



© Armi Vitale

A guide for pollinator-friendly cities:

How can spatial planners and land-use managers create favourable urban environments for pollinators?

A guide for pollinator-friendly cities:

How can spatial planners and land-use managers create favourable urban environments for pollinators?

This document has been drafted by ICLEI Europe within the framework of the contract No 07.0202/2018/795538/SER/ENV.D.2 "Technical support related to the implementation of the EU Pollinators Initiative". The information and views set out in this document may not be comprehensive and do not necessarily reflect the official opinion of the Commission, or ICLEI Europe. The Commission does not guarantee the accuracy of the data included in this document. Neither the Commission nor ICLEI Europe or any person acting on the Commission's behalf, including any authors or contributors of the notes themselves, may be held responsible for the use which may be made of the information contained therein. Reproduction is authorised provided the source is acknowledged. This document shall be cited as:

Wilk, B., Rebollo, V., Hanania, S. 2019. A guide for pollinator-friendly cities: How can spatial planners and land-use managers create favourable urban environments for pollinators? Guidance prepared by ICLEI Europe for the European Commission.

Authors: Bettina Wilk, Veronica Rebollo, Serene Hanania

List of contributors:

Holger Robrecht (ICLEI), Alice Reil (ICLEI), Stuart Connop (University of East London), Sue Collins (Butterfly Conservation Europe), Octavi Borrueil (city of Barcelona), Luis Lobo (city of Vitoria-Gasteiz), Harald Schaich (city of Freiburg), João Cardoso de Melo (city of Cascais), Mina Charnaux (city of Strasbourg), Stefan Rüter (city of Hannover), Maruška Markovčič (city of Ljubljana), Marjana Jankovic (city of Ljubljana), Katrien Van De Sijpe (city of Genk), Valeria Stacchini (city of Bologna), David Jamieson (city of Edinburgh), Evelyn Underwood (IEEP), Catarina Ferreira (IUCN), Chantal Van Ham (IUCN)

Date of completion: 15/01/2020

Table of content

EXECUTIVE SUMMARY	4
Why this guidance?	4
Who is this guidance for?	5
Recommendations for decision- and policy-makers	5
Recommendations for practitioners (spatial and land-use planners and land-use managers)	5
1. INTRODUCTION	7
1.1 What is pollination?	8
1.2 What are pollinators?	8
1.3 Pollinators are declining	8
1.4 The importance of pollinators and why their conservation matters	8
1.5 Action on urban pollinators is urgently needed	9
1.6 Why this guidance document? Who is it for?	9
1.7 From global to local: why global, EU, national and municipal contexts are crucial	10
2. GOOD PRACTICES AND RECOMMENDATIONS FOR DECISION- AND POLICY-MAKERS	12
2.1 Declare commitment to becoming a pollinator-friendly city	13
2.2 Develop a pollinator-friendly city vision and policy programme	14
2.3 Integrate pollinator concerns into existing policies and policy instruments	15
2.3.1 Promote pollinator-friendly spatial planning	15
2.3.2 Promote pollinator-friendly infrastructure development	18
2.3.3 Ensure protection and expansion of urban and peri-urban nature conservation areas	19
2.3.4 Adopt policies for zero or reduced pesticide use at local level in alignment with the SUPD	20
2.4 Channel and tap financial and human resources for pollinator-friendly measures	21
2.5 Foster collaboration with other sectors and secure commitments	22
2.6 Promote research on pollinators for evidence-based policies	24
2.7 Participate in awards that recognise pollinator conservation efforts	25
3. GOOD PRACTICES AND KEY RECOMMENDATIONS FOR PRACTITIONERS AT LOCAL AUTHORITIES	26
3.1 Preserve existing pollinator habitats	28
3.2 Restore, create and connect pollinator habitats	30
3.2.1 Improve the condition of soil	32
3.2.2 Create nesting and hibernating habitats for wild pollinators	33
3.2.3 Adjust mowing practices	35
3.2.4 Prevent and manage the use of chemical pesticides in line with SUPD	36
3.2.5 Control invasive alien species	36
3.2.6 Grow a pollinator-friendly, native seed mix	37
3.3 Raise awareness through community engagement and environmental education	38
3.4 Monitor urban pollinators	40
References	42



© City of Barcelona

EXECUTIVE SUMMARY

Why this guidance?

Thriving wild pollinator populations are a prerequisite for healthy, resilient green spaces and urban ecosystems. They provide vital pollination services. Seventy five per cent of the world's main food crops and 85% of wild plants rely on pollinating insects. Aside from the benefits to agriculture and the environment, multiple sectors in society benefit directly or indirectly from the services of pollinators – sectors such as public health or industry. They underpin the stability of pollinator services over time and ensure plant diversity. However, numerous scientific studies indicate that populations of wild pollinators (i.e. bees, hoverflies, moths, butterflies and beetles) have declined significantly across Europe over the last few decades. These trends call for urgent conservation action.

This guidance supports the EU Pollinators Initiative¹, adopted by the Commission in 2018 as the first-ever EU coordinated action on pollinators. The Initiative sets strategic objectives and a set of actions to be taken by the EU and its Member States to address the decline of pollinators in the EU and contribute to global conservation efforts. This guidance contributes to Action 6, which aims to improve pollinator habitats in urban areas and the wider landscape.

Cities and towns can be a major refuge for many insect pollinators, providing foraging and nesting sites, larval food plants and nectar that may be less available on intensively managed farmland. Thus, they have an important role to play. Local authorities (including politicians and policy makers) and local authority practitioners (planners, landscape architects, land managers, contractors, developers and gardeners) are well equipped to drive forward wild pollinator conservation.

¹ COM/2018/395 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0395>

They can:

- raise awareness of the role of pollinators for citizens and the urban environment, and thereby encourage others to partake in actions that promote pollinator conservation;
- use their substantial legislative, administrative, regulatory and funding powers to bring about change on the ground, and;
- promote the design and management of urban spaces in a way that: creates vibrant pollinator habitats, reduces pressures, and boosts pollinator diversity and the benefits they deliver.

Who is this guidance for?

- **Policy- and decision-makers in towns and cities;**
- **Practitioners in local authorities across policy domains and sectors**, such as nature conservation, spatial planning, housing and infrastructure (i.e. roads, railways, active travel, etc.) and water management.
- **Consulting engineers and project developers including spatial planners, landscape architects and contractors executing works.**

This is in order to help these actors make their cities and towns pollinator-rich². It includes tips and pointers for policy, plus practical steps to ensure the recovery of pollinators. The guidance provides recommendations, good practices and lessons from European cities that have succeeded in becoming more pollinator friendly.

The context for local action is set by the Convention for Biological Diversity (to which the EU and all its Member States are signatories), international commitments by the EU and national governments to the Sustainable Development Goals (SDGs), and the EU Pollinators Initiative. These frameworks also recognise the crucial role played by leaders in towns and cities across Europe.

The planning and deployment of Green Infrastructure in urban and peri-urban areas can create and re-connect pollinator habitats, while also delivering a range of multiple other benefits to citizens and society.

Recommendations for decision- and policy-makers

Section 2 of this document will focus on good practices and recommendations for decision- and policy-makers. It outlines three essential, consecutive steps:

1. Make a **formal commitment to protect and restore pollinator habitats** (linked to international or national agreements and declarations). Such steps create opportunities for sharing lessons learnt in developing and implementing pollinator strategies. Making a formal commitment is essential for creating a supportive policy framework at the local level, that will enable streamlined, co-ordinated local action. A formal commitment can be widely communicated in order to create visibility, raise awareness and mobilise citizens' support for any local actions.
2. Develop a **pollinator-friendly city vision** - ideally captured in a dedicated **Local Pollinator Strategy or Plan** that is developed with the engagement of relevant stakeholders. This guidance therefore provides a list of pollinator strategies/plans developed by cities that might serve as inspiration. Engaging relevant stakeholders is of crucial importance – it will help raise awareness, mobilize support, draw on local knowledge and allay potential concerns.
3. Set concrete actions to **integrate pollinator concerns into urban plans and sectoral policies**. This guidance provides recommendations on where and how pollinator concerns could be integrated into policies/instruments for spatial planning, infrastructure and housing, nature conservation and land-use management.

This guidance also provides further supporting recommendations on channelling financial resources, fostering co-operation with other sectors, pollinator research for evidence-based policies, and capacity building for local authorities.

² This guidance specifically focuses on cities and towns. Rural areas will be covered in a separate guidance document on agriculture.

Recommendations for practitioners (spatial and land-use planners and land-use managers)

Section 3 of the guidance will focus on recommendations for practitioners in local authorities, especially spatial and land-use planners as well as land-use managers. It outlines a step-wise approach **to preserve existing pollinator habitats, create new habitats and connect them in habitat mosaics.**

1. An important first step is to **map existing and potential future urban pollinator habitats and networks.** This can help to:

- 1a. identify existing high-value pollinator landscapes that require protection, which can be found in public and private gardens, church yards and cemeteries, around ponds, lakes and wetlands or buildings, and;
- 1b. spot areas of high potential for creating and reconnecting pollinator habitats through anticipatory land-use planning and improved land-use management for pollinator diversity. The latter could comprise brownfields and unused urban areas, green corridors, green roofs, Sustainable Drainage Systems, and road, railway and waterway verges.

This guidance provides a list of criteria for high quality pollinator habitats, that includes a patchwork of heterogeneous landscapes and diverse ground conditions – namely substrate, topography, water availability, varying vegetation height and a diverse plant community.

Mapping might lead to two possible steps:

- 2a. **Protect wilderness in existing pollinator landscapes.** In those areas where natural regeneration is possible, the simplest and preferred option is to let nature take its course and let self-seeding plants grow.

2b. **Restore, create and connect pollinator habitats** by:

- improving ground conditions for nesting grounds and the quality of substrate for a healthy community of plants to thrive – both important requirements for pollinator habitats;
- creating nesting and hibernating habitats for wild bees (by leaving as many areas as wild as possible, leaving some areas bare for ground nesting, or leaving deadwood or logs in sunny spots for shelter and nesting);
- using low-risk pesticides as well as biological control measures, and non-chemical pest control techniques;
- combatting invasive alien species, and;
- growing pollinator-friendly native plant mixes and adjust mowing practices – pollinators require a continuous supply of nectar-rich flowers or trees and herb-rich areas to feed (ideally all-year round). The guidance provides a few key principles for choosing the right vegetation.

This guidance document also provides several additional supporting recommendations for practitioners, related to awareness raising through community engagement and environmental education, as well as monitoring urban pollinators.



1.INTRODUCTION

- 1.1 What is pollination?
- 1.2 What are pollinators?
- 1.3 Pollinators are declining...
- 1.4 The importance of pollinators and why their conservation matters
- 1.5 Action on urban pollinators is urgently needed

1.1 What is pollination?

Pollination – the transfer of grains of pollen between flowers on different plants of the same species – is an essential step in the reproduction process of most flowering plants, including many plants we rely on for food and materials. This process takes place as insects and other animals move from plant to plant, facilitating pollen dispersal; those species that actively seek pollen as a source of

food are the most effective pollinators. Without pollinators, many plants could not set seed and reproduce, causing vegetation diversity to decline, depriving many animal species of a primary source of food and unleashing knock-on effects along trophic chains [8]. In addition, pollination is thought to be a key factor in the diversification and evolution of many plants and animals [9].

1.2 What are pollinators?

Some pollinators need little introduction; the decline of honeybees (*Apis mellifera*) gained public attention some time ago. Honeybees are often assumed to provide the majority of pollination services to agriculture, but actually most pollination is brought about by wild pollinators. In Europe, pollinators are primarily insects – including bees, hoverflies, butterflies, moths, beetles and other fly species.

Whilst the conservation of our European honeybee varieties is important because of their link to our cultural heritage and to honey production, there is a crucial need to extend conservation efforts to wild pollinator species to protect ecosystem health, build resilience, and underpin plant diversity – particularly considering the current and anticipated impacts of climate change.

1.3 Pollinators are declining...

Insect declines are being systematically described around the world, and Europe is no exception. Populations of wild pollinators – i.e. bees, hoverflies, moths, butterflies and beetles – have declined significantly across Europe over the last few decades [1, 2]. For example, in Germany seasonal declines over 27 years of more than 75% of total flying insect biomass were recently estimated [2], while systematic monitoring in some EU Member States has shown declines of some 75% since 1990 and of about

40% in the abundance of grassland butterfly species across the EU [3]. Furthermore, the European Red List of Bees published in 2014 concluded that at the EU-27 level, over 9% of wild bee species are threatened with extinction, and >50% of Europe's wild bee species are not sufficiently known to assess their conservation status. Insects are at the base of the food chain for many other animals and wild pollinators provide vital and efficient pollination services.

1.4 The importance of pollinators and why their conservation matters

Pollinators are a diverse and widespread part of our biodiversity. Without pollination services, we would lose many fruits, nuts and vegetables from our diets, and many other important food stuffs and materials, such as vegetable oils, cotton and flax. Besides these

material benefits, society benefits in multiple ways directly or indirectly from the services of pollinators and their influence on ecosystem quality, including our health and well-being, our sport and recreation, education, tourism and culture [4, 10-13].

Apis Mellifera © Codega/Shutterstock.com



1.5 Action on urban pollinators is urgently needed

Many actors can help to drive this action forward: politicians, policy-makers, planners, landscape architects, land managers, contractors, developers and gardeners. And city leaders can show the way. Over half of the population live in urban areas, and as the human population continues to grow, so does the level of urbanisation, which is expected to rise to nearly two thirds by 2050 [14]. With this trend in mind, cities have become the focus for sustainable development efforts and biodiversity initiatives. The conservation and enhancement of urban nature is increasingly recognised as helping to deliver a variety of ecosystem services that will favour the transition to healthier, better adapted and more resilient cities. We are now familiar with concepts such as ecosystem-based adaptation, green-blue infrastructure and nature-based solutions; concepts which implicitly recognise the important functions of a healthy biodiversity and abundant pollinator populations. However, for driving sustained action in cities, it will be important to go one step further and restore the connection between people and nature in cities, as a way of increasing awareness of the value of biodiversity, and in particular, pollinators.

