemptions and 18 years for the inheritance tax exemption) (Illes et al., 2017).</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
<p><b>Credit-trading systems:</b> As an instrument for pollution control, credit-trading systems organise the exchange of rights to emit a particular pollutant into a receptor environment (Common and Stagl, 2005). The regulating authority establishes an aggregate pollution target and distributes among potential polluters a number of permits (credits) corresponding to the target set. Each economic agent is only allowed to emit a quantity corresponding to its permit holding. Trading emerges when individual agents have different marginal abatement costs (Perman et al., 2011). Agents with relatively high marginal abatement costs will seek to buy additional permits when the price is lower than the marginal cost of abatement, while lower-cost abaters will be motivated to sell some of their permits (Perman et al., 2011).</p> <p>In relation to GI, mechanisms following a similar logic are starting to be used to achieve stormwater management targets, but could potentially be envisaged in other areas also. Public authorities set a stormwater retention standard that new developments are required to meet (by installing GI and/or minimising sealed surface). Developers are allowed to meet their standard partly by purchasing 'retention credits' generated by other properties in the city that achieved higher retention capacity than their required target, or to which the standard does not apply. This can ensure that GI for runoff mitigation is deployed where it is most feasible and cost-effective, and provides a financial incentive for unregulated properties to voluntarily increase stormwater retention.</p>	<p>The instrument requires regulatory change.</p> <p>The credit-trading market may be slow to take off, particularly since there will likely be uncertainty at the beginning regarding the value of credits. Property owners may be willing to install stormwater retention measures in order to gain profits by selling the credits afterwards, but the costs of the installation must be paid up-front whereas the credits will only be sold later, and their value may be uncertain (Spector, 2016). Similarly, if developers do not know what the cost of the credits will be, they cannot calculate whether it is more profitable to plan for GI in the new development or meet their standard by purchasing credits. Once the market is fully up and running, the credit prices become more predictable.</p>	<p><b>Stormwater Retention Credit Trading Program, Washington, DC</b> - Stormwater runoff is a main cause of the severe degradation of water bodies in Washington, DC. In 2013, the Washington DC District Department of the Environment (DDOE) introduced standards requiring certain types of developments to introduce or retrofit green infrastructure reducing stormwater runoff (C-40 Cities, undated). The cost of retrofitting all areas affected by the new standards was estimated at USD \$7 billion, and the question of who should pay was controversial (C-40 Cities, undated). With an annual budget of USD \$17 million for stormwater policies, the DDOE could not cover these costs alone. The DDOE therefore created the Stormwater Retention Credit trading programme (SRC), aimed at lowering the compliance costs of regulated sites while maximising benefits (C-40 Cities, undated). The SRC creates a market for stormwater retention credits; if developers meet 50% of their water retention requirement, they can purchase the rest of the credits from unregulated properties elsewhere in the city, or regulated developers exceeding their own regulatory requirements (C-40 Cities, undated; Spector, 2016). It gives developers some flexibility to meet their regulatory requirements, and incentivises unregulated properties to install GI in order to generate and subsequently sell credits.</p> <p>Nevertheless, stormwater credit trading was slow to take off in Washington DC, partly due to credit value uncertainty and the up-front costs property owners have to pay to install GI. To help overcome these issues and jumpstart the market, in 2016 the investment company Prudential invested \$1.7 million in a new company - District Stormwater LLC - affiliated with The Nature Conservancy, which will work with property owners to install GI for free. District Stormwater receives part of the retention credits, which it can resell on the market to recoup its investment (Spector, 2016). It is expected that this investment will create a dependable supply of credits and show developers that they can rely on the SRC market (Spector, 2016).</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
<p><b>Offsets:</b> Developers and other actors (such as companies whose activities impact on ecosystems) can be required by regulation to ‘offset’ or compensate for their residual negative impacts on GI by creating or improving GI elsewhere. In some cases, compensation can also take place by making a financing contribution into a fund (e.g. managed by public authorities or conservation organisations) which can then be used to finance GI. Such payments do not ensure no net loss from a specific project or development directly, but can be designed and regulated such that they offset losses collectively (Tucker et al., 2014).</p> <p>As a more specific category, <b>biodiversity offsets</b> are defined as “measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss (NNL) and preferably a net gain of biodiversity on the ground” (Business and Biodiversity Offsets Programme, 2013).</p> <p>An extension of offsets is <b>habitat banking</b>, whereby a credit-trading market is created in which “the credits from actions with beneficial biodiversity outcomes can be purchased to offset the debit from environmental damage. Credits can be produced in advance of, and without ex-ante links to, the debits they compensate for, and stored over time” (EFTEC and IEEP, 2010).</p>	<p>Requires accurate quantification of how much compensation is required, using appropriate metrics (Illes et al., 2017).</p> <p>Robust monitoring and reporting is needed to ensure compliance with the offsetting requirements (Illes et al., 2017).</p>	<p>In <b>Germany</b>, mandatory offsetting for all impacts on biodiversity has been in place since 1976, laid down in the Federal Nature Conservation Act and the Federal Building Code, which together are often referred to as the <b>Impact Mitigation Regulation</b> (Illes et al., 2017). The regulation requires adverse impacts on nature and landscapes to be avoided, and all residual impacts on natural assets and their functions (including habitats, soil, water, air quality, climate and the aesthetic quality of the landscape) must be compensated for (Illes et al., 2017).</p> <p>In <b>England</b>, a <b>pilot biodiversity offsetting programme</b> was established by Defra between 2012 and 2014 to encourage offsetting on a voluntary basis (Illes et al., 2017).</p> <p>In <b>Melbourne, Australia</b>, the water utility Melbourne Water runs a <b>stormwater offsets scheme</b>. Developers who are unable to treat stormwater within their development to meet best practice standards according to Victoria’s Planning Policy can pay a fee to Melbourne Water which is then used for stormwater management works undertaken in another location. The rate of stormwater offsets is calculated based on the area developed and the type of development (Melbourne Water, undated).</p>



