SAFEGUARD EURO CITIES ICLEI Local Governments for Sustainability

Urban greening for pollinators: from policy to practice (8 Dec)

Background information and useful resources

About the project

Safeguard is an EU Horizon project (2021-2025) involving an interdisciplinary team of partners in European and International universities, research institutions and many others.

Safeguard aims to contribute to reversing the loss of wild pollinators across Europe through increasing the understanding of the direct and indirect drivers of pollinator declines, and the environmental, economic, and societal impacts as well as investigating the effective responses to counteract wild pollinator decline. Safeguard will deliver an integrated assessment framework as a decision-making tool for a portfolio of effective policy and practice solutions. The goal of the project is to inspire the development of management and policy guidelines for the public and private sectors to safeguard wild pollinators and the benefits they provide.

Policy context – Urban greening plans

The **EU Biodiversity Strategy for 2030** announces that cities with over 20,000 inhabitants are expected to develop Urban Greening Plans. These should describe the city strategy to protect and restore biodiversity and mitigate climate change. Plans are expected to include measures to

- create new urban green spaces such as urban forests, public green spaces, gardens, urban farms, and green infrastructure (e.g., green roofs and walls)
- improve the management of existing green spaces for biodiversity such as eliminating pesticide use and regulating mowing
- set biodiversity indicators and targets and monitoring framework (at a minimum
- outline the policy, regulatory and financial framework needed to deliver these measures.

Urban greening plans will set cities' strategies to support biodiversity, including pollinators. In addition, they will be an important vehicle to deliver on other relevant EU BDS commitments such as "eliminating chemical pesticides in sensitive areas such as EU urban green areas". Urban greening plans will need to pay a particular attention to pollinator monitoring to assess the state and trend of pollinators in the municipality, which will be critical for the implementation of conservation activities and adequate planning.

The Commission released last October the EU Urban Greening Platform which hosts a comprehensive **guiding document**, a **toolkit** as well as other resources for the development and implementation of urban greening plans.

URBAN GREENING PLAN REQUIREMENTS [Nature Restoration Law]:

Targets : in all cities and in towns and suburbs (NB at LAU level)

- Reverse the decline of pollinator populations by 2030 and achieve thereafter an increasing trend of pollinator populations, measured every three years after 2030, until satisfactory levels are achieved
- No net loss of urban green space, and of urban tree canopy cover by 2030, compared to 2021, in all cities and in towns and suburbs.
- Net gain - increase in the total national area of urban green space in cities and in towns and suburbs of at least 3 % of the total area of cities and of towns and suburbs in 2021, by 2040, and at least 5 % by 2050
- Minimum of 10 % urban tree canopy cover by 2050
- Net gain of urban green space that is integrated into existing and new buildings and infrastructure developments, including through renovations and renewals

Indicators & monitoring:

- key/selected bird species
- key/selected pollinator species (such as butterflies)
- urban green space – area
- urban green space – integrated into buildings and infrastructure
- urban tree canopy

NB at a mimimum cities should measure and monitor the core criteria set out for nature and biodiversity in the Green City Accord

Useful resources

- the EU Pollinators Information Hive
- EU Pollinators Initiative guidance for city planners and spatial planners: (Wilk, Rebollo and Hanania, 2019)
- Green City Accord indicators guidebook
- Consultation workshop on local and regional actions for wild pollinators in the context of the revision of the EU pollinators initiative (workshop report, July 2022)
- Integration of biodiversity data in urban assessments - The European Topic Centre on Biological Diversity Working paper N°B/2017
- The proposed EU Nature Restoration Law: what role for cities and regions? Policy brief, Wilk, B.; Utkarsh, S. Drafted by ICLEI for Network Nature, November 2022.

Q&A

Are urban areas important for pollinators?

Appropriately managed cities have the potential to enhance the conservation of pollinators and act as hotspots for pollination services. Green spaces in urban and peri-urban can be **important habitats for pollinators providing them with food resources and foraging and nesting sites**, that may be less available on intensively managed farmland. Improving the wild pollinator populations in urban areas may also **improve species richness and abundance in nearby agricultural** lands via a **spillover effect** (Hall et al, 2017). Urban areas could become refuges and corridors of favourable habitats for pollinators. Therefore, local authorities have an important role to play in the preservation of pollinators in urban areas.