Given the variety of foraging and nesting sites in the urban environment, together with larval food plants and habitats, cities can be a refuge for many insect pollinators under threat in the agriculturally dominated countryside [15, 16]. Various studies reveal that urban areas host a higher abundance and diversity of certain populations of native bees than more heterogeneous urban landscapes [15, 16, 17, 18, 19].

Insect pollinators can thrive if they have the resources they need for all the stages of their life cycle close together and at the right seasons, and small actions can yield large benefits for pollinators in cities [20]. Cities' financial, human and technological capital provide good testing grounds to develop creative solutions to attract pollinators. Cities also offer many opportunities for research to understand what works well in different locations. It is essential to inventory sites and monitor the impacts of conservation efforts, so that results can be validated, improved, and communicated among partners and experts. Cities can then recommend transferable practices that could aid decision makers at different levels of governance in other cities.

1.6 Why this guidance document? Who is it for?

This guidance supports the EU Pollinator Initiative, adopted by the Commission in 2018 as the first-ever EU coordinated action on pollinators³. The Initiative sets strategic objectives and a set of actions to be taken by the EU and its Member States to address the decline of pollinators in the EU and contribute to global conservation efforts. This guidance contributes to Action 6, which aims to improve pollinator habitats in urban areas and the wider landscape.

This guidance provides recommendations, good practices and lessons from European cities that have succeeded in becoming more pollinator-friendly. It is addressed to both decision makers and city practitioners with tips and pointers for policy-making and practical action on pollinators. This document synthesises available information and makes recommendations to address the causes of declining pollinators. It also shows ways of supporting their recovery through both policy and practical steps. If taken up by many municipalities at a sufficient scale, cities and towns can make a real difference to the survival and recovery of bee, hoverfly, moth and butterfly abundance and the pollination services they provide. They can help to underpin the well-being of this and future generations.

The local authority target groups of this guidance document are:

1. Political leaders, policy- and decision-makers in towns and cities

who can make use of their political influence and responsibility to promote pollinator issues at higher levels and adopt city-wide strategic policy programmes, including mayors and municipal councillors, (senior) policy officials, regulation agencies that approve projects and monitor compliance with environmental standards, and non-governmental actors with considerable societal influence that advocate for specific issues.

2. Practitioners in local authorities across policy domains and sectors

either directly or indirectly affecting pollinators, such as nature conservation, spatial planning, housing and infrastructure (i.e. roads, railways, active travel, etc.), water management, and public procurement.

3. Consulting engineers and project developers including spatial planners, landscape architects and contractors executing works

from the private sector, who are commissioned by local authorities to design, plan and deliver public services. These services could be green space management or landscape planning in public areas.

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0395>

1.7 From global to local: why global, EU, national and municipal contexts are crucial

International commitments by governments to the SDGs, specifically SDG 15, “Life on Land”, affirm the importance of preventing species extinctions, mainstreaming biodiversity and ecosystem services in policy making and funding delivery of better conservation.

The Strategic Plan of the Convention on Biological Diversity (CBD) calls for National Biodiversity Strategies and Action Plans (NBSAP) that integrate the international targets. Local authorities can actively contribute to their implementation through participating in NBSAP processes and through implementing relevant actions at the local level [21].

The EU, which is a Signatory of the CBD, has an EU Biodiversity Strategy with a headline target for biodiversity and ecosystem service recovery, and is discussing an ambitious approach for action over the next decade. The recent IPBES Report, of course, strengthens the case for resolute and transformative action also within the EU. Wild pollinators, which are declining globally, are clearly a target for action.

The EU Pollinators Initiative, as part of the EU Biodiversity Strategy to 2020, sets three priorities: (1) Improving knowledge of pollinator decline, its causes and consequences; (2) Tackling the causes of pollinator decline; (3) Raising awareness, engaging society-at-large and promoting collaboration.

The EU also has strong nature-related legislation to protect species and habitats of importance in Europe: the Birds and Habitats Directives aim to create an EU-wide [Natura 2000 Network](#)⁴ of protected areas to ensure the long-term survival of threatened species and habitat types across land and sea, including selected pollinators and key pollinator habitats such as grasslands and heathlands.

[The EU Directive on Sustainable Use of Pesticides \(2009/128/EC\)](#)⁵ provides for a range of actions to reduce the risks and impacts of pesticide use on human health and the environment. It also provides for the implementation of Integrated Pest Management (IPM) and the promotion of alternative approaches or techniques, so as to reduce dependency on pesticides. National and regional authorities should ensure that the use of pesticides is minimised or prohibited in sensitive areas, including green spaces and other areas used by

the general public or by vulnerable groups, Natura 2000 sites and areas protected for drinking water.

And the [EU Strategy on Green Infrastructure](#)⁶ - a key step to achieving the EU Biodiversity Strategy - aims to make the [protection, restoration, creation and enhancement of green infrastructure an integral element of spatial planning and development](#)⁷, and has promoted the development of green infrastructure strategies in many cities⁸.

All these conventions, commitments, initiatives and action plans set the context for action locally and recognise the crucial role played by leaders and citizens in towns and cities across Europe (for more information see section 2 of the supplementary information). These policies help to drive improved biodiversity outcomes, aiming to boost the abundance of pollinating insects and sustain their diversity and functionality and, thus, the resilience of the ecosystems and habitats on which they depend.

Municipalities, who are close to the design and management of urban space and to local communities, can act as important drivers for change. They have a key role in raising urban citizens’ awareness for pollinators, as one crucial step towards restoring the connection between people and nature. This connection is essential for implementing commitments to achieve international, EU and national biodiversity objectives. Local authorities can lead on pollinator conservation across their communities and encourage others to take part in actions that promote pollinator conservation. Cities can use their legislative, administrative, regulatory and funding powers to bring about change on the ground. Where space is contested, they can serve as mediators between competing demands from recreation, housing and conservation interests [22] and they can make a direct contribution through the way they manage their own land and regulate development. This helps to create more nesting, roosting and feeding areas for a diversity of pollinators to flourish [23, 24]. On the policy side, municipalities can connect policy domains by ensuring that pollinators have a clearly defined role in green infrastructure strategies, storm water and flood management strategies, sustainable development strategies and so forth, rather than remain isolated in biodiversity strategies.

⁴ https://ec.europa.eu/environment/nature/natura2000/index_en.htm

⁵ https://ec.europa.eu/food/plant/pesticides/sustainable_use_pesticides_en

⁶ https://ec.europa.eu/environment/nature/ecosystems/strategy/index_en.htm

⁷ https://eur-lex.europa.eu/resource.html?uri=cellar:d41348f2-01d5-4abe-b817-4c73e6f1b2df:0014.03/DOC_1&format=PDF

⁸ For generic guiding principles for mainstreaming ecosystem services into decision-making and planning processes, look at:

https://ec.europa.eu/environment/nature/ecosystems/pdf/SWD_2019_305_F1_STAFF_WORKING_PAPER_EN_V2_P1_1042629.PDF





2.GOOD PRACTICES AND RECOMMENDATIONS FOR DECISION- AND POLICY-MAKERS

- 2.1 Declare commitment to becoming a pollinator-friendly city
- 2.2 Develop a pollinator-friendly city vision and policy programme
- 2.3 Integrate pollinator concerns into existing policies and policy instruments
- 2.4 Channel and tap financial and human resources for pollinator-friendly measures
- 2.5 Foster collaboration with other sectors and secure commitments
- 2.6 Promote research on pollinators for evidence-based policies
- 2.7 Participate in awards that recognise pollinator conservation efforts

As a political leader and/or decision-maker, there are several ways you can play a decisive role in improving pollinator conservation in urban areas. This can be by demonstrating commitment and leadership and advocating action for pollinator conservation, thereby influencing and responding to public attitudes. Crucially, you can actively promote the mainstreaming of pollinator objectives into policies and practice.

The following sections begin with three essential steps (2.1., 2.2. and 2.3) that help you establish and anchor pollinator concerns in your local administration and its various departments, starting with: (1) declaring political commitment to becoming a pollinator-friendly city, to (2) developing a pollinator-friendly city vision, and finally (3) mainstreaming pollinator concerns in existing sectoral policies with a special focus on spatial planning, housing and infrastructure, nature conservation and land-use management. Note that these steps can be taken progressively as part of a long-term strategy.

The supporting recommendations further below (2.4. to 2.7) focus on: tapping and channelling financial resources, fostering co-operation with other sectors and; and securing commitments and the promotion of pollinator research and capacity-building. These provide some further guidance and support while implementing our first three steps.

2.1 Declare commitment to becoming a pollinator-friendly city

Make a formal commitment to international, European or national agreements and declarations and translate it into local ambitions and programmes. Political commitment and priorities are a major impetus for designing programmes, strategies and action plans on pollinator conservation and recovery. A first step towards creating a supportive policy framework for pollinators at local level (and to promote co-ordinated action) is to make a formal commitment to international or existing national agreements and declarations, which are then further translated into local ambitions. This helps align provisions and action points in pollinator-relevant decision making across different governance levels (local, regional, national, EU, international). It also ensures that they do not contradict but rather complement each other [21].

While most official commitments can only be made at national level there is still a lot that can be done at the local level.

EU Member States are subject to the [Convention on Biological Diversity](#)⁹ and its Protocols, as well as its Aichi biodiversity targets. They, should develop a National Biodiversity Strategy and Action Plan that integrates the Aichi targets [25]. As a policy maker or senior officer in a local authority, you should make sure to have a say in the formulation of the latter to adequately address local perspectives and ambitions.

You can also develop your own Local Biodiversity Strategy and Action Plan to inform ambitions on higher levels. Showcase your actions for pollinator conservation on the [CBD Action Agenda for Nature and People](#)¹⁰. The online platform collects and features commitments and contributions from stakeholders across all sectors. It will enable the mapping of biodiversity efforts around the world, estimate impact and drive up-scalable action.

You might also want to encourage your national government to **become a signatory to the Declaration of the Coalition of the Willing on Pollinators**¹¹ in order to benefit from sharing experiences and lessons learnt in developing and implementing pollinator strategies [26]. Initiated by the government of the Netherlands at the CBD COP 13 in 2016, as a response to the [Thematic Assessment on Pollinators, Pollination and Food Production](#)¹², the group currently comprises 16 member countries within and outside Europe. It aims to influence national political opinion through supporting policy measures and innovative actions on protecting and conserving pollinators.

Find initiatives to join at the local level: In several countries, there are initiatives at the local level to join. In Germany for instance, more than 339 municipalities have signed the [declaration 'Biodiversity in Municipalities'](#)¹³, committing to measures for protecting and enhancing biodiversity in municipalities.

⁹ <https://www.cbd.int/intro/>

¹⁰ <https://www.cbd.int/action-agenda>; <https://cbc.iclei.org/subnational-platform-for-advancing-the-post-2020-framework/>

¹¹ <https://promotepollinators.org/>

¹² <https://ipbes.net/assessment-reports/pollinators>

¹³ www.kommbio.de/home/



Citizen-driven development of the *Bee Plan* in Genk, Belgium

Genk's *Bee Plan* was not inspired by, or aligned with high-level pollinators' strategies (either European or national) as these were seen as too remote and abstract from a city level perspective. Instead, it originated in 2013, after an open environmental council meeting that showcased the documentary "More than honey", where the importance of pollinators was highlighted. The audience brainstormed on how to improve the conditions of pollinators within the city. This was the starting point of a working group (formed by diverse stakeholders such as beekeepers, city services, environmental organisations and concerned citizens) to further develop the Bee Plan, that was finally approved in 2014. The plan aimed to strengthen the pollinator population in the city region by 1) improving pollinators' living conditions on public land, 2) engaging citizens to do the same on their private properties and 3) supporting local beekeepers. The processes of drafting, implementation and dissemination were bottom-up.



2.2 Develop a pollinator-friendly city vision and policy programme

Use your influence as a senior officer to promote the development of a pollinator-friendly vision for your city. A written vision should include: strategy, targets, systematic monitoring, guiding principles and actions to achieve this within a certain timeframe [27] – all ideally captured in a [dedicated Local Pollinator Strategy or Plan](#)¹⁴. International Conventions, such as the Convention for Biological Diversity and their guidance on how to formulate National and Local Biodiversity Strategies and Action Plans can provide focus and direction for the formulation of such a local strategy and associated actions.

Make sure to include all relevant stakeholders in the design and formulation of such as strategy and action plan so that all relevant sectors are addressed and adequately represented. Pollinator conservation cuts across a variety of sectors (i.e. spatial and landscape planning, land use, infrastructure and housing, urban agriculture, education, health, etc.) and including representatives from all these areas in the writing and implementation process not only safeguards ownership but also improves the chances of success [28,29].

Edinburgh's integrated approach to biodiversity and pollinator conservation

Edinburgh is aware of the importance of pollinators, as demonstrated by engaged citizens and a local and national government proud of their natural heritage – one that supports sustainable land use management. The main policy document that addresses pollinators in Edinburgh is the Biodiversity Action Plan, in conjunction with [Edinburgh's Open Space Strategy](#)¹⁵. Some other policies indirectly address pollinators, such as Edinburgh's Climate Change Adaptation Action Plan 2016-2020, Sustainable Edinburgh 2020 or the Edinburgh Design Guidance 2017. Together, they set the framework for the work being conducted by the Biodiversity Action Group and the Edinburgh Living Landscape – the main municipal initiatives addressing pollinators.