Type of instrument	Prerequisites & limiting factors	Case study examples
<p><b>Payments for Ecosystem Services (PES):</b> PES schemes remunerate land owners or managers for the provision of ecosystem services (Illes et al., 2017). PES are generally voluntary transactions between service users and service providers, conditional on agreed rules of natural resource management, in order to generate offsite services (Wunder, 2015, cited in Illes et al., 2017). Payments can be input-based (e.g. based on the costs of managing a site) or output-based, i.e. depending on the achieved level of ecosystem service provision (Illes et al., 2017).</p>	<p>Presupposes a payment (and hence available funds) from the municipality, unless it is a business-led initiative (e.g. water utilities providing payments to farmers for catchment management).</p> <p>Output-based payments are more difficult to implement, since they require an estimation of the level of service provision, including that under a baseline scenario if additionality is to be ensured (Illes et al., 2017).</p>	<p><b>English Woodland Grant Scheme, UK</b> – The scheme remunerates owners of woodland, leaseholders and tenants, as well as government departments and other public bodies owning forest land for various management activities or works delivering environmental or social benefits. Grants are delivered through the UK Rural Development Programme, with the Forestry Commission acting as intermediary (Illes et al., 2017).</p> <p><b>South West Water’s catchment management scheme ‘Upstream Thinking’, UK</b> - Implemented by South West Water since 2008, the ‘Upstream Thinking’ scheme provides advice and grants to farmers whose land is connected to rivers above water abstraction points. As part of the scheme, farm advisers visit farms and carry out an assessment which leads to a farm-wide plan. This includes a water management plan and future capital investment proposals aimed at improving water quality. These are funded up to 50% by Upstream Thinking. The water utility company benefits from the scheme by avoiding increased costs of water treatment (South West Water, undated).</p>
<p><b>BUSINESS IMPROVEMENT DISTRICTS (BID):</b></p> <p>Originally introduced in Ontario, Canada, BIDs have been widely used in the US and Europe since the 1960s to finance and deliver improvements to commercial and industrial environments, and the model has also been applied in some cases to GI improvements (McNeill and Rayment, 2015). Businesses and other stakeholders enter an agreement with local government to contribute an additional levy to finance improvements in a specific area. Once established, BIDs are free to constitute their own management body, make spending decisions, and seek additional income through various instruments (Sandford, 2018).</p>	<p>Requires a number of businesses within a certain area to be willing to pay for similar services (Merk et al., 2012).</p> <p>BIDs are less effective in areas which are spread out or have mixed land use as it is more difficult for the payer to capture the benefits of targeted improvements (Merk et al., 2012).</p>	<p><b>Team London Bridge, UK</b> - In 2005, rate-paying organisations based in the London Bridge to Tower Bridge area voted to create a Business Improvement District and pay annual contributions towards a fund used for services and projects benefiting businesses and employees in the area. The BID was renewed in 2010 and 2015 (it is a requirement in the UK for a new vote to take place every 5 years). A compulsory annual levy is charged on all businesses in the district with a rateable value of £10,000 or more. For the 2018/19 financial year, this levy is set at 1.17% of a property's rateable value. Income from the levy totals approximately £1.3 million per year. External sources such as Southwark Council and Network Rail also provide additional income, usually towards specific capital projects. The BID (including the fund) is managed by a not-for-profit Company Limited by Guarantee, Team London Bridge (Team London Bridge, undated a). The BID’s projects include greening actions, such as the maintenance of street trees, creation of pocket parks and urban gardens (Team London Bridge, undated b).</p> <p>The <b>Lower Don Valley Flood Defence project in Sheffield, UK</b> is funded partly through a BID levy on businesses in the area (expected to cover about 17% of the total project costs). The project improves flood defences at over 50 locations along an 8 km stretch of the River Don, helping to protect over 500 businesses and thousands of jobs, as well as ensuring that the valley remains an attractive place for new investment (Sheffield City Council, undated). The</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