Is pollinator species richness higher in urban environments?

Generally yes for wild bees:

- A UK study comparing pollinator communities in replicate urban and non-urban landscapes, found that **bee species richness** was higher in urban areas than farmland and flower visitor abundance was equivalent (Baldock et al, 2015). Hall et al (2017) showed that urban areas can harbour greater bumblebee species richness than rural or natural areas. (Sirohi et al, 2015) found solitary and eusocial bee species to be more diverse and abundant in core urban areas of a British town compared to the meadows and nature reserves.
  (Samuelson Ash et al, 2018) even showed that bumblebee colonies reached higher peak size, had more food stores, encountered fewer parasite invasions, and survived for longer in urban areas compared to agricultural land.

Generally no for hoverflies, flies, and butterflies and moths:

- **hoverfly** abundance was found **lower** in urban areas than elsewhere, which was confirmed by (Persson et al, 2020). Hoverflies species are often dependent on the presence of deadwood in their habitats for nesting, which is not abundant in urban environments.
- Theodorou et al (2020) made the same conclusion for Diptera and Lepidoptera, with lower insect species richness in urban areas.

Which habitats are key for pollinators?

Within cities, residential gardens and allotments (community gardens) are pollinator 'hotspots': allotments were even found to lever city-scale plant–pollinator community robustness (Baldock et al, 2019) and (Daniels et al, 2020).

Pollinators thrive in heterogenous landscapes where there is variety of habitats assembled. (Wilk, Rebollo and Hanania, 2019) provide a guide on elements that high quality pollinator habitats should include as well as advice on restoring, connecting and connecting pollinator habitats within the city (rehabilitation of brownfields and unused urban spaces, green corridors, green roofs, verges, etc).

- (Fortel et al, 2014) showed that soil sealing was negatively associated with bee species diversity – so diversity decreases towards the city centre.

- (Hülsmann et al, 2015) found plant species diversity, abundance and composition to be more important than the amount of concrete in driving the abundance and species richness of common bumble bees in the city of Lüneburg (Germany).

Example from a city – inventory of high quality brownfields in the UK

BugLife and Natural England have partnered to develop an inventory of the highest quality brownfield sites in the UK to inform local planning. Such sites then stand a better chance of being protected, conserved and managed as nature reserves for people and pollinators. In a 2018 blog, researchers Connop and Nash underline the potential value of industrial sites for biodiversity, provided rehabilitation mimics a landscape mosaic and provide examples of ecologically friendly designs, like the Beetle Bump, in London docklands area. The Beetle Bump design was species-led, which means that the site was designed to mimic the habitat features associated with the last site on which the beetle was found. Surveys on the Bump in subsequent years revealed that not only was the streaked bombardier able to persist on the site in the short-term, but a rich community including other conservation priority species was also utilising the habitat.

Climate change is affecting how attractive cities are for pollinators.

- (Hamblin, Youngsteadt and Frank, 2018) found that city warming in the Mediterranean region under climate change, and regardless of floral diversity, is creating less hospitable habitats for bees than surrounding rural areas due to high temperatures and high levels of soil sealing.
- (Ganuza et al, 2022) revealed declines in pollinator diversity and regional community homogenization in warmer and drier climates.
- (Herbertsson et al, 2021) showed that global warming may increase the dominance of the common bumblebee (*Bombus terrestris*) compared to other bumblebee species.

GREEN SPACES

What kinds of plant resources help pollinators in urban landscapes?

Pollinators need **1) flower resources for foraging throughout the year** and **2) nesting sites**.

High flower density and diversity could be more decisive factor for pollinator diversity than the habitat type (Daniels et al, 2020). Ensuring the continuity in floral resource availability (with continuous supply of pollen and nectar from March to September) and identify gaps in species mixes is thus very important. It is also generally recommended to generate **structurally diverse green spaces** and reduce the level of intervention to allow spontaneous vegetation and mimic natural habitat.

Impact of green spaces management on pollinators

- Areas with reduced maintenance (especially **reduced lawn mowing**) demonstrate significantly higher total wild bee species numbers and biodiversity indices (Wastian, Unterweger and Betz, 2016).
- (Steidle et al, 2022) showed that the arthropod loss caused by conventional mowing on grassland ranged from 29% for Heteroptera, 50% for Hymenoptera and Diptera and up to 87% for Lepidoptera. However, researchers found that arthropod-friendly mowing techniques could substantially mitigate losses.