[Edinburgh Living Landscape](#)¹⁶ was conceived as a multi-stakeholder, cross-sectoral effort to create, reinforce and connect green areas, with a strong focus on their quality and biodiversity. The initiative is a partnership project led by the Scottish Wildlife Trust, The City of Edinburgh Council, The Royal Botanic Garden Edinburgh, Edinburgh and Lothians Greenspace Trust, The University of Edinburgh, Butterfly Conservation Scotland and the Royal Society for the Protection of Birds (RSPB). Together, they implement land management measures, deliver environmental education campaigns and initiate evaluation and monitoring services. On the website of the Edinburgh Living Landscape Initiative, people can take the [Edinburgh Pollinators Pledge](#)¹⁷ aimed at creating a network of local actors supporting pollinators.

¹⁴ www.buglife.org.uk/resources/planning-hub/good-practice-planning-for-invertebrates/

¹⁵ www.edinburgh.gov.uk/info/20178/park_management_and_rules/427/open_space_strategy

¹⁶ <https://edinburghlivinglandscape.org.uk/about/>

¹⁷ <https://edinburghlivinglandscape.org.uk/pollinatorpledge/>

Look out for **proactive individuals in the city administration** eager to collaborate with other departments that could build up a cross-departmental working group to disseminate the idea of pollinators in local authorities and beyond. A proactive individual is not only the ‘glue’ between different departments and a **cross-departmental co-ordination body**, but can also build and expand relationships with stakeholders outside the city administration. The City of Edinburgh notes from its experience that it is best to go for a senior member or leader in the city administration who is able to **communicate effectively** with chief executives and leaders in different organisations, and able to **direct and monitor resources** and therefore drive change.

Hannover’s vision on pollinators

As a former European Capital of Biodiversity (2011), the City of Hannover is committed to nature conservation and biodiversity protection. Pollinators are viewed as a flagship species for biodiversity conservation. To date, more than 250 species of local wild bees have been recorded in Hannover. Pollination has become a priority in the City’s environmental agenda, supported by both broad media coverage and also citizens becoming aware and caring for pollination services (especially as this is linked to the quality of green urban spaces, health and well-being). There are numerous actors within the municipal area which are implementing actions to tackle pollinator decline. The challenge right now is to bring these actors together to deliver more focused action. At a City level, the Environment and Urban Green spaces Department has recently drafted and presented a Bee Protection Plan that will be integrated into the existing local Biodiversity Strategy to facilitate such action. And collaboration extends beyond the City administration, to research centres (i.e. the Leibniz University Hannover), local NGOs, beekeepers and citizen groups.

2.3 Integrate pollinator concerns into existing policies and policy instruments

Use your influence to promote awareness for pollinator concerns among the relevant stakeholders, and ensure that they are integrated in policy, planning instruments and regulations. This could be regional and local laws, building standards, certifications, local and regional taxes, or even development, land use and zoning plans [23]. This can help steer supportive processes and procedures across sectors (i.e. urban planners, developers, utility managers, businesses, green space managers, etc.). A valuable EU guidance was produced recently on integrating ecosystems and their services into decision-making which puts forward eight guiding principles for doing so¹⁸.

The ultimate objective of a dedicated pollinator strategy is to make the overall vision and associated actions part of existing urban plans and sectoral policies (whether spatial planning policies and frameworks, biodiversity strategies, green infrastructure or open space plans, landscape programmes, urban agricultural strategies, storm water management, land use or forestry policies and so forth).

These sections below provide recommendations for the following sectors on how to integrate pollinator concerns in policies and instruments: Spatial planning, infrastructure and housing, nature conservation, land-use management.

2.3.1 Promote pollinator-friendly spatial planning

Spatial planning plays a crucial role in the long-term mainstreaming of pollinator concerns. The principles of pollinator-friendly planning should be anchored in the planning system of a city, its policies and its planning instruments.

¹⁸ [SWD\(2019\) 305 EU guidance on integrating ecosystems and their services into decision-making.](#)



What can you do?

STEP 1

Review existing plans and planning policy

This will ensure that habitats beneficial for pollinators are recognised and adequately protected. Several departments within local authorities have plans and policies that relate to habitat protection and green space. These plans should be critically reviewed to include pollinator objectives as well as measures. Existing policy frameworks can be utilised, and/or adjusted if needed, in order to better address pollinators [23].



STEP 3

Develop your own planning guidance or handbook with pollinator criteria

You could think of creating a dedicated planning guidance or handbook that outlines provisions and technical guidance for the design of pollinator-friendly spaces.

The [Edinburgh Design Guidance](#)¹⁹ outlines the City Council's expectations for landscape proposals as part of new developments and, crucially, how biodiversity should be maintained and enhanced. It includes: provisions and technical guidance for creating multi-functional green networks in new developments of all scales; site design considering bio- and geodiversity, and; maintaining the integrity of European, nationally or locally protected nature areas.

The [Sustainable Drainage Systems Planning Guidance](#)²⁰ released by the London Borough of Tower Hamlets includes a focus on SuDS components with the potential for supporting urban biodiversity, as well as a particular focus on planting for pollinators.

¹⁹ www.edinburgh.gov.uk/info/20069/local_development_plan_and_guidance/1755/edinburgh_design_guidance

²⁰ www.towerhamlets.gov.uk/Documents/Environmental-protection/Monitoring/LBTH-SuDS-Guidance-up-to-date.pdf



STEP 2

Make sure that pollinator concerns are adequately considered in urban plans

Integration in urban master plan

Most municipalities have an urban master plan (general urban plan) covering proposed development, housing, infrastructure, nature areas, etc., that are either legally binding or non-binding depending on national legislation. In the land use section of the master plan, municipalities can determine valuable landscapes and habitat types as part of the land use objectives. Certain areas can be designated as green, protected or recreational areas. There is also the option to define certain habitat types and landscapes as zones requiring “special consideration”. Guidelines and requirements for their management and preservation can be issued accordingly. Maps of preferred pollinator habitats and networks across the city could be utilised to define these special consideration zones.

Integration in zoning plans

Zoning plans can include more detailed aspects of land use objectives, regulations and guidelines as regards zones that require special consideration. If the municipality is responsible for the operation and management of a particular area, regulations regarding the use of particular plant species (one beneficial for pollinators) could be laid down in the zoning plan. Moreover, nature conservation sites of international, national and local importance need to be disclosed in zoning plans to protect them from adverse developments. That way, any development proposal is obliged to meet strict policy tests to ensure that integrity of the site is not affected.

Integration into open space strategy and/or municipal green infrastructure strategy

Several cities in Europe, such as Barcelona, Edinburgh, London, Malmö and Manchester have developed dedicated green infrastructure strategies. These outline objectives and spatial, policy and planning strategies that ensure the city has to maintain, qualify and expand green and blue spaces– including making them more pollinator friendly.

Barcelona’s Green and Biodiversity Plan 2020, Spain

Barcelona does not have a dedicated pollinator conservation strategy but combines biodiversity with green infrastructure in its strategic [Barcelona Green and Biodiversity Plan 2020](https://bcnroc.ajuntament.barcelona.cat/jspui/bitstream/11703/104927/1/esp_Mesura%20de%20govern%20increment%20verd_08_06_2017.pdf)²¹. Provisions are further broken down in a recently issued [Urban Green Infrastructure Promotion Programme](http://www.glasgow.gov.uk/CHttpHandler.ashx?id=40410&p=0)²², which establishes two measurable targets: (1) an increase of 1 square metre of green space per inhabitant, meaning an additional 160 hectares of green space by 2030, and (2) the improvement of existing green infrastructure, which includes two actions on the creation of pollinator-friendly habitats and favourable structures for foraging and refuge [30].

Glasgow’s new Open Space Strategy, UK

[Glasgow’s Pollinator Plan](http://www.edinburgh.gov.uk/downloads/download/77/edinburgh_biodiversity_action_plan)²³ is a local plan aligned with the [Biodiversity Action Plan](http://www.nature.scot/pollinator-strategy-scotland-2017-2027)²⁴, that translates a [national strategy](http://www.edinburgh.gov.uk/info/20178/park_management_and_rules/427/open_space_strategy)²⁵ into local actions. It is also considered in the [Open Space Strategy](http://www.edinburgh.gov.uk/info/20178/park_management_and_rules/427/open_space_strategy)²⁶.

²¹ <https://climate-adapt.eea.europa.eu/metadata/case-studies/barcelona-trees-tempering-the-mediterranean-city-climate/11302639.pdf>

²² https://bcnroc.ajuntament.barcelona.cat/jspui/bitstream/11703/104927/1/esp_Mesura%20de%20govern%20increment%20verd_08_06_2017.pdf

²³ www.glasgow.gov.uk/CHttpHandler.ashx?id=40410&p=0

²⁴ www.edinburgh.gov.uk/downloads/download/77/edinburgh_biodiversity_action_plan

²⁵ www.nature.scot/pollinator-strategy-scotland-2017-2027

²⁶ www.edinburgh.gov.uk/info/20178/park_management_and_rules/427/open_space_strategy

2.3.2 Promote pollinator-friendly infrastructure development

There are some options for integrating pollinator criteria into existing planning instruments, such as the Environmental Impact Assessment (EIA), or adding requirements for pollinator friendliness to the planning decision process. Some of these instruments are decided at national level but play a decisive role for the local level:



Make Ecological Impact Assessments part of Environmental Impact Assessments (or Strategic Environmental Assessments) for major and small-scale developments. These could require biodiversity or pollinator impact assessments as part of development proposals. They could propose avoidance, mitigation and compensation options [31, 32]. Tools like the [Wildlife Assessment Check](#)²⁷ are a useful resource to support pollinator-friendly development.



Make pollinator species surveys obligatory for planning permission processes

There are lists of protected species such as the [European protected species \(EPS\)](#)²⁸, the [IUCN European Red List](#)²⁹ of endangered species and [National Red Lists of endangered butterflies](#)³⁰. These can be used to prioritise protection measures and require development proposals – that are likely to damage resting and breeding sites – to survey and assess proposed development sites for impacts on protected species, or even identify remediation options [31, 32].



Make compensation areas with pollinator habitat obligatory for major developments

In Germany, national law requires property developers to compensate the surface area taken up by housing development by creating ecological compensation areas or respective substitutes. These can address pollinator concerns. The City of Hannover is currently collaborating with the University of Hannover to identify suitable areas for pollinator conservation in and around the city to create a pool of strategically selected areas in line with nature protection law for future developments in the city [33].



Allow a “temporary nature” approach on land that is to be (re-)developed.

This means that in a given area outside the green zoning category, and pending realisation of the proscribed land use, a temporary nature area is permitted. This will later be removed (paid for by the developer). In the Netherlands this is a common model [32].

Light pollution as a “new” threat to pollinators

Wildlife species are more sensitive to light than humans and can thus be adversely affected by so-called light pollution which occurs when artificial light becomes a threat. Positioning, duration, type of light source and level of lighting are all factors that can determine the impact of light on wildlife and thus, pollinators. Light can affect mating behaviour, nesting and foraging behaviours, as well as ease of predation. Especially artificial light at night can disrupt the nocturnal behaviour of many species and thus has negative consequences on plant reproductive success [34]. As a topic gaining increasing attention with regards to Green Public Procurement, some recommendations were developed on how to take action on light pollution:

- Limit illumination to desired areas such as sidewalks or roads;
- Dim light sources to the lowest acceptable light intensity;
- Reduce the number of light fixtures installed in and around ecologically vulnerable areas;
- Shield path lights in green spaces from the top and the bottom to minimise their impact on nearby biodiversity;
- Install temporal limits – motion activation and/or automatic timers that extinguish lights when not needed or when vulnerable species are likely to be most affected, i.e. during the two month long courtship season of the common glow-worm (firefly);
- Use red wavelength LED lights, adjust wavelength to red and exclude blue and ultraviolet spectrum (however with bright modern LED lights this has no or only a very limited effect) [35].

²⁷ www.biodiversityinplanning.org/wildlife-assessment-check/

²⁸ https://web.archive.org/web/20060818110659/http://ec.europa.eu/environment/nature/nature_conservation/eu_enlargement/2004/habitats/annexiv_en.pdf

²⁹ www.iucn.org/content/european-red-list

³⁰ <https://link.springer.com/article/10.1007/s10841-019-00127-z>

Further read:

- [EU green public procurement criteria for road lighting and traffic signals](#)³¹
- Technical report “[Revision of the EU Green Public Procurement Criteria for Road Lighting and traffic signals](#)”³² which proposes concrete G-index values (directly related to blue light content) for parks, gardens and ecologically sensitive areas.

2.3.3 Ensure protection and expansion of urban and peri-urban nature conservation areas

Below is a list of relevant policies expanding on the [guidance document for ecological green space management in urban and peri-urban areas](#)³³ produced by the [URBAN Bees project](#)³⁴ [36]. This list can help you guide actions to protect, restore and expand protected natural areas that are not only important pollinator habitats but also comprise valuable stepping stones of ecological connectivity in urban areas.

Table 4: Policies and tools for protection, restoration and expansion of protected natural areas

International context	Biosphere Reserves ³⁵ are areas of terrestrial, coastal and marine ecosystems that serve as learning laboratories for interdisciplinary approaches to biodiversity conservation and sustainability. They are recognised by UNESCO, based on a proposal by individual states.
	Many wetlands are protected by the Ramsar Convention ³⁶ in recognition of their ecological, botanical and water-related interest.
European context	The European Birds Directive ³⁷ protects wild bird species, and in particular sets up Special Protection Areas (SPAs) .
	The Habitats Directive ³⁸ requires European Union Member States to provide comprehensive assessments of each of the habitat types and species present on their territory, based on which Sites of Community Importance (SCIs) are proposed. After evaluation by experts, Member States must designate them as Special Areas of Conservation (SACs) as soon as possible, or within six years at most.
	To ensure the long-term survival of the most threatened species and habitats listed under the Habitats and Birds Directive, the Natura 2000 ³⁹ sites comprise protected areas for rare and threatened species to form an ecological network stretching across Europe.
	The European Green Belt Initiative ⁴⁰ aims to preserve and restore the extraordinary ecological network which connects the high-value natural and cultural landscapes that developed along the former Iron Curtain.
Regional context	Regional Nature Parks ⁴¹ are territories with natural and cultural heritage recognised as being “rich” or “endangered” – often under the administration of local authorities (Verband Deutscher Naturparke & EUROPARC Federation, 2017). There are also “natural heritage sites”, protected due to their unique character/function, and “protected biotopes”.
Municipal (local) context	A broad set of options are available in cities to protect and expand green spaces that are beneficial for pollinators, namely: create green belts and corridors; redevelop and/or increase the number of parks, public gardens, urban forests and protected nature areas; implement biotopes, and; build commercial and institutional green spaces or community gardens. See IUCN Urban Protected Areas for guidance ⁴² .