		<p>project is managed by the Sheffield Chamber of Commerce, the Environment Agency and Sheffield City Council. It is one of the first BIDs set up specifically for climate change adaptation, and the funds are used both for construction of the flood defences and for the maintenance of GI. The BID applies an annual levy based on businesses' rateable value. A higher levy rate of 2.25% per year applies for businesses expected to receive the greatest flood protection benefits from the scheme, while a lower rate of 0.75% per year applies for businesses which would also benefit significantly, but to a lower extent (Sheffield Chamber of Commerce and Industry, 2013).</p> <p>In the United States, the BID model has also been extended to residential areas, in the form of '<b>Green Benefit Districts</b>' (Drayson, 2014). Residents vote on establishing a Green Benefit District and a compulsory levy is raised on residents within the area to support green space maintenance (in addition to the maintenance performed by the local authority) (Drayson, 2014).</p>
<p><b>ENDOWMENTS:</b> a fund is established – e.g. through donation of property or money, developer contributions, land sales, or other finance sources – and the interest accrued from investment of the funds is used to pay for the maintenance of the green infrastructure, leaving the original endowment untouched (Drayson, 2014).</p>	<p>Requires local authorities to establish a legal partnership with stakeholders/board of trustees to manage the endowment fund (Mell, 2017).</p> <p>If the local authority sells GI land as a basis for the endowment, there may be public opposition to such sales (Mell, 2017).</p> <p>Investment expertise and management and sufficient initial capital is required (Drayson, 2014).</p>	<p><b>The Land Trust, UK</b> - The Land Trust are a UK charity that manages endowment funds. The Trust take on the management of public land, using the interest earned or annual income generated from the site to feed into the annual budget. Funds from donations, grants, site funding and trading activities support the purchase of more land (The Land Restoration Trust, 2015). The Land Trust now owns and manages more than 1,000 hectares of public space to deliver community benefits, including urban parks and community woodlands (Drayson, 2014). Their funding model consists of first calculating the amount required to form a sustainable endowment fund for a site, and then sourcing that funding from the public and private sectors (approx. 90% of funding is currently sourced from the public sector), and may be complemented by revenue from commercial uses of the site, such as car parking (Drayson, 2014). The funding is invested and the interest is used to pay for the maintenance of the site in perpetuity (Drayson, 2014).</p> <p><b>The Parks Trust, UK</b> – Green spaces in Milton Keynes are managed by the Parks Trust, an independent charity created in 1992 by the Milton Keynes Development Corporation. The Parks Trust is self-financing, generating income from the property and investment portfolio that the trust was endowed with when it was first established (Drayson, 2014). The Parks Trust has long-term leases on the parks and open spaces, but the freehold belongs to Milton Keynes Council, hence the Council and the Parks Trust must agree before significant changes can be made to the areas (Drayson, 2014).</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
		<p><b>Newcastle Parks Trust, UK</b> - Newcastle City Council has agreed with the National Trust (a conservation organisation) to set up a new charitable trust to which it would transfer (by long-term lease) in 2019 most of the Council's parks and allotments. The Council will be a member of the Trust and appoint some of the trustees, retaining some involvement in the governance structure, but being obliged to act in the best interests of the charitable trust. The Council will also retain the freehold of the land. The Council agrees to make a revenue contribution to the Trust of £9.5 million to support the Trust until it gains financial independence. Some of these resources may be used to create an endowment fund (Newcastle City Council, 2017; 2018).</p> <p><b>Sheffield Endowment Fund</b> - The National Trust and Sheffield City Council are working to develop an endowment fund to maintain parks and green spaces throughout Sheffield. The National Trust has been awarded £100,000 through the Rethinking Parks programme, a joint funding programme by the Heritage Lottery Fund, the Big Lottery Fund and the foundation Nesta. The partners are now exploring further possible contributions, for example from the health sector, stakeholders benefiting from water and flood management, sports organisations, philanthropists and businesses (Nesta, 2018).</p>