- (Aguilera et al, 2019) studied long term changes in butterfly species richness in urban green spaces in Malmö (Sweden) characterised by different management regimes. While intensively managed traditional parks had the greatest loss of species over time, semi-natural parks and ruderal sites had higher number of butterfly species and lost fewer species over time.

The importance of plant diversity

- (Wilk, Rebollo and Hanania, 2019) emphasise on the need to select pollinator friendly mixes providing pollen, nectar rich flowers and trees and herb rich areas. They advise to choose local native plants and to select in priority flowers rich in pollen and nectar, with special attention to generalists and specialists. Special consideration should be given to early spring-flowering species as a critical food source after the winter period.
- Hicks et al (2016) analysed that although many 'pollinator-friendly' seed mixes are available, it is unsure if the floral resources they provide are suitable for pollinators throughout the year. Perennial meadows provide more nectar and pollen than annual meadows but both seed mixes fail to provide resources early in the year. Daniels et al (2020) showed that the diversity and long vegetation periods of flowering blossoms in flower beds of cities affect the richness and diversity of pollinators.
- Daniels et al (2020) explain that trees like Tilia – lime – and Salix - willows are very relevant for honeybees since the trees are highly dominant as a food source in urban green spaces and have a high nectar content through the flowering period. Solitary bees, in contrast to honeybees, need small and constant flowering because they need pollen rather than nectar.

Providing nesting sites

- (Fortel et al, 2016) argue that the persistence of bee species in urbanized areas depends not only on floral availability but also on the availability of nesting resources (square soils, bee hotels).
- However, different pollinators have different nesting requirements and therefore supportive management practices may vary according to species (Wilk, Rebollo and Hanania, 2019). 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.

The example of road verges

- (Villemey et al, 2018) explored the potential of transport infrastructure (roads, railways, oil and gas pipelines, power lines, rivers and canals) as corridors for insects conservation through meta-analysis of 64,206 articles. Globally, insect abundance seemed higher on these infrastructure verges than in compared habitats.
  On this topic, the all-Ireland pollinator plan issued a guidance on the pollinator friendly management of road transport

Example from a city – Freiburg

(Wilk, Rebollo and Hanania, 2019) 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.

PESTICIDE USE

The revision of the **Sustainable Use of Pesticides Directive** was proposed in June 2022. The Directive includes legally binding **targets to reduce by 50% the use and risk of chemical pesticides by 2030**. Member States will set their own national reduction targets within defined parameters to ensure that the EU wide targets are achieved. The directive also includes a ban on all pesticides in sensitive areas, such as **urban green areas** (public parks, gardens, playgrounds, public paths, and protected areas) and any ecologically sensitive area to be preserved for threatened pollinators.

How can cities become pesticide free?

Pesticide free towns movement – PAN Europe

Pesticide Action Network (PAN Europe) has set up a network of pesticide free cities and towns across Europe. Within the **European Pesticide Free Towns Network, cities** are encouraged to minimize the use of pesticides to safeguard the quality of life and health of inhabitants, but also preserve the environment. Members of the network sign a pledge that engages them at political level. Pesticide free towns include : Copenhagen (1990s), Versailles (2005), Strasbourg (2008), Ghent (2009), Rennes (2012), Luxembourg (2016), Grenoble, Munster, Brussels (2020), etc.

- **Pesticides in plants sold in garden centres**:

(Reuter, 2014) conducted an analysis of the pesticides used to produce flowers grown in domestic gardens, balconies and public parks. Results from 86 samples in ten European countries revealed pesticides residues in 97.6% of the flowering plants, including three neonicotinoid pesticides (Imidacloprid, Thiamethoxam and Clothianidin) restricted in Europe found in half of the samples and partly in high concentrations. Pesticides not authorized in the EU were recorded in 14% of the samples.

Example from a pesticide free town - Strasbourg

(Wilk, Rebollo and Hanania, 2019) 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 Initiative 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 guidance 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.

NATIVE VS EXOTIC SPECIES

Why do native plant species matter?