³¹ SWD(2018) 494 final, https://susproc.jrc.ec.europa.eu/Street_lighting_and_Traffic_signs/docs/Final_SWD.pdf

³² https://susproc.jrc.ec.europa.eu/Street_lighting_and_Traffic_signs/docs/JRC115406_eugpp_road_lighting_technical_report.pdf

³³ http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=URBANBEES_Management_Plan.pdf

³⁴ <https://urbanbees.eu/>

³⁵ www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/

³⁶ www.ramsar.org/

³⁷ https://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm

³⁸ https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

³⁹ https://ec.europa.eu/environment/nature/natura2000/index_en.htm

⁴⁰ www.europeangreenbelt.org/

⁴¹ www.european-parks.org/downloads/living-landscapes.pdf

⁴² <https://portals.iucn.org/library/sites/library/files/documents/PAG-022.pdf>

Protected nature areas help cities strengthen their biodiversity conservation efforts:

- One third of the municipal area of **Cascais'** (Portugal) lies within the **Sintra Natural Park**, which forms part of the NATURA 2000 network. The municipality leads a series of nature conservation and awareness-raising activities, such as butterfly monitoring programmes, nature hikes and visits to local beekeepers.
- Around 50% of the metropolitan area of **Freiburg** (Germany) is protected under legal status, and subject to strict land use management. One of Freiburg's goals is to augment the amount of nature conservation areas "**Naturschutz Gewinnt**" to the highest protection level in Germany.
- The green belt of **Vitoria-Gasteiz** (Spain), managed by the city administration, integrates the **Salburua Wetlands**, a designated RAMSAR site and part of the Natura 2000 network.

2.3.4 Adopt policies for zero or reduced pesticide use at local level in alignment with the SUPD

Pollinators are exposed to an array of pesticides that can have a negative impact on their populations. One class of insecticides, namely neonicotinoids, is having a particularly harmful impact on insect pollinators. They are long lasting and permeate the tissues of plants, thus affecting the pollen and nectar collected by pollinators [38]. Because of their impacts on wildlife, four of the active substances in the class are no longer permitted for outdoor use⁴³.

On the EU level, the [Sustainable Use of Pesticides Directive](#)⁴⁴ (SUPD) is of major relevance for pollinator conservation with its binding rules to minimise or prohibit use of pesticides in certain public areas, such as parks. The SUPD provides a legal framework for national and regional authorities to ensure that the use of pesticides is minimised or prohibited in sensitive areas, including green spaces and other areas used by the general public or by vulnerable groups, Natura 2000 sites and areas protected for drinking water. It obliges EU Member States to adopt National Action Plans (NAPs) that contain quantitative objectives, targets, measures and timetables which are required to be based on a stakeholder engagement process. NAPs should also include indicators to monitor the use of pesticides containing hazardous substances and describe the implementation of relevant measures [39].

National and regional authorities are required by article 12 of the SUPD to minimise and eliminate the use of pesticides in certain sensitive areas such as public areas and parks, having due regard for the necessary hygiene and public health requirements and biodiversity, or the results of relevant risk assessments.

This means that national and regional authorities can:

- implement restrictions on pesticide use and pesticide bans in public spaces and nature reserves in towns and cities, and
- define measures to prioritise non-chemical methods of pest control with a view to protecting pollinators.

Towns and cities also have a contributing role in actions under the SUPD to:

- ensure that professional users of pesticides are trained and kept up to date in the impacts of pesticides on pollinators, that their equipment is regularly tested, and that they follow the rules regarding pesticide use;
- ensure that non-professional users of pesticides – the general public – are informed about how pesticides can harm pollinators, for example by targeting citizens in gardening shops, gardening courses, public gardens and allotments, and by providing training courses and events on pesticide-free gardening;
- set up monitoring schemes to track pesticide use and pesticide residues in bees, pollen, honey and the urban environment.

Cities and towns can adopt [Integrated Pest Management strategies](#)⁴⁵ **for urban agriculture**. Mandated under the Directive is a strategy to prevent and/or suppress harmful organisms (pests and diseases) through non-chemical methods and, if necessary, low risk pesticides, with chemical pesticides used as minimally as possible.

⁴³ Only acetamiprid is still approved outdoors after a risk assessment for honeybees proved there are safe uses. The other three were restricted to permanent greenhouses. Clothianidin, thiacloprid and thiamethoxam are no longer approved.

⁴⁴ https://ec.europa.eu/food/plant/pesticides/sustainable_use_pesticides_en

⁴⁵ https://ec.europa.eu/food/plant/pesticides/sustainable_use_pesticides/ipm_en

By becoming a member of the European *Pesticide Free Towns Network*, founded by the Pesticide Action Network Europe, **you can support the implementation of the SUPD – and corresponding NAPs – on the city level.** This network provides best practices and guidance on taking steps to reduce pesticide use or become a pesticide free town, in line with the mandate of the Sustainable Use of Pesticides Directive to national and regional authorities to ensure that the use of pesticides is minimised or prohibited in sensitive areas. Membership is open to national governments and requires signing a pledge to take steps to reduce pesticide use or even become pesticide free.

Zero Pesticides Initiative in Strasbourg, France

The City of Strasbourg, an active promoter of urban agriculture, is a pioneer of the Pesticides Free Towns network. With the support of the Rhine-Meuse Water Agency it launched the Zero Pesticides Initiative⁴⁶ in 2008, banning the use of pesticides in public areas – such as parks, gardens or sport fields. Since then, the City has relied on a variety of physical management techniques – which vary according to type of plant – and can include the use of boiling water to kill certain plant species, the use of natural pesticides or manual and selective weeding. Awareness campaigns were implemented and guidance⁴⁷ produced for citizens to adopt pollinator-friendly techniques in their own gardens. As part of their charter “United in favour of biodiversity”, the city collaborates with gardening centres that are committed to taking harmful pesticides off their shelves and switching to organic products instead. To prepare for the changes in public land management, the City of Strasbourg started training their city gardeners to recognise the health benefits of pesticide-free activities. Through these supportive activities, a broad acceptance of the initiative was achieved.

- ***Step-by-step guidance on how to become a pesticide-free town***⁴⁸ has been issued by the Pesticide Action Network Europe.
- *Several guidance documents on Integrated Pest Management are available*⁴⁹.

2.4 Channel and tap financial and human resources for pollinator-friendly measures

Pollinator-friendly measures often require funding. Ideally, adequate resources should be made available from municipal budgets. However, given that many local authorities lack financial resources, identifying existing and external funding sources is also crucial. As a politician, a mayor or senior local authority officers you are in the position to promote and negotiate budgetary requirements [27], and thus secure political support for the pollinator agenda. This can result in municipal budgets being increased, allocated or at least safeguarded. Other, short-term options make use of existing resources:

Reassess existing budget and ongoing activities

Instead of lobbying for a new budget, which implies more work on top of existing responsibilities, a good starting point is to analyse existing activities and budgets in the local authority from the perspective of pollinator conservation and see where you can “link in” to achieve joint goals.

Link into funding programmes that overlap with pollinator conservation

Identify funding programs you can link into and also look into regional level funds. Next to nature conservation subsidy instruments or green infrastructure projects, it is worthwhile thinking outside of the box. Storm water management funds can be leveraged to promote green space enhancement for pollinators through pollinator-friendly **Sustainable Drainage Schemes** (cf. [Thames Water's Twenty4twenty scheme](#)⁵⁰). In [Poznań](#)⁵¹, **education funding** is used to enhance outdoor spaces at nursery/kindergarden schools to promote ecological learning and design spaces that are beneficial to urban wildlife and pollinators. Also, **local regeneration funds** or **highway roadside verge management funds**⁵² can be used to install pollinator-friendly habitats and enhance connectivity of habitats.

⁴⁶ <https://www.strasbourg.eu/zero-pesticide>

⁴⁷ https://www.strasbourg.eu/documents/976405/1628244/manuel_jardinage.pdf/90f94883-0e75-6518-da14-8dcc11e823a3

⁴⁸ www.pesticide-free-towns.info/methods-techniques#node-21

⁴⁹ https://ec.europa.eu/food/plant/pesticides/sustainable_use_pesticides/ipm_en

⁵⁰ <https://corporate.thameswater.co.uk/About-us/Investing-in-our-network/Twenty-4-twenty>

⁵¹ <https://connectingnature.eu/oppla-case-study/19387>

⁵² www.bristol.gov.uk/documents/20182/32827/Flower_Margin_Info_Meadows_0.pdf/0952ae80-1998-4b8d-a791-fc434dbb380b





Collaborate with stakeholders outside the council and reduce requirements for resources

Next to contracting entities or associations for carrying out specialised technical work, strategic collaboration with stakeholders such as businesses or citizens (i.e. “citizen science”) is a way to outsource services and reduce required resources.

Learn about innovative financing mechanisms from cities:

- **Freiburg** has developed an incentive mechanism in peri-urban areas together with farmers and nature conservation NGOs. It comprises a reduction in the lease of the land in exchange for integrating pollinator-friendly measures in the maintenance and management of the farmland (i.e. zero pesticide use, creating flower strips using regional seeds).
- In **Genk**, Heempark was created as a collaboration between the local authority and local community groups. Emerging from a consultation about turning derelict agricultural land into a public park, the site became a **community-driven nature and sustainability park with a strong focus on pollinators**⁵³. Collaboration continued with a statutory environment agency taking up residence in the park (which helps with its management and funding).
- In the **Metropolitan Area of Bologna**, government funds for pollinator conservation are limited. To implement pollinator-friendly measures in Villa Smeraldi Orchard and Bentivoglio Agricultural Heritage Museum, the city launched a crowdfunding campaign called **BEE HAPPY (Let's Protect Biodiversity)**⁵⁴. Besides raising EUR 4,000 by the end of the campaign, the initiative sought to raise awareness of the importance of biodiversity conservation, directly engaging citizens in its protection.

Have a look at section 4 of the supplementary material to find out **how and where to tap EU funding for pollinator conservation measures!**

2.5 Foster collaboration with other sectors and secure commitments

Pollinator conservation cannot be addressed in silos. Everyone can contribute. It is important to find partners, build good networks and bring all relevant actors together. Multi-stakeholder collaboration is crucial for successful and sustained implementation of pollinator actions and strategies. Indeed this creates ownership [28]. As an elected politician you have a vital interest in liaising with different stakeholders and you are in a good position to convince a large part of your own local government and community of the benefits of pollinator conservation [27]. Target groups should be large-scale landowners, developers, brownfield site managers, facility and utility managers, transport business managers, farmers⁵⁵, schools, local NGOs – the latter in particular as a vehicles to more equitable project development and community groups [40].

Collaborate with municipal utilities to integrate pollinator-friendly actions in infrastructure

Consider municipal services and utilities for creating pollinator refuges and ecological network elements. These include solid waste management (landfills), wastewater and storm water management (SuDS), transportation (road, railway and waterway edges) and housing (brownfields, biodiverse green roofs, walls, etc.). Often only simple changes are required to land management to provide food, shelter and nest sites for pollinators. As a chairperson or board member of governance bodies of municipal utilities, you can reach out to influential stakeholders and promote pollinator conservation measures.

Biogas plant managers create pollinator-friendly meadows

An innovative incentive scheme that persuaded farmers and biogas plant owners to switch from high-yield energy plants (monocultures) to pollinator-friendly plants was initiated in Germany. Clients of the municipal utilities of Nürtigen are charged one cent more per kilowatt hour to compensate farmers for their switch to lower-yield pollinator-friendly plants. This scheme provides one farmer with an annual compensation of up to EUR 700 per hectare whilst saving on costs and pesticides (given that sowing is reduced to every five years with these plants).

⁵³ <https://connectingnature.eu/oppla-case-study/19380> ⁵⁴ www.ideaginger.it/progetti/bee-happy-protogliamo-la-biodiversita.html

⁵⁵ A separate guidance will be produced for farmers, agronomists/advisors and managing authorities.



Collaborate with farmers as they could incentivize pesticide-free management of agricultural land for pollinators and the creation of landscape-wide habitat networks. A starting point of collaboration is to highlight the co-benefits of implementing pollinator measures for farmers which include: erosion reduction on farmland; climate adaptation (increased sponge capacity of the land) and; more attractive fields and landscapes [29, 41].

Which other parties to consider for collaboration⁵⁶?

- **Organisations operating urban farming allotments** to integrate pollinator-friendly measures;
- **Large-scale landowners, brownfield site managers, facility managers, utility managers, transport business managers, infrastructure managers;**
- **Landscape architects and generalist architects (including umbrella institutions for these disciplines)** to raise awareness of pollinators in design processes and the importance of selecting appropriate plants;
- **Research institutions** to maximise the potential of implementation measures and to perform evaluation and monitoring activities;
- **NGOs and communities**⁵⁷ to develop natural heritage projects;
- **Catering industry** to help spread the message of the importance of bees;
- **Collaboration with the education sectors** to raise awareness at a young age and generate a pathway back into communities;
- **Collaboration with green maintenance teams** to increase awareness of the impacts of appropriate management.