<p><b>PUBLIC-PRIVATE PARTNERSHIPS (PPP):</b>  PPPs can be defined as “long-term contracts between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility” (UN-Habitat, 2017). PPPs have been used for a range of infrastructure services (government entities ‘delegate’ service provision to a private entity) and can also be developed for the delivery and/or maintenance of GI. In general, PPPs can take various forms, including operation and maintenance contracts, leases, concessions, etc. (UN-Habitat, 2017).</p>	<p>Suitable only for projects that deliver an attractive return to a private entity.</p>	<p><b>Public Private Partnership for a flood-proof district in Bilbao, Spain</b> – The Zorrotzaurre district, a formerly industrial area, is being redeveloped into a flood-resilient residential area. The costs and management of the project are undertaken by a public-private partnership between land owners and the City Council of Bilbao, the ‘Management Commission of Zorrotzaurre’. The Commission is composed of various public and private actors owning land in the area, who are responsible for the supervision of the redevelopment and pay for all of the project’s expenses, on the basis of the share of ownership (51% public, 49% private) (Climate-ADAPT, 2016e).</p> <p><b>Oxley Creek, Brisbane, Australia</b> - The flood-prone Oxley Creek is being transformed into a 20-km green corridor, designed to improve not only flood resilience, but also habitats and recreational opportunities. The project costs (AUD 100 million) are funded through a series of public-private partnerships involving several stakeholders in the area. The overall management of the redevelopment is entrusted to a new company owned by Brisbane City Council, the Oxley Creek Transformation Pty Ltd (Moore, 2016; Oxley Creek Transformation, undated).</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
<p><b>REVOLVING FUNDS:</b></p> <p>A revolving fund is a fund replenished through repayments of the loans drawn from the fund or by a constant flow of financial contributions (UN-Habitat, 2017).</p>	<p>Requires expertise in real-estate investments, in order to decide when and where to purchase properties.</p> <p>If the Australian model is applied, mechanisms have to be in place to ensure that landholders respect their obligations under the conservation covenants.</p>	<p><b>Clean Water State Revolving Fund (CWSRF), USA</b> - The CWSRF provides low-interest loans for projects aimed at improving water quality, including GI and estuary protection projects. The Environment Protection Agency (EPA) provides grants to each state as capital for state CWSRF loan programmes. The latter then provide low interest loans to eligible recipients for water infrastructure projects. Repayments of loan principal and interest earnings are then recycled into the programmes to finance new projects. The funds thus ‘revolve’ over time at the state level (US EPA, 2018).</p> <p><b>Revolving Funds for Biodiversity, Australia</b> - In Australia, revolving funds have been used specifically for financing nature conservation. State governments purchase properties with natural or cultural values, place a ‘conservation covenant’ on the title (protecting the biodiversity values in law), and resell the land to conservation organisations or other actors that commit to conservation. The proceeds from the sale of properties are then used to buy more properties, which are then sold with a conservation covenant in place. Conservation covenants are defined as “voluntary agreements made between a landholder and an authorised body (such as a Covenant Scheme Provider) that aims to protect and enhance the natural, cultural and/or scientific values of certain land” (Australian Government, undated). The revolving funds are generally operated by not-for-profit organisations or trusts established by the state governments.</p>
<p><b>COMMUNITY ASSET TRANSFER:</b></p> <p>Local authorities may transfer to community organisations the management or ownership (usually via long leasehold) of public land or buildings. In the UK, the transfer can be made at less than market value, provided that it promotes economic, social or environmental well-being (Drayson, 2014).</p>	<p>Legal possibilities for such transfers exist in some countries, such as the UK, but might not be available in others (or the process may be cumbersome).</p> <p>There is a risk that the community organisation receiving the transfer will not always have, over the long term, the expertise and staff required to manage the site such that it delivers the intended benefits, so some mechanisms should be in place for the local authorities to monitor the management and provide support.</p>	<p><b>Marchmont Community Garden, London, UK</b> - Community groups transformed a derelict vacant site in Camden into an attractive public garden. The Kings Cross-Brunswick Neighbourhood Association obtained a ‘peppercorn’ lease agreement for the site from Camden Borough Council in 2009. Design ideas for the public garden were sought from local residents and a steering group of local organisations secured a £100,000 grant from Big Lottery and funds from Camden Council. The garden is managed by the Marchmont Community Garden Partnership (Drayson, 2014).</p> <p><b>‘Beyond the Construction Site’ - Community-based gardening in Ljubljana, Slovenia</b> – In 2011, a cultural association (Obrat) approached the municipality (owner of the site) to gain temporary lease of land that was a derelict construction site and transform it into a community space intended for urban gardens, socializing, education, and culture. The City approved to lease the land for free (originally for one month, then extended to a one-year rolling contract, still ongoing) and the area was transformed into an attractive community space</p>