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. Salisbury et al (2015) reported greater abundance of total pollinators recorded on native and near-native treatments compared with exotic plots. This manifests in considerably (40-50 percent) fewer visits to exotic flowering plants, compared to native and near-native species, with even the more generalist groups such as honeybees and short-tongued bumblebees favouring native over exotic plantings (ibid). Mody et al (2020) found that the replacement of exotic woody vegetation by native wildflower meadows significantly increased arthropod abundance.

However, studies also found that plant structural heterogeneity and plant taxon richness rather than native or non-native status had the strongest influence on species richness (Smith et al, 2006). Indeed, floral abundance is a primary driver for insect visits regardless of plant origin (Williams et al, 2011).

The majority of plants available to gardeners are non-native[1]. Favouring a native mix and enriching it with exotic plants could extend the flowering season and provide resources for specialist pollinator groups and solitary bees (Salisbury et al, 2015).

Example from a city – Edinburgh

(Wilk, Rebollo and Hanania, 2019) 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.

LIGHT POLLUTION

Does light pollution influence wild pollinators?

Light pollution - Artificial Light At Night (ALAN) - can have a big influence on pollinators' mating behaviour, ease of predation, ease of predator evasion, nesting, and foraging behaviours. A growing body of evidence in the academic literature is showing that night-time light can seriously disrupt the nocturnal behaviour of many species. Knop et al (2017) highlight the disruption that ALAN creates for pollinators (both nocturnal and diurnal) and subsequently on plant reproductive success. Insects that are attracted by lights are already affected in the flight to light behaviour (Eisenbeis, 2006):

- "fixated or capture effect" - moths fly towards lights and remain there all night, losing opportunities for feeding and reproduction
- "crash barrier effect" – insects fly directly to the light source and are unable to leave the illuminated zone

[1] For example, in the UK, more than 70 000 plant taxa (ca. 14 000 distinct species) are available to purchase (Cubey 2014), whilst the list of plant taxa considered native or naturalized is approximately 4800 (Stace 2010)

- "vacuum cleaner effect" – insects that otherwise are not moving (foraging or migrating) are drawn to their death by light

(Giavi, Fontaine and Knop, 2021) report disruption of plant-pollinator interactions at night, but also diurnal plant-pollinator interactions, with decreased interactions potentially due to modifications of floral traits (physiological processes linked to the seasonal and daily timing of plants).

(Boyes et al, 2021) found that ALAN impacts moths across most life stages and key behaviours. ALAN can disrupt reproduction and larval development, with likely negative impacts on individual fitness. The study reports insufficient evidence that ALAN contributes to long term insects decline at population scale, considering the major impacts of other anthropogenic drivers (climate change, agricultural intensification, pesticides).

(Kalinkat et al, 2021) lay out recommendations for the design of long-term studies assessing the decline of pollinators due to ALAN at population scale, to address research and data gaps in this field.

What can be the ways to address light pollution issues in the city?

The **EU Green Public Procurement Criteria for Road Lighting and traffic signals** has been revised - it proposes concrete G-index values (directly related to blue light content) for parks, gardens and ecologically sensitive areas (Donatello et al, 2019).

AIR POLLUTION

There is relatively little research on the impacts of air pollution on pollinators, so it is still unclear to what extent air pollution may negatively affect them.

(Leonard et al, 2019) assessed the impact of acute exposure to diesel on cognitive functions of honey bee (odour learning and memory). The proportion of bees that successfully learnt odours following direct air pollution exposure was significantly lower in bees exposed to low, medium and high air pollutant concentrations, than in bees exposed to current ambient levels.

HONEYBEES / BEEKEEPING IN CITIES

Are wild pollinators affected by beekeeping in urban spaces?

Urban areas are increasingly recognised as havens for pollinators, but the support of pollinator populations is often mistaken to policies supporting honey bee colony installations (Ropars et al, 2019). Ropars et al showed that in Paris, wild pollinator visitation rates were negatively correlated to honey bee colony densities present in the surrounding landscape. Further, lower interaction in plant-pollinator networks was observed with high honey bee colony density within a 1000m buffer.

(Sponsler and Bratman, 2021) developed the concept of beekeeping *of* the city, as opposed to beekeeping *in* the city, which describes beekeeping that is consciously tailored to the urban context and takes into account the associated symbolic and social dimensions of the activity. In that context, beekeeping of the city should adopt a self-critical form of urban ecological citizenship; these include fostering