Successful multi-stakeholder initiatives

Originally focusing on honeybees, the benefits of [Ljubljana's Bee Path](#)⁵⁸ have spilled over to a variety of pollinators, as the initiative has facilitated connectivity among existing green areas and the multiplication of pollinator-friendly habitats. The Bee Path was established in 2015 and was accompanied by a targeted awareness-raising campaign on the importance of honeybees for the environment and for the city's cultural heritage and economic development. The initiative is based on a strong bottom-up approach, now comprising 35 partners (educational and cultural institutions, companies, NGOs, beekeepers and individuals) that contribute on a voluntary basis to pollinator conservation and local honey production. The Bee Path has gained international attention, becoming a movement offering support and advice on sustainable beekeeping and implementation of pollinator-friendly measures. For example, it delivers educational programmes (i.e. school students also learn the basics of apitherapy in ten beekeeping clubs currently operating within the city), establishes and maintains new bee yards, and raises awareness among the public.

The [Farfalle in ToUr project](#)⁵⁹ started in spring 2019 as a collaboration between the city of Turin, the University and a Mental Health Centre in the district of Mirafiori Sud, Turin. It transforms urban areas into ecosystems and habitats for pollinator insects like bees, butterflies and moths next to mental health care facilities. Mental health centers in Turin are surrounded by green areas that are so far not cultivated or managed as urban gardens and therefore offer ample opportunities for pollinator-friendly design and management. Mental health patients are actively engaged in the monitoring of butterflies and bees that visit these new greeneries to take nectar, pollen and honeydew and to reproduce. They receive training in monitoring activities, learn about breeding caterpillars and how to identify plants that attract butterflies. Butterflies and bees are recorded by direct counting and photographed, the data are then validated by scientists and published. There are also plans for mental health patients to share their knowledge and experience by training other vulnerable groups. Through helping educate others about the value of pollinators, participants who were previously marginalized can find their place in society while reducing social stigma.

⁵⁶ Refer to section 6 of the supplementary information to learn which arguments you can use for getting different actors on board for pollinator conservation

⁵⁷ Refer to chapter 3.3. for collaboration with citizens

⁵⁸ www.ljubljana.si/en/ljubljana-for-you/environmental-protection/the-bee-path/

⁵⁹ www.farfalleintour.it/

2.6 Promote research on pollinators for evidence-based policies

There are decisive knowledge gaps in a number of areas within this domain. They include status and trends of pollinators, threats to pollinators, their relative importance and interaction, as well as impacts on nature, human well-being and the economy. It is important to bridge these knowledge gaps to support evidence-based, effective policy making. Moreover, generally existing research does not necessarily inform policy-making.



Actively engage with research initiatives and implement monitoring to achieve evidence-based and effective policy-making

Seek collaboration with research institutions to help you map pollinators and their habitats, and to monitor pollinator status and the causes of their decline. Generating relevant data sets (i.e. the density and number of insects, coverage and favoured plant species) can support you in making informed decisions about where interventions will be most effective. Further, researchers can help you set specific, measurable, ambitious, realistic and time-bound (SMART) targets in your plans, accompanied by indicators for measuring progress [25]. If funding is tight, you can consider participating in Horizon 2020 projects (with related focus areas such as Nature-based Solutions (NBS) or resilience) that allow for integrating a pollinator focus⁶⁰. One example is the current [project proGireg](#)⁶¹ (productive Green Infrastructure for post-industrial urban regeneration; 2018-2023) where the creation of pollinator habitats through linked greening actions (NBS) and their monitoring is a central objective of the “Urban Living Labs” which the project entails.

Joining resources for pollinator conservation in Vitoria-Gasteiz

In the case of Vitoria-Gasteiz, the work on pollinators is mostly addressed by two units of the Municipal Environmental Department: the Green Belt and Biodiversity Unit and the Parks and Gardens Unit. Together, they are responsible for the management of urban and peri-urban green areas, which account for more than 300 square kilometres. Within the Green Belt Unit there is a dedicated team of two people leading biodiversity conservation efforts. To deal with the lack of human resources, the team works in close co-operation with institutions such as the Environmental Studies Center, an autonomous municipal centre that operates at a strategic level. It serves as a link between the municipality, European and international institutions and NGOs (such as the Alaves Institute of Nature Conservation, which delivers citizen science training in programmes launched by the city).



Identify needs of local authority officers for technical guidance and dedicate resources to training

Local authority officers need to have an understanding of pollinator issues and threats to act on pollinator conservation in an effective, integrated way. Capacity building measures are therefore essential.

Here are a few pointers:

- Hold workshops on managing urban pollinators. These would target local authorities, developers, planners, local government ecologists, social landlords, landscape architects, brownfield site managers and local nature partnerships [41];
- Develop targeted, practical and user-friendly best practice guidelines (i.e. handbooks, manuals, guidelines, online guides or case studies). These would cover aspects such as the development and implementation of pollinator strategies and actions, management procedures, and mainstreaming pollinator issues and priorities in policy making;
- Participate in capacity development platforms;
- Promote peer-to-peer learning through on-the-job-trainings;



Engage in city-to-city exchanges

Doing so means receiving tested, practical information on concrete measures and actions. Exchange platforms with other cities are particularly useful for exchanging knowledge and making progress in implementing pollinator-friendly policies and measures in a cost-effective manner, i.e. [CitiesWithNature](#)⁶², [Biophilic Cities](#)⁶³, [EcoCity Builders](#)⁶⁴. In Bologna, Italy, the Bologna Charter for the Environment was issued as a result of an exchange with other metropolitan areas committed to environmental protection. Participating cities commit to regular exchanges on best practices and lessons learnt.

⁶⁰ Refer to EU funding options in section 4 of the supplementary information ⁶¹ www.progireg.eu/nature-based-solutions/pollinator-biodiversity/
⁶² <https://cwn.iclei.org/> ⁶³ www.biophiliccities.org/ ⁶⁴ <https://ecocitybuilders.org/>

2.7 Participate in awards that recognise pollinator conservation efforts

This is an option that could be considered by cities already advanced in pollinator conservation – cities that want to tackle the issue long-term. Participating in awards that recognise and reward excellence in pollinator conservation efforts can be a powerful tool for driving actions to become a role model and spur political commitment. It can also raise public awareness and promote future actions [28].

Promote participation in relevant EU awards

- The [European Green Capital and Green Leaf Award](#)⁶⁵ promotes and awards the efforts of cities that tackle environmental challenges. In fact this will also soon integrate pollinator criteria.
- The [European Capital of Biodiversity Award](#)⁶⁶ promotes cities that achieve the EU biodiversity targets. It aims at acknowledging the key municipal players in biodiversity management and raises awareness more generally.
- The [European Natura 2000 Award](#)⁶⁷ was created to reward excellence in the management of Natura 2000 sites, but also promotes the network and showcases its value for local economies.

Some countries have replicated similar awards at national level to encourage the uptake of pollinators' needs in current or emerging initiatives and sustain public interest. Examples include the Green Flag Awards in the UK. Also, the National Pollinator Strategy of the UK plans to introduce an annual Pollinator Champions (Bees' Needs) award ceremony to reward pollinator-friendly practices by land owners and managers [41]. At a more local level, initiatives that reward dedication to conservation and pollinator championing (i.e. [Bees' Needs](#)⁶⁸ and the [Big Biodiversity Challenge](#)⁶⁹) can be an effective mechanism for incentivising pollinator conservation.



⁶⁵ https://ec.europa.eu/environment/europeangreencapital/index_en.htm

⁶⁶ <https://www.capital-biodiversity.eu/2.html>

⁶⁷ https://ec.europa.eu/environment/nature/natura2000/awards/index_en.htm

⁶⁸ <https://www.bumblebeeconservation.org/bees-needs/>

⁶⁹ <https://www.bigchallenge.info/>





3. GOOD PRACTICES AND KEY RECOMMENDATIONS FOR PRACTITIONERS AT LOCAL AUTHORITIES

- 3.1 Preserve existing pollinator habitats
- 3.2 Restore, create and connect pollinator habitats
- 3.3 Raise awareness through community engagement and environmental education
- 3.4 Monitor urban pollinators

Practitioners working at the implementation level in local authorities are in a very strategic position – one that allows them to lead on / facilitate the conservation of pollinators. They have a wide range of responsibilities, services and land holdings which gives them ample opportunity to push for pollinator action. This can be seen in their work as local planners and managers of public green space.

They are the main target groups of the following recommendations⁷⁰– all based on the real-life experiences of local authority practitioners:

- **Spatial and land use planners:** aside from creating the appropriate policy landscape and instruments (outlined in section 2.3), spatial planners can stimulate the conservation and enlargement of pollinator habitats. Through anticipatory land-use planning (based on pollinator habitat mapping) they can identify options for green corridors and new wildlife habitats, as well as making provisions for connecting up small pockets of well-planned urban green space or parks into butterfly-ways that cross the city and peri-urban areas.
- **Land use managers:** Managers of public green spaces and land (such as parks, cemeteries, sports facilities, landfills, wetlands, wastelands, schools, roadsides, etc.) can manage existing and new land in a pollinator-friendly way. They can determine mowing practices, grow pollinator-friendly plant species, create important resting and hibernating areas, and apply Integrated Pest Management in compliance with the SUPD. Managers need to ensure that all professional users of pesticides are trained in Integrated Pest Management and non-chemical pest control, and know the risks to pollinators. Public authorities can require private contractors to use non-chemical pest control methods and develop and implement their own approaches.

3.1 Preserve existing pollinator habitats

STEP 1

Map existing and potential pollinator habitats and networks in urban spaces

Maps of pollinator habitats and networks play a critical role in facilitating and directing pollinator-friendly land use planning and improved land-use management for pollinator diversity. Along with type, presence/absence and density of pollinator species, they indicate existing sources of food and shelter for pollinators, identify where land could be better managed, or identify where new habitats can be created to help pollinators move around urban areas⁷¹.

Such maps can be used to:

- Identify high-value habitats in urban areas that already exist and require protection (proceed to Step 2)
- Identify urban areas of high potential for creating and reconnecting pollinator habitats (such as brownfields and unused urban areas, green corridors, green roofs, sustainable drainage systems, road, railway and waterway verges) (proceed to chapter 3.2)

Brownfields and unused urban spaces

Brownfields are abandoned areas or pieces of land on which previous developments or industrial activities once existed. Often, such sites suffer from soil contamination but some of them also have a high biodiversity value. Due to a lack of regimented, intensive management, biodiversity-rich brownfield sites have often developed sporadic and localised disturbance. In combination with their varied, often low-nutrient and friable, substrates they support various forms of insects [43]. To ensure that brownfield sites are considered for their potential to support pollinators –

⁷⁰ Note that there exists a variety of other sectors with great potential for driving pollinator conservation – sectors that cannot be dealt with in more detail here, such as municipal procurement, social care, education and economic development. Examples for pollinator-friendly action for these sectors can be found in Section 5 of the Supplementary Information.

⁷¹ Such maps should be promoted to developers and local communities and integrated within existing initiatives such as green infrastructure plans and zoning plans (see chapter 2.3.1)

rather than just their development potential – **those with high biodiversity value should be identified and communicated to decision-makers** in order to have it recognised before planning applications are submitted. A good example of this was the UK partnership between BugLife and Natural England that developed an [inventory of the highest quality brownfield sites](https://naturalengland-defra.opendata.arcgis.com/datasets/03b0e55ff4204dcbb5e2f4e153c585e8_0)⁷² to inform local planning. Such sites then stand a better chance of being protected, conserved and managed as nature reserves for people and pollinators.



STEP 2

Protect areas of urban ‘wilderness’

In those areas where natural regeneration is possible (applying to existing patches and the creation of new patches), **the simplest and preferred option is to let nature take its course and allow self-seeding plants to grow.**

Cities offer multiple spaces for wild and ‘spontaneous’ vegetation, such as roadside verges, roundabouts, pavements, spaces between walls, field margins or brownfields. These spaces can offer a rich food source for wild bees and insects, are attractive to look at and contribute to the green network in urban spaces [36, 44].

In general, to preserve existing pollinator habitats in these (often overlooked) ‘wild’ spaces, the same recommendations for pollinator habitat design and management apply as given below in chapter 3.2.2 -3.2.6.



© Charlotte Evelyn/Shutterstock.com

⁷² https://naturalengland-defra.opendata.arcgis.com/datasets/03b0e55ff4204dcbb5e2f4e153c585e8_0

What makes a high quality pollinator habitat?

Pollinators thrive in heterogeneous landscapes where there is a variety of habitats assembled (**Open Mosaic Habitats** (see [Connop & Nash blogs](#)) suiting a broad range of pollinator species. Pollinators need foraging sites (for food) and nesting habitats (used as shelter during hibernation time or while settling colonies). Most urban spaces provide one or the other, sometimes even both at the same time, which would be ideal. If separate, they can work well if they are well connected to each other, allowing pollinators to easily move between them.

Elements that high quality pollinator habitats should include:

- Heterogeneous landscapes (a patchwork of fine-leaved grassland, wildflower-rich grassland, heathland and open bare areas);
- Diverse ground conditions (substrate, topography, water availability);
- Ideally, some areas of bare ground to allow for nesting possibilities;
- Vegetation of varying heights to benefit sedentary stages such as cocoons by providing a substrate;
- A diverse plant community with no more than 10% of a single plant species, both flowering and non-flowering (as larval host plants);
- High abundance and diversity of flowering plants, with flowers of different size, colour and shape suitable both for generalists and specialists; many of them growing in clusters;
- A mix of early and late flowering species of plants;
- A large share of native species;
- Limited management, ideally remaining as unmanaged as possible;
- Freedom from environmental pollutants (including insecticides, pesticides and herbicides);
- A variety of nesting habitats, including loose soils such as sand and loams, shrubs, herbaceous plants of different heights, dead wood, dried leaves, twigs and stems, stones and logs [42].