Type of instrument	Prerequisites & limiting factors	Case study examples
	Administrative costs for setting up such transfers may be high (e.g. in terms of the ‘paperwork’ needed) (Drayson, 2014).	with the help of residents (Naturvation, 2018b). It is unclear whether any funds are used for maintenance; presumably the garden is maintained by residents.
<p><b>REGULATION &amp; PLANNING STANDARDS:</b></p> <p>Although not a financing instrument as such, local authorities can apply regulatory and planning instruments to mandate GI implementation by private stakeholders, such as grey infrastructure developers and homeowners. For example, development planning regulations may require that new residential neighbourhoods incorporate a certain percentage of green space.</p>	<p>Introduction of the instrument requires regulatory change.</p> <p>If the same standards apply across all regulated entities, irrespective of their cost of meeting the standards, the instrument might not achieve cost-effectiveness.</p>	<p><b>Biotope Area Factor (BAF), Berlin, Germany</b> – Since 1994, plans for the development of new buildings in the inner city area of Berlin are covered by a regulation requiring a proportion of the area to be left as green space, known as the Biotope Area Factor (BAF). The regulation aims to encourage more green space in densely built-up urban areas and applies to about 16% of Berlin (areas where legally binding Landscape Plans are present). In other areas, the BAF can be implemented on a voluntary basis. Developers can choose from a variety of options for meeting the standard. When calculating whether the BAF of each development meets the minimum requirement, different measures are weighted according to their ecological value (based on a number of bio-physical parameters) (Climate-ADAPT, 2014).</p>
<p><b>LEVERAGING EXISTING REGULATORY REQUIREMENTS</b></p> <p>A number of entities with environmental obligations can leverage these requirements to invest in alternative nature-based solutions. Entities, particularly in the water management sector, face regulatory standards that require large investments, usually in high cost and high energy-intensive solutions such as wastewater treatment plants. Green infrastructure alternatives can be implemented instead, to meet environmental regulations by alternative means.</p>	<p>A prerequisite for this type of project is an existing regulatory or legislative requirement leading to significant expenditure, that can be redirected to nature-based investments that meet the original requirement, as well as broader green infrastructure goals.</p>	<p><b>Wetland filtration of wastewater, River Ingol, England</b> – Anglian Water owns a wastewater treatment plant that discharges treated water to the River Ingol. Due to population growth, the treatment plant required an upgrade to meet water quality standards for discharge. However, in collaboration with a local charity and supported by customer engagement, a natural filtration wetland system was constructed to further filter water after treatment in the Treatment plant, before discharging to the River Ingol. In addition to providing water filtration, the wetlands provide biodiversity benefits and habitat for water birds (IWA, 2018).</p>