Which urban spaces to look for that possibly fit high value habitat criteria?

- Public and private gardens;
- Churchyards and cemeteries;
- Flowery areas associated with school grounds, sports pitches and urban golf courses;
- Forest margins;
- Landscaped business parks;
- Municipal parks and patches of formal landscaping with flowers e.g. flowerbeds and shrubberies;
- Spaces around street trees;
- Transport corridors such as roads, railway lines, bike paths and canals, and less formal car parks with some vegetation;
- Brownfield land (including old quarries and spoil heaps) and other disturbed or temporary sites;
- Watercourses such as rivers and streams;
- Ponds, lakes and wetlands;
- Buildings and other built structures (e.g. bridges and old walls) with potential for pollinator-friendly features;
- Encapsulated semi-natural habitat such as remnant floodplain grassland, scrub, woodland, wetland or heathland;
- Small nature reserves and other [areas of created habitats](#)⁷³

3.2 Restore, create and connect pollinator habitats

After identifying potential pollinator habitats in Step 1, steps can be taken to restore, create or reconnect habitats. The following sections provide simple rules and some practical advice on what you can do as a manager of public green spaces to restore, create and/or connect pollinator habitats, or simply to improve the quality of pollinator habitats through pollinator-friendly design and management.

⁷³ https://cdn.buglife.org.uk/2019/08/managing-urban-areas-for-pollinators_0.pdf

In general, make sure that management techniques are integrated across relevant sectoral domains and into local land use management plans developed by the spatial planning department (see section 2.3.1).

Which urban spaces could qualify for restoring, creating or connecting pollinator habitats?

Brownfields and unused urban spaces as abandoned pieces of land on which previous developments or industrial activities once existed, brownfields often suffer from soil contamination. However they might still present an opportunity for restoration or natural regeneration, depending on the degree of contamination. Brownfields with little biodiversity value represent an opportunity for [beneficial reuse and rehabilitation](#)⁷⁴ by converting them into meadows.



Green corridors

with abundant vegetation play an important role in creating a healthy, ecological city. They make cities more pleasant, provide appealing habitats for fauna and flora, and provide social benefits such as recreation. Several cities have green infrastructure and open space strategies in place that lay the groundwork for pollinator preservation and habitat expansion efforts (see chapter 2.3.3). Through **anticipatory land use planning** you can identify options for green corridors and new wildlife habitats, strategically linking existing spots of green infrastructure across the city. By ensuring habitat connectivity this benefits pollinators and allows for the movement and mixing of species. Also do consider multi-functionality (combining different functions to enhance the utility of the planned/developed green infrastructure) for multiple co-benefits and leveraging wider funding for pollinator conservation [45].

Green roofs

Pollinator species do not necessarily require green physical connections. Stepping stones of suitable habitat over spatial scales can be sufficient to connect habitat patches [42]. Biodiverse green roofs can fulfil this function, whilst delivering a variety of co-benefits such as water retention and delayed water run-off to drainage systems – thus improving water quality through infiltration, reducing energy consumption through insulation, and reducing the urban heat island effect. **Consider green roofs in the planning stages** of new developments and redevelopment of public housing and infrastructure. In comparison with grey infrastructure, their upfront investment is cheaper and they are more cost-effective in terms of maintenance.



⁷⁴ www.grassroofcompany.co.uk/brownfield-landscapes

Biodiverse green roofs are based on extensive green roof systems with shallow, low-nutrient substrates that require little or no maintenance and irrigation. At best, biodiverse green roofs replicate Open Mosaic Habitats found on wildlife-rich and low-nutrient sites such as brownfields [42]. [A best practice guide for creating green roofs for invertebrates](#)⁷⁵ – including design considerations, substrate choice and management – was produced by Buglife.

- More information on [biodiverse design of urban green infrastructure](#)⁷⁶
- More information on [mimicry of habitat mosaics](#)⁷⁷

- **Storm water management infrastructure** for roads, drainage, housing and other developments is often managed by public bodies and forms part of municipal services. When integrated with green infrastructure, they can turn into pollinator habitats. **Look out for “greening” opportunities by combining green with grey infrastructure.** Green walls, rain gardens and swales represent some of the [sustainable drainage components](#)⁷⁸ that can be designed and managed to help pollinators (see recommendations for creating and managing habitats).

• [Guidance on Sustainable Drainage Systems for Wildlife](#)⁷⁹

- **Road, railway and waterway verges** can assume the function of ecologically important network elements and indeed pollinator refuges in densely populated urban areas. Consider complementing green belts and green corridors when planning traffic verges, road side and railway verges, roundabouts, water ways and river banks (see creation and management of pollinator habitat).

- [Transport Corridors for Pollinators](#)⁸⁰
- [Guidance on managing highway verges for pollinators for highway managers](#)⁸¹
- [Guidance on the governance and logistical issues associated with roadside verge campaigns](#)⁸²



3.2.1 Improve the condition of soil

Soil is important for pollinators for two main reasons:

1. It provides **nesting ground for many species of solitary bees.**
Many species of wild bees build their nests in the ground on banks surrounding storm-water basins, ditch sides, track edges or sloping hillsides. Different species of bees prefer different soil textures or types. Generally, bees nest in soil that is at least 35% sand and avoid soils that are more than 40% clay [47]. They prefer un-vegetated sunny spots, gently sloped and undisturbed. Well-drained soils as sands or loams are ideal.
2. It is the **substrate in which plant communities may grow and thrive** (essential for food and shelter). Here, moisture and the presence of organic matter play a key role. The optimum soil texture tends to be a mixture of sand, silt and clay which gives it a loamy aspect.

⁷⁵ https://cdn.buglife.org.uk/2019/07/Creating-Green-Roofs-for-Invertebrates_Best-practice-guidance.pdf

⁷⁶ <https://repository.uel.ac.uk/item/851x5>

⁷⁷ www.thenatureofcities.com/2018/01/09/landscaping-erases-local-ecological-diversity/

⁷⁸ www.susdrain.org/case-studies/case_studies/derbyshire_street_pocket_park_london.html

⁷⁹ www.welshwildlife.org/things-to-do/wildlife-gardening/sustainable-drainage-systems-suds-for-wildlife/

⁸⁰ https://pollinators.ie/wp-content/uploads/2019/10/Transport-Corridors_actions-to-help-pollinators-2019-WEB.pdf

⁸¹ www.monmouthshire.gov.uk/app/uploads/2017/01/Managing-Highway-Verges-for-Pollinators-An-introduction-for-highway-managers-final-draft-18.11.15.pdf

⁸² <https://plantlife.love-wildflowers.org.uk/roadvergecampaign/management-guidelines>

STEP 1**Analyse existing soil and determine if it is suitable for any of the two purposes above.**

Things to look at are soil moisture and composition, since they determine habitat type, erosion potential, plant selection and management techniques. You could start by conducting basic observations to **determine aspects related to the soil drainage and composition**: do the soils appear to drain fast or slow? Are the soils generally wet, moist or dry? Are the soils mostly sand, clay or loam?

Other things to consider:

- Proximity to water will favour both plant growth and pollinator survival;
- Soils rich in organic matter at early stage of decomposition (dry leaves, twigs, dead wood) provide tunnels and holes for pollinators to hibernate or nest, and nutrients for the vegetation to grow;
- Soils free from pollutants, such as chemicals or heavy metals, are preferred. In case of doubt, first conduct a soil analysis (if you do not have the technical resources, you may want to send a sample to a laboratory).

**STEP 2****Improve ground conditions for pollinator nesting grounds**

You can start by creating bare-ground small areas, clearing small patches of vegetation. This would also allow the sun to hit the ground, which would help pollinators to warm up. To create new habitat, you could add small mounds of sand. Ground-nesting bees are attracted to artificial ground nesting sites. Leave a few existing rocks in the area, or add new ones, for wasps to bask upon (read on in section 3.2.2).

STEP 3**Improve the quality of substrate for a healthy community of plants.**

Add organic materials to the soil. You can use diverse kinds of these, and reduce maintenance (e.g. leave organic matter there once it falls, reduce capping, encourage root development), or artificially-made compost. Prevent erosion and compaction, e.g. by leaving small clumps of low-growing vegetation such as grass. Soil cover will protect the ground from raindrops and temperature extremes. Minimise tillage and other soil disturbances. Manage and monitor fertility and PH status regularly [47].

3.2.2 Create nesting and hibernating habitats for wild pollinators

Different pollinators have different nesting requirements and therefore supportive management practices may vary according to species. Proximity to food sources is crucial if nesting creation and management are to succeed. The maximum distance between nest site and forage can vary greatly dependent upon the foraging energetics of the species in question⁸³.

The best general way of maximising the value to a broad diversity of pollinators is one that promotes a “mosaic approach” to habitat design and management (see [Connop⁸⁴](#) & [Nash blogs⁸⁵](#)).

⁸³ For data on distance to food sources for different species, look at Osborne et al., 2008 and Zurbuchen et al., 2010.

⁸⁴ www.thenatureofcities.com/2018/01/09/landscaping-erases-local-ecological-diversity/

⁸⁵ www.thenatureofcities.com/2019/02/27/mosaic-management-missing-ingredient-biodiversity-innovation-urban-greenspace-design/

The pointers below provide links to specific guidelines on how to approach managing habitats for different pollinator species.



BEST OPTION! Create natural nesting habitats by:

- Leaving as much areas wild as possible (nature will know best);
- managing hedgerows for pollinators by ensuring they are planted with native species providing resources for pollinators;
- creating and maintaining bare earth and sand banks for wild pollinator nesting;
- creating suitable nesting habitat for stem nesting species, for example by cutting back bramble (*Rubus fruticosus*) to expose stems;
- Leave some areas bare for ground-nesting species;
- leave deadwood, in particular standing deadwood, or logs in sunny spots as many cavity nesting species use this habitat (for shelter and nesting).



SECOND BEST! Create artificial nesting habitats with:

- “Bee hotels” for wild pollinators (it is recommended to install a large number of small ‘hotels’ rather than installing one big one);
- “bee bricks” for solitary bees in new developments or building extensions/renovations;
- holes in wood or concrete (for example in the concrete fencing in public areas, or in a pallet block which is then attached to fences);
- [sand planters and other sand-filled features](#)⁸⁶ ;
- rammed earth walls;
- the addition of pools, rubble piles;
- soil squares; and,
- insect spirals.



Create hibernating habitat:

Pollinating insects also need hibernating habitats. Any dense vegetation, bramble clumps, dense scrub, compost heaps, derelict structures, log piles or debris can provide important features for hibernating insects (i.e. hoverflies, bumblebees and butterflies) or even overwintering larvae, pupae and eggs of different species.

More information here:

- <https://www.thenatureofcities.com/2019/02/27/mosaic-management-missing-ingredient-biodiversity-innovation-urban-greenspace-design/>
- <http://urbanpollinators.blogspot.com/2013/01/where-do-pollinators-go-in-winter.html>
- <https://ptes.org/wp-content/uploads/2019/05/How-to-make-a-habitat-for-ground-nesting-bees.pdf>

⁸⁶ <https://www.grassroofcompany.co.uk/habitat-planters>

3.2.3 Adjust mowing practices

Altering the frequency and timing of mowing can reap great benefits for pollinators by providing them with much needed shelter and food.

Ensure that a supply of wildflowers is available for as long as possible: pollinators will begin foraging early in the year and some species finish foraging very late. In fact, in some countries, some pollinators will be active year-round, having more than one brood. If sufficient area is available, rotational mowing – to ensure continuity of resources throughout this season – is recommended.

Where sufficient areas of forage are not available, or rotational cutting is not possible:

Avoid mowing too early in spring: late mowing ensures that there is a source of critical food available for pollinators at an early stage of spring. For example, cutting at the end of May and not again until mid-late July increases the growth of important plants like clover, selfheal, cuckooflower and bird's-foot trefoil. For meadows, on the other hand, removing the annual cut in September improves soil fertility. Both these practices have the long-term and cost-effective outcome of increased numbers of pollinator-friendly local species adapted to local conditions [44].

Alter the frequency of mowing: mowing less often and cutting grass less frequently allows wildflowers to flower among the longer grass. This is one of the most economic ways for providing food for pollinators. Another measure involves introducing a layered mowing approach to verges. For example, meadows can be managed effectively for pollinators by decreasing the frequency of mowing, increasing the level of mowing, and through less frequent watering. Also, the longer a meadow is in place, the richer in flowers and more attractive it will become for pollinators. An additional benefit can be achieved by leaving meadows uncut over the winter; these meadows can then provide shelter and additional habitat for some pollinator species.

Leaving patches of land to grow wild – even negatively perceived plants like stinging nettles and dandelions can provide very valuable food sources and breeding places for certain pollinator species (i.e. butterflies and moths).



Did you know that there are alternatives to intensive agricultural management?

In an effort to transform intensively-managed grasslands into extensively-managed, more biodiversity-friendly ones, the city of Freiburg (Germany) has in many cases replaced mulching by mowing, which is less aggressive with the population of micro-invertebrates. It has also established a cattle-grazing system (using sheep and water buffalos) in some specific locations within the municipal territory (i.e. Rieselfeld, Schlossberg) to replace traditional mowing. Additionally, mowing has been reduced in urban meadows from 10 times a year to twice a year.

3.2.4 Prevent and manage the use of chemical pesticides in line with SUPD



Implement an Integrated Pest Management approach that uses non-chemical pest and weed control and use of low risk pesticides where necessary, with minimal or no use of higher risk pesticides including herbicides. Make sure to use pesticides only if absolutely necessary and avoid using pesticides on flowering plants or where pollinators are active or nesting. The use of insecticides is particularly harmful.