## References

- Anillo Verde (2018) 'Green Belt of Bay of Santander'. Available at: <https://anilloverde.wordpress.com/>
- Australian Government (undated) Biodiversity conservation. Available at: <https://www.environment.gov.au/biodiversity/conservation>
- Bertram, N. P. et al. (2017) Synergistic benefits between stormwater management measures and a new pricing system for Stormwater in the City of Hamburg. *Water Science and Technology*, 76(6), 1523-1534.
- Business and Biodiversity Offsets Programme (2013) To No Net Loss and Beyond: An Overview of the Business and Biodiversity Offsets Programme (BBOP). Washington, D.C.
- Business in the Community (2018) Water Resilient Cities. A business case for Greater Manchester.
- C-40 Cities (undated) Washington DC: Stormwater Retention Credit Trading Program. Available at: <https://www.c40.org/profiles/2014-washingtondc>
- City of Gothenburg (2015) Green Bond framework. Available at: <https://finans.goteborg.se/en/greenbonds/green-bond-framework/>
- City of Vancouver (undated) 'Development Cost Levies'. Available at: <https://vancouver.ca/home-property-development/development-cost-levies.aspx>
- Climate-ADAPT (2014) 'Berlin Biotope Area Factor – Implementation of guidelines helping to control temperature and runoff'. Available at: <https://climate-adapt.eea.europa.eu/metadata/case-studies/berlin-biotope-area-factor-2013-implementation-of-guidelines-helping-to-control-temperature-and-runoff>
- Climate-ADAPT (2016a) Ghent crowdfunding platform realising climate change adaptation through urban greening
- Climate-ADAPT (2016b) GAIA - Green Area Inner-city Agreement to finance tree planting in Bologna (2016). Available at: <https://climate-adapt.eea.europa.eu/metadata/case-studies/gaia-green-area-inner-city-agreement-to-finance-tree-planting-in-bologna>
- Climate-ADAPT (2016c) Climate bond financing adaptation actions in Paris (2016). Available at: [https://climate-adapt.eea.europa.eu/metadata/case-studies/climate-bond-financing-adaptation-actions-in-paris/#challenges\\_anchor](https://climate-adapt.eea.europa.eu/metadata/case-studies/climate-bond-financing-adaptation-actions-in-paris/#challenges_anchor)
- Climate-ADAPT (2016d) Four pillars to Hamburg's Green Roof Strategy: financial incentive, dialogue, regulation and science. Available at: <https://climate-adapt.eea.europa.eu/metadata/case-studies/four-pillars-to-hamburg2019s-green-roof-strategy-financial-incentive-dialogue-regulation-and-science>
- Climate-ADAPT (2016e) Public-private partnership for a new flood proof district in Bilbao. Available at: <https://climate-adapt.eea.europa.eu/metadata/case-studies/public-private-partnership-for-a-new-flood-proof-district-in-bilbao>
- Common, M. and S. Stagl (2005) *Ecological Economics: An Introduction*. Cambridge, UK: Cambridge University Press.
- Covenant of Mayors (2017) Scheme for the purchase of rainwater management installations. Available at: [https://www.covenantofmayors.eu/index.php?option=com\\_attachments&task](https://www.covenantofmayors.eu/index.php?option=com_attachments&task)
- Drayson, K. (2014). Green society: Policies to improve the UK's urban green spaces. London: Policy Exchange. Available at: <https://policyexchange.org.uk/wp-content/uploads/2016/09/green-society.pdf>

Droste, N. et al. (2017) Implementing nature-based solutions in urban areas: financing and governance aspects. In *Nature-Based Solutions to Climate Change Adaptation in Urban Areas* (pp. 307-321). Springer.

EEA (2017) Financing urban adaptation to climate change, EEA report No 2/2017, European Environment Agency. Available at: <https://www.eea.europa.eu/publications/financing-urban-adaptation-to-climate-change>

EFTEC and IEEP (2010) The Use of Market-based Instruments for Biodiversity Protection - the Case of Habitat Banking. Technical report for European Commission DG Environment, Eftec and IEEP, London.

EIB (2017) 'Alzette River Renaturalisation (NCFF)'. Available at: <http://www.eib.org/en/projects/pipelines/pipeline/20170618.htm>

EIB (2018) 'EIB confirms EUR 55 million backing for Athens urban investment during Mayor's visit.' Available at: <http://www.eib.org/en/infocentre/press/releases/all/2018/2018-159-eib-confirms-eur-55-million-backing-for-athens-urban-investment-during-mayors-visit.htm>

EIB (undated) 'Natural Capital Financing Facility. Boosting investment for biodiversity and nature-based adaptation to climate'. Available at: <http://www.eib.org/en/products/blending/ncff/index.htm>

Forestry Commission Scotland, NHS and Scottish Natural Heritage (2015) Briefing Note. Green Exercise Partnership. Available at: <https://scotland.forestry.gov.uk/images/corporate/pdf/gep-briefing-note.pdf>

Illes, A., Russi, D., Kettunen, M. and Robertson M. (2017) Innovative mechanisms for financing biodiversity conservation: experiences from Europe, final report in the context of the project "Innovative financing mechanisms for biodiversity in Mexico / N°2015/368378". Brussels, Belgium.

Infrastructure Victoria (2018) Value capture – options, challenges and opportunities for Victoria. Policy paper. Available at: [http://www.infrastructurevictoria.com.au/sites/default/files/images/IV18%20Value%20Capture%20Options\\_Final%20web\\_v2.pdf](http://www.infrastructurevictoria.com.au/sites/default/files/images/IV18%20Value%20Capture%20Options_Final%20web_v2.pdf)

IWA (2018) Nature-Based Solutions Utility Spotlight: Anglian Water. Available at: <http://www.iwa-network.org/nature-based-solutions-utility-spotlight-anglian-water/>

Janz, L. (2012) Das Hemelinger Weserufer wird renaturiert, *Weser Kurier*. Available at: [https://www.weser-kurier.de/bremen/bremen-stadt\\_artikel,-Das-Hemelinger-Weserufer-wird-renaturiert-\\_arid,114982.html](https://www.weser-kurier.de/bremen/bremen-stadt_artikel,-Das-Hemelinger-Weserufer-wird-renaturiert-_arid,114982.html)

LIFE Urban Adapt (2018) LIFE Urban Adapt: Demonstrating urban climate adaptation and resilience in inner city Rotterdam. Available at: [http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n\\_proj\\_id=5239](http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5239)

McNeil, D., and Rayment, M. 2015, Financing Opportunities and Needs: Green Infrastructure, Business and Biodiversity Platform. Available at: [http://ec.europa.eu/environment/biodiversity/business/assets/pdf/workstream3/green-infrastructure\\_en.pdf](http://ec.europa.eu/environment/biodiversity/business/assets/pdf/workstream3/green-infrastructure_en.pdf)

Melbourne Water (undated) Stormwater offsets explained. Available at: <https://www.melbournewater.com.au/planning-and-building/developer-guides-and-resources/drainage-schemes-and-contribution-rates-1-1>

Mell, I.C. (2017) Financing the future of green infrastructure planning: alternatives and opportunities in the UK. *Landscape Research*, 43(6), 751-768.

Mell, I. C. (2016) GI management – time to 'let someone else have a go'? *Town and Country Planning*, pp. 138 - 141.