Use safe alternatives (integrated pest management practices), and **encourage physical control measures** (such as manual weed control and barriers to control certain pests) [41, 48].

Ensure that bedding plants, bedding plant seeds or amenity turf have not been dressed with neonicotinoids [23].

3.2.5 Control invasive alien species⁸⁷

It is crucial to avoid and control the spread of invasive alien species, both plants and animals. Measures for removing invasive alien plant species include limiting their growth through actions such as using physicochemical or organic treatment, cutting aquatic weeds and grasses, grazing, manual removal techniques, covering the plants with a tight cover (to smother them without scattering debris), and encouraging competition using taller plants, trees and shrubs [36]. As regards animal invasive species, these are often more difficult to address due to their mobility and behavioural patterns. Measures include removal, relocation or population control (i.e. through extermination or controlled reproduction).

Efforts by Vitoria-Gasteiz (Spain) to control the Asian Hornet

The fight against the Asian Hornet is one of the cross-cutting topics in Vitoria-Gasteiz's Local Biodiversity Strategy. The Asian Wasp was introduced to the region via Bordeaux (France) five years ago. Since then, and due to its aggressive and adaptable nature, it has become a threat to local populations of pollinators, especially honeybees. The city's actions to control this pest are based on two steps: 1) the identification and capture of hibernating wasp queens in early spring with the use of bait (financed by the regional government), and 2) the removal of nests once the queen has settled and produced a colony (financed by the municipality). The latter step is conducted by local firefighters (responsible for 90 percent of nest removal) with some support from local citizens. Through an emergency protocol, citizens that spot (and correctly identify) a nest of Asian Hornet are expected to warn firefighters who will then proceed to eliminate. Despite these efforts and their relative success, the whole process remains costly, and new complementary measures need to be found for the eradication of the invasive Asian Hornet species.



Vespa velutina (Asian hornet), © Gilles San Martin, Flickr, CC BY 2.0

⁸⁷ A separate guidance document will be published by IEEP in 2019 on controlling invasive species

3.2.6 Grow a pollinator-friendly, native seed mix

In urban spaces that are newly created, improved for pollinator needs, or where natural regeneration is not possible, the **selection of a pollinator-friendly seed mix** is key. Pollinating insects need: i) pollen (for females to develop ovaries and feed their young), ii) nectar-rich flowers and trees that provide the energy for flying and to feed adult insects (e.g. butterflies), and iii) herb-rich areas for feeding larvae.

There are a few simple key principles to consider when choosing the right vegetation:



IMPORTANT! Choose local native plants.

There is a growing body of evidence suggesting that native plants provide the greatest biodiversity value in comparison with exotic species and are therefore first choice. Native species receive a greater number of visits from pollinators, even from the more generalist species (i.e. pollinators that feed on many species of plants). They are more resilient since they have adapted to local climate and soil conditions. They provide both adult and larval food sources and they do not require fertilizer [49].

If you require information about indigenous plants, local botanical associations can provide this, and native planting stocks and seeds are best sourced from local producers and horticulturalists [36, 44]. This is particularly important in relation to locally rare mono- or oligolectic species.



Edinburgh is using pictorial meadows – meadows in which native and non-native plants co-exist – in order to increase the attractiveness of the ecosystem. The enhanced aesthetic value of these grasslands is believed to gain higher levels of acceptance among citizens while offering a good source of food and shelter for a variety of pollinating species.



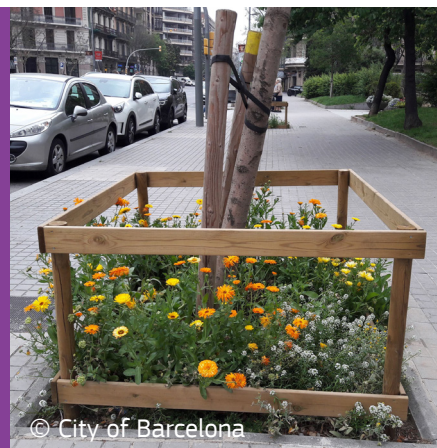
Select flowers rich in pollen and nectar.

Whilst native plants are always the first choice, the focus should be on flowers among them that are rich in pollen and nectar. Special attention should be paid to generalists (i.e. pollinators that feed on many species of plants) and specialists (i.e. pollinators that feed on specific species of plants, such as most butterflies). **Habitats should continuously supply pollen and nectar from March to September.** These are the main periods of activity for pollinators. Special consideration should be given to early spring-flowering species as a critical food source after the winter period. If habitats are to sustain **a wide diversity of pollinators, it is imperative to provide a range of flower resources throughout this period** [23, 50]. Again, native plants are first choice here and alien species should be avoided.



Growing high-nectar-density plants for pollinators in the periphery of urban trees in Barcelona

An alternative to planting nectar-rich trees is creating a pollinator-friendly periphery for urban trees. This primes them to become an important micro-ecosystem that ensures connectivity among wider green spaces (thereby enabling pollinators to transit from one urban area to another with the possibility to feed, rest and hide). Barcelona initiated a project in 2016 that led to the naturalisation of the holes surrounding 1,460 urban trees. This was done through planting a mix of high-nectar-density plant seeds, providing additional food for pollinators and creating additional habitat for insects that would control pests (thereby leading to a reduction in phytosanitary products).



© City of Barcelona

Information on plants for pollinators:

- [Plants for pollinators](#)⁸⁸ issued by the Royal Horticultural Society (UK and Ireland)
- [Nectariferous and polliniferous plants in the area in and around Lyon \(p. 111ff\)](#)⁸⁹
- [Important native plants for pollinators in Ireland](#)⁹⁰
- [Guidance on managing green spaces for pollinators for managers](#)⁹¹
- [10 valuable do's and don't's for land management for butterflies and biodiversity](#)⁹² are provided by Van Swaay et al., 2012
- [Guidance on habitat creation and management for pollinators](#)⁹³ with a guide for diverse, year-round flower sources for pollinators

Knowledge resources on creating pollinator-friendly spaces:

- [the All-Ireland Pollinator Plan](#)⁹⁴, including an estimation of costs and effort required for each action. On its website it offers guidance for different entities, including councils: <https://pollinators.ie/resources/>
- [Guide to Ecological Green Space Management in Urban and Peri-Urban Areas](#)⁹⁵
- [Habitat creation and management for pollinators guidance](#)⁹⁶
- [Guidance on how to manage urban areas for pollinators](#)⁹⁷

3.3 Raise awareness through community engagement and environmental education

As a practitioner at a local authority you work closely with local community groups, schools, and NGOs. You can therefore play a crucial role in raising awareness of the importance of pollinators and conservation needs. The most effective way to do so is by directly involving the public in pollinator-friendly activities, and through education and training programmes.



Establish measures to raise awareness and promote community engagement:

- **Erect signage to identify pollinator friendly habitats on local authority land** – this can include indicating why mowing regimes have changed to avoid negative perceptions associated with grasslands appearing ‘unmanaged’;

⁸⁸ www.rhs.org.uk/science/conservation-biodiversity/wildlife/plants-for-pollinators

⁸⁹ http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=URBANBEES_Management_Plan.pdf

⁹⁰ <https://pollinators.ie/>

⁹¹ www.monmouthshire.gov.uk/app/uploads/2017/01/Managing-Green-Spaces-for-Pollinators-An-introduction-for-managers-final-draft-18.11.15.pdf

⁹² <https://natureconservation.pensoft.net/articles.php?id=1326>

⁹³ www.ceh.ac.uk/sites/default/files/Habitat%20Management%20and%20Creation%20For%20Pollinators.pdf

⁹⁴ <https://pollinators.ie/>

⁹⁵ http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=URBANBEES_Management_Plan.pdf

⁹⁶ www.ceh.ac.uk/sites/default/files/Habitat%20Management%20and%20Creation%20For%20Pollinators.pdf

⁹⁷ https://cdn.buglife.org.uk/2019/08/managing-urban-areas-for-pollinators_0.pdf

- **Distribute wildflower seeds to citizens.** Indeed this has been undertaken in cities like Freiburg, Edinburgh and Bristol with high acceptance and demand from the public. The Grow Wild Initiative (led by the Royal Botanic gardens of Kew in the UK) launched a flagship project called a 'Tale of Two Cities' where wildflower seeds are given to citizens to be planted on five hectares of dedicated space.
- **Hold citizen workshops on the importance of pollinators,** or on the economic benefits of engaging in pollinator-friendly activities, health and well-being, etc. One such example is the BEES Day organised by the City of Wrocław in Poland;
- **Encourage the public to take action** in their gardens, allotments, window boxes and balconies to make them pollinator friendly (or through other opportunities such as community gardening or even volunteering on nature reserves) [41].

Learn how cities build on citizens as drivers for change

- **Edinburgh City Council** encourages communities to take some ownership of their local green spaces by setting up 'Park Friends Groups'. There are a total of 64 active groups where citizens carry out activities such as site maintenance, fundraising and planting. Citizens provide feedback on the improvement of green spaces through social media platforms such as Edinburgh Outdoors or Edinburgh Living Landscapes.
- **Genk** counts on a dedicated team to voluntarily act as ambassadors for **Genk's Bee Plan: the B-Team**. In a collaborative process, they raise awareness of the importance of pollinators and disseminate some of the actions stated in the plan, participating in a variety of events, local festivals and markets. The support provided by the 'B-Team' has been invaluable to the city's Environment & Sustainability Department which lacks human resources to take over the dissemination work.



Focus education efforts on the young to build a new generation with strong pollinator awareness, knowledge and ownership.

Collaborate with kindergartens/ nursery schools and primary schools to encourage them to raise awareness with, and create healthier environments for, their students. The production of educational materials and the implementation of educational programmes involving pollinators (i.e. natural science days, study visits to community gardens or planting a pollinator-friendly garden with students) can promote learning from an early age.

Environmental education programmes in Cascais (Portugal)

The **City of Cascais** has an ongoing Environmental Education Plan that involves a strong collaboration component with local schools. Aimed at pollinators, this is done through a multi-step process led by **Cascais Ambiente** in collaboration with the [Butterfly Zoo](#)⁹⁸ located in Quinta de Rana Urban Park. Firstly, biologists visit the schools to deliver lectures on the basics of pollination, pollinator species and their life cycle. Thereafter, school groups have the chance to visit the Butterfly Zoo to explore the different aspects of butterfly-led pollination through the exhibition area, laboratory and outdoors gardens. Finally, school groups are assisted in the set-up of insect hotels. The plan also introduces children to the concept of monitoring, by analysing the diversity and abundance of the insect hotel visitors (information that is then collected in spreadsheets and distribution maps). The City plans to expand the concept to its urban parks.

The City of Poznań turns unused kindergarden/ nursery school grounds into eco-gardens for pollinators

In the pursuit of creating more public green spaces, the [City of Poznań](#)⁹⁹ in Poland is working with kindergartens/ nursery schools across the city to convert their grounds into eco-gardens and, in some cases, open up these areas as social gardens for the local community. The new spaces are designed, constructed and managed in collaboration with the students and the local community. This provides added value for both the kindergartens (increased resources and activities) and the local community (unlocking of more public open space). The pilot actions are deemed to have been successful and more projects are underway.

⁹⁸ www.cascais.pt/en/equipamento/butterfly-zoo

⁹⁹ <https://connectingnature.eu/oppla-case-study/19387>

3.4 Monitor urban pollinators

Monitoring pollinators is essential for understanding their status and trends and deploying effective conservation actions (e.g. required protection and conservation zones). Monitoring is also an important tool for mapping pollinator habitats and threats that pollinators might face, and thereby supporting pollinator-friendly land use planning and management (see section 3.1 and 3.2). It is also a prerequisite for evaluating the impacts of pollinator-friendly measures and checking whether the targets in pollinator strategies and action plans were reached (see section 2.2).

Systematic and regular monitoring and recording of urban pollinators and their habitats is often a challenge for local authorities since it requires workforce, budget and technical expertise. Here are a few recommendations to make things easier for you:



Check existing pollinator strategies and implementation plans for the indicators they use. This is to monitor the performance and impact of pollinator measures. And here are useful resources to which you might refer:

- [Ireland Pollinator Plan 2015 – 2020](#)¹⁰⁰
- [National Pollinator Strategy for England 2014 – 2024](#)¹⁰¹
- [Pollinators Strategy for Scotland](#)¹⁰²
- [Pollinator Strategy for Scotland – Progress Report 2018](#)¹⁰³
- [Green Infrastructure Action Plan for Pollinators of South-East Wales](#)¹⁰⁴
- [NL Pollinator Strategy “Bed & Breakfast for Bees”](#)¹⁰⁵
- [Norwegian National Pollinator Strategy](#)¹⁰⁶



Collaborate with research institutions to outsource monitoring and save city resources (economic, technical and human).

Research institutions have the capacities and knowledge to map pollinator habitats and monitor pollinator status. They can generate relevant data on density of invertebrates, number of invertebrates, coverage and favoured plant species, thus supporting decision making on where interventions are most effective. Researchers can also help you set specific, measurable, ambitious, realistic and time-bound (SMART) targets in pollinator plans.

Brussels has created an ‘Atlas of Wild Bees of the Brussels-Capital Region’ together with the Université Libre de Bruxelles, the Royal Belgian Institute for Natural Sciences and the NGOs Natagora and Natuurpunt. This contains a regional database as well as several strategic documents, including: a red list of vulnerable species (for future legal protection), a monitoring list (for long term surveillance), and a «plants of special interest» list (for vulnerable mono- or oligolectic species).



Include citizens in monitoring (citizen science).

Citizens can for instance take part in systematic surveying; keeping track of pollinator sightings by counting the number of flower visits by pollinators (which can help experts determine dietary breadth and planting choices)¹⁰⁷. This can even be achieved through the use of [digital applications](#)¹⁰⁸ that citizens can easily download on their phones, thus supporting national monitoring schemes. Note that providing modest support for co-ordination and training of volunteers can also be a cost-effective action.

¹⁰⁰ <https://pollinators.ie/>

¹⁰¹ www.gov.uk/government/publications/national-pollinator-strategy-for-bees-and-other-pollinators-in-england

¹⁰² www.nature.scot/sites/default/files/2018-04/Pollinator%20Strategy%20for%20Scotland%202017-2027.pdf

¹⁰³ www.nature.scot/sites/default/files/2018-11/Pollinator%20Strategy%20for%20Scotland%20-%202018%20Progress%20Report.pdf

¹⁰⁴ www.monmouthshire.gov.uk/app/uploads/2016/12/GIAPP.pdf

¹⁰⁵ <https://promotepollinators.org/wp-content/uploads/sites/117/2018/07/nl-pollinator-strategy-bed-breakfast-for-bees.pdf>

¹⁰⁶ www.regjeringen.no/contentassets/3e16b8410e704d54af40bcb3e687fb4e/national-pollinator-strategy.pdf

¹⁰⁷ [A separate guidance will be produced on how citizens can engage in pollinator conservation and citizen science](#)

¹⁰⁸ <https://friendsoftheearth.uk/bee-count/what-happens-data-great-british-bee-count>

Cities using citizen science to monitor pollinators

The **Urban Butterfly Monitoring Scheme in Barcelona and Madrid** is a network of volunteers that gathers monthly data on (1) the absence/presence and (2) abundance of different butterfly species. Based on the principles of citizen science, it involves trained volunteers regularly walking fixed transects during the butterfly flight season to collect data on pollinator abundance. The scheme belongs to a broader network of 'European Butterfly Monitoring Schemes' (eBMS), an initiative of Butterfly Conservation Europe (BCE) and partners. The initiative itself began over 40 years ago and now operates with volunteers in 35 countries across Europe. In Barcelona and Madrid it is led locally by the Ecological and Forestry Applications Research Center (CREAF), in collaboration with The Granollers Natural Science Museum and Madrid Autonomous University. It is supported by a broad range of institutions and bodies, including the municipalities of Madrid and Barcelona. The outcomes are expected to shed light on the local state of butterfly diversity, critical urban conservation areas, adequate management techniques and environmental quality enhancement.

References

- [1] Goulson, D., Nicholls, E., Botías, C., & Rotheray, E. L. (2015). Bee declines driven by combined stress from parasites, pesticides, and lack of flowers. *Science*, 347(6229), 1255957.
- [2] Hallmann, C. A., Sorg, M., Jongejans, E., Siepel, H., Hofland, N., Schwan, H., ... & Goulson, D. (2017). More than 75 percent decline over 27 years in total flying insect biomass in protected areas. *PLoS one*, 12(10), e0185809.
- [3] Van Swaay, C.A.M et al. (2019) The EU Butterfly Indicator for Grassland species: 1990-2017: Technical Report. Butterfly Conservation Europe & ABLE/eBMS (www.butterfly-monitoring.net).
- [4] IPBES (2016) *The assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production*. S.G. Potts, V. L. Imperatriz-Fonseca, and H. T. Ngo (eds.), Secretariat of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Bonn, Germany.
- [5] Lautenbach S, Seppelt R, Liebscher J, Dormann CF (2012) Spatial and Temporal Trends of Global Pollination Benefit. *PLoS One* 7(4): e35954. doi:10.1371/journal.pone.0035954
- [6] Klein, A. M., Vaissiere, B. E., Cane, J. H., Steffan-Dewenter, I., Cunningham, S. A., Kremen, C., & Tscharntke, T. (2006). Importance of pollinators in changing landscapes for world crops. *Proceedings of the Royal Society B: biological sciences*, 274(1608), 303-313.
- [7] Gallai, N., Salles, J. M., Settele, J., & Vaissière, B. E. (2009). Economic valuation of the vulnerability of world agriculture confronted with pollinator decline. *Ecological Economics*, 68(3), 810-821
- [8] Kearns, C. A., Inouye, D. W., & Waser, N. M. (1998). Endangered mutualisms: the conservation of plant-pollinator interactions. *Annual Review of Ecology and Systematics*, 29(1), 83-112.
- [9] Ollerton, J., Winfree, R., & Tarrant, S. (2011). *How many flowering plants are pollinated by animals?* *Oikos*, 120(3), 321-326
- [10] Laliberte, E., Wells, J. A., DeClerck, F., Metcalfe, D. J., Catterall, C. P., Queiroz, C. & McNamara, S. (2010). Land-use intensification reduces functional redundancy and response diversity in plant communities. *Ecology letters*, 13(1), 76-86.
- [11] Kevan, P. G. (1999). Pollinators as bioindicators of the state of the environment: species, activity and diversity. In *Invertebrate Biodiversity as Bioindicators of Sustainable Landscapes* (pp. 373-393).
- [12] Abrol, D. P. (2012). Pollinators as bioindicators of ecosystem functioning. In *Pollination Biology* (pp. 509-544). Springer, Dordrecht.
- [13] Goulson, D., Lepais, O., O'Connor, S., Osborne, J. L., Sanderson, R. A., Cussans, J., ... & Darvill, B. (2010). Effects of land use at a landscape scale on bumblebee nest density and survival. *Journal of Applied Ecology*, 47(6), 1207-1215.
- [14] United Nations. (2018). The World's Cities in 2018. The World's Cities in 2018. Available at: www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf
- [15] Baldock, K. C., Goddard, M. A., Hicks, D. M., Kunin, W. E., Mitschunas, N., Osgathorpe, L. M., ... & Vaughan, I. P. (2015). Where is the UK's pollinator biodiversity? The importance of urban areas for flower-visiting insects. *Proceedings of the Royal Society B: Biological Sciences*, 282(1803), 20142849.
- [16] Sirohi, M. H., Jackson, J., Edwards, M., & Ollerton, J. (2015). Diversity and abundance of solitary and primitively eusocial bees in an urban centre: a case study from Northampton (England). *Journal of Insect Conservation*, 19(3), 487-500.
- [17] Matteson, K. C., & Langellotto, G. A. (2009). Bumble bee abundance in New York City community gardens: implications for urban agriculture. *Cities and the Environment (CATE)*, 2(1), 5.
- [18] Lowenstein, D. M., Matteson, K. C., Xiao, I., Silva, A. M., & Minor, E. S. (2014). Humans, bees, and pollination services in the city: the case of Chicago, IL (USA). *Biodiversity and Conservation*, 23(11), 2857-2874.
- [19] Baldock, KCR et al. (2019). A systems approach reveals urban pollinator hotspots and conservation opportunities. *Nature Ecology & Evolution* 3, 363-373.

- [20] Hall, D. M., Camilo, G. R., Tonietto, R. K., Ollerton, J., Ahrné, K., Arduser, M., ... & Goulson, D. (2017). The city as a refuge for insect pollinators. *Conservation Biology*, 31(1), 24-29
- [21] Secretariat of the Convention on Biological Diversity. (2017). *Guidelines for an integrated approach in the development and implementation of national, subnational and local biodiversity strategies and action plans*. Secretariat of the Convention on Biological Diversity. Retrieved from <https://cbc.iclei.org/project/bsap-guidelines/>
- [22] ICLEI – Local Governments for Sustainability. (2010). *Local Action for Biodiversity Guidebook: Biodiversity Management for Local Governments*. (M. T. Laros & F. E. Jones, Eds.).
- [23] Friends of the Earth, & Buglife. (2014). *Helping pollinators locally. Developing a local pollinator action plan or strategy*.
- [24] Secretariat of the Convention on Biological Diversity. (2012). *Cities and Biodiversity Outlook. Action and Policy. A Global Assessment of the Links between Urbanization, Biodiversity and Ecosystem Services*.
- [25] OECD (2019), Biodiversity: Finance and the Economic and Business Case for Action, report prepared for the G7 Environment Ministers' Meeting, 5-6May 2019.
- [26] Underwood, E., Gerritsen, E., & Darwin, G. (2017). *Pollinator Initiatives in EU Member States: Success Factors and Gaps*. <https://ieep.eu/publications/eu-pollinator-initiative-informed-by-eu-member-states-initiatives-successes-and-gaps>
- [27] ICLEI Europe, Bodensee Stiftung, Ambiente Italia, & Union of the Baltic Cities. (2012). *Integrated Management for Local Climate Change Response. Capacity Development Package*.
- [28] Davis, M., Gerdes, H., Muehlmann, P., & Robrecht, H. (2014). *Multilevel-governance of our natural capital: the contribution of regional and local authorities to the EU Biodiversity Strategy 2020 and the Aichi Biodiversity Targets* (Part B: Recommendations). <https://doi.org/10.2863/10326>
- [29] Environmental Justice Foundation. (2015). *Policies for Pollinators. The Need for Government Leadership in Backing England's Bees*. London. <https://doi.org/10.4324/9781315680798-11>
- [30] Ayuntamiento de Barcelona. (2017). *Medida de gobierno: programa de impulso de la infraestructura verde urbana*. Retrieved from https://bcnroc.ajuntament.barcelona.cat/jspsui/bitstream/11703/104927/1/esp_Mesura_de_govern_increment_verd_08_06_2017.pdf
- [31] City of Edinburgh Council. (2017). *Edinburgh Design Guidance*. Retrieved from http://www.edinburgh.gov.uk/directory/180/edinburgh_design_guidance
- [32] IEEP & IUCN. (2018). *Consultation workshop on an EU Pollinators Initiative European Network for Rural Development Special Area of Conservation*. Brussels. Retrieved from http://ec.europa.eu/environment/nature/conservation/species/pollinators/documents/consultation_workshop_report.pdf
- [33] Region Hannover. (2016). *Die Biodiversitätsstrategie der Region Hannover. Beiträge Zur Regionalen Entwicklung*, 143.
- [34] Knop, E, Zoller, L, Ryser, R, Gerpe, C, Hörler, M and Fontaine, C (2017) Artificial light at night as a new threat to pollination. *Nature* No 548, 206.
- [35] Owens, A C S, Cochard, P, Durrant, J, Farnworth, B, Perkin, E K and Seymoure, B (2020) Light pollution is a driver of insect declines. *Biological Conservation* No 241, 108259. Available at: www.sciencedirect.com/science/article/pii/S0006320719307797
- [36] Coupey, C., Mouret, H., Fortel, L., Visage, C., Vyghen, F., & Aubert, M. (2015). *Helping Wild Bees and Nature Find a Home in the City. A guide for Ecological Green Space Management in Urban and Peri-Urban Areas*.
- [37] Verband Deutscher Naturparke, & EUROPARC Federation. (2017). *Living Landscapes. Europe's Nature, Regional, and Landscape Parks - model regions for sustainable development of rural areas*. Bonn. Retrieved from <https://www.european-parks.org/downloads/living-landscapes.pdf>
- [38] Rose, T., Kremen, C., Thrupp, A., Gemill-Herren, B., Graub, B., & Azzu, N. (2015). *Policy Analysis Paper: Mainstreaming of Biodiversity and Ecosystem Services with a Focus on Pollination*. Rome. Retrieved from <http://www.fao.org/3/a-i4242e.pdf>

- [39] European Commission, DG for Health and Food Safety (2017). Overview report on the implementation of Member States' measures to achieve the sustainable use of pesticides under Directive 2009/128/EC, Luxembourg. Available on: http://ec.europa.eu/food/audits-analysis/overview_reports/details.cfm?rep_id=114
- [40] Kampelmann, S, Van Hollebeke, S & Vandergert, P (2016) Stuck in the middle with you: The role of bridging organisations in urban regeneration, *Ecological Economics* 129, 82-93.
- [41] Department for Environment / Food and Rural Affairs. (2014). *The National Pollinator Strategy: for bees and other pollinators in England*. Bristol: Defra. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/409431/pb14221-national-pollinators-strategy.pdf
- [42] Gedge, D., Grant, G., Kadas, G., & Dinham, C. (2012). *Creating Green Roofs for Invertebrates. A Best Practice Guide*. Peterborough. Retrieved from <https://cbc.iclei.org/project/bsap-guidelines/>
- [43] Gibson, C.W.D. (1998) Brownfield: red data – the values artificial habitats have for uncommon invertebrates. English Nature Research Report No. 273. Peterborough: English Nature.
- [44] National Biodiversity Data Centre. (2016). *Councils: actions to help pollinators. All-Ireland Pollinator Plan 2015-2020*. Waterford.
- [45] Hansen, R., Rall, E., Chapman, E., Rolf, W., & Pauleit, S. (2017). *Urban Green Infrastructure Planning. A Guide for Practitioners*.
- [46] Saura, S., Bodin, Ö., & Fortin, M. J. (2014). Stepping stones are crucial for species' long-distance dispersal and range expansion through habitat networks. *Journal of Applied Ecology*, 51(1), 171-182.
- [47] Shepherd, M., Vaughan, M., & Black, S. H. (2008). POLLINATOR-FRIENDLY PARKS. *How to Enhance Parks, Gardens and other Greenspaces for Native Pollinators*. Seattle, WA: The Xerces Society for Invertebrate Conservation.
- [48] CBD, & FAO. (n.d.). *The International Pollinator Initiative Plan of action 2018-2030*.
- [49] Salisbury, A., Armitage, J., Bostock, H., Perry, J., Tatchell, M. and Thompson, K. (2015) Enhancing gardens as habitats for flower-visiting aerial insects (pollinators): should we plant native or exotic species?. *Journal of Applied Ecology*, 52(5), pp.1156-1164. Schweiger, O., Settele, J., Kudrna, O., Klotz, S., & Kühn, I. (2008). Climate change can cause spatial mismatch of trophically interacting species. *Ecology*, 89(12), 3472-3479.
- [50] Nowakowski, M., & Pywell, R. F. (2016). Habitat creation and management for pollinators. Centre for Ecology & Hydrology, Wallingford, UK.