- Merk et al. (2012) Financing Green Urban Infrastructure, OECD Regional Development Working Papers 2012/10, OECD. Available at: [http://www.oecd.org/cfe/regional-policy/WP\\_Financing\\_Green\\_Urban\\_Infrastructure.pdf](http://www.oecd.org/cfe/regional-policy/WP_Financing_Green_Urban_Infrastructure.pdf)
- Moore, T. (2016) '\$100 million super park for Brisbane's southside: Quirk', Brisbane Times, 14 December 2016. Available at: <https://www.brisbanetimes.com.au/national/queensland/100-million-super-park-for-brisbanes-southside-quirk-20161214-gtb8za.html>
- Naturvation (2018a) Renaturalisation of the Weser river's coast. Available at: <https://naturvation.eu/nbs/bremen/renaturalization-weser-rivers-coast>
- Naturvation (2018b) Urban Gardening in Ljubljana. Available at: <https://naturvation.eu/nbs/ljubljana/urban-gardening-ljubljana>
- Nesta (2018) 'Endowing public parks in the 21st century'. Available at: <https://www.nesta.org.uk/project/rethinking-parks/endowing-public-parks-in-the-21st-century/>
- Newcastle City Council (2017) Supplemental Agenda Pack 1. Creating a Charitable Trust to Protect Newcastle's Parks and Allotments. Available at: <https://democracy.newcastle.gov.uk/documents/b25602/Supplemental%20Agenda%201%2020th-Nov-2017%2016.30%20Cabinet.pdf?T=9>
- Newcastle City Council (2018) 'The Future of Newcastle's Parks and Allotments'. Available at: <https://www.newcastle.gov.uk/leisure-libraries-and-tourism/parks-and-countryside/future-newcastles-parks-and-allotments>
- Nowell, R. (2016) Susdrain: Celebrating SuDS – Converting challenges to opportunities. Available at: [https://www.susdrain.org/files/resources/Presentations/roger\\_nowell\\_161101.pdf](https://www.susdrain.org/files/resources/Presentations/roger_nowell_161101.pdf)
- Oxley Creek Transformation (undated) The Master Plan. Available at: <https://www.oxleycreek.com.au/master-plan>
- Perman, R., Y. Ma, J. McGilvray and M. Common (2011) *Natural Resource and Environmental Economics*. Fourth Edition. Harlow, UK: Pearson Addison Wesley.
- Rotterdam Climate Initiative (2010) 'Subsidy now also available for smaller green roofs in Rotterdam'. Available at: [http://www.rotterdamclimateinitiative.nl/uk/news/subsidy-now-also-available-for-smaller-green-roofs-in-rotterdam?news\\_id=431&p=6](http://www.rotterdamclimateinitiative.nl/uk/news/subsidy-now-also-available-for-smaller-green-roofs-in-rotterdam?news_id=431&p=6)
- Sandford, M. (2018) Business Improvement Districts. Briefing Paper 04591. House of Commons, London. Available at: <http://researchbriefings.files.parliament.uk/documents/SN04591/SN04591.pdf>
- Scheja, Gotthard (undated) 'Hochwasserschutz einmal anders – am Beispiel der Stadt Arnsberg'. Available at: [http://www.iww.rwth-aachen.de/download/pdf/symposium/proceeding/IWASA2016/IWASA2016\\_Tagungsbeitrag\\_Scheja.pdf](http://www.iww.rwth-aachen.de/download/pdf/symposium/proceeding/IWASA2016/IWASA2016_Tagungsbeitrag_Scheja.pdf)
- Searle, G. (2013) 'Private events help fund public parks, but there's a cost too'. *The Conversation*, December 16, 2013. Available at: <http://theconversation.com/private-events-help-fund-public-parks-but-theres-a-cost-too-21343>
- Sheffield Chamber of Commerce and Industry (2013) Sheffield Lower Don Valley Flood Defence Project. Business Improvement District (BID) Business Plan. Available at: <https://www.sheffield.gov.uk/content/dam/sheffield/docs/planning-and-development/beyond-city/ldv-flood/Sheffield%20LDV%20BID%20Business%20Plan.pdf>



Sheffield City Council (undated) Lower Don Valley Flood Defence project & Business Improvement District. Available at: <https://www.sheffield.gov.uk/content/sheffield/home/planning-development/master-action-plans/lower-don-valley-flood-defence.html>

South West Water (undated) 'Upstream Thinking'. Available at: <https://upstreamthinking.org/index.cfm?articleid=8692>

Spector, J. (2016) Turning Stormwater Runoff Into Everyone's Business. Available at: <https://www.citylab.com/solutions/2016/03/stormwater-runoff-credits-nature-conservancy-washington-dc/473700/>

Team London Bridge (undated a) 'Team London Bridge'. Available at: <http://www.teamlondonbridge.com/default.aspx?m=3&mi=173>

Team London Bridge (undated b) 'Greening Projects'. Available at: <https://www.teamlondonbridge.co.uk/default.aspx?m=42&mi=176&ms=111&title=Greening>

Tucker, G. M., Allen, B., Conway, M., Dickie, I., Hart, K., Rayment, M. and Schulp, C. J. E. (2014) Policy Options for an EU No Net Loss Initiative. Report to the European Commission (with Annexes), Institute for European Environmental Policy, London/Brussels.

UN-Habitat (2017) Finance for City Leaders Handbook 2<sup>nd</sup> Edition: Improving Municipal Finance to Deliver Better Services. Nairobi: United Nations Human Settlements Programme. Available at: <https://unhabitat.org/books/finance-for-city-leaders-handbook-2nd-edition/>

US EPA (2018) 'Learn about the Clean Water State Revolving Fund (CWSRF)'. Available at: <https://www.epa.gov/cwsrf/learn-about-clean-water-state-revolving-fund-cwsrf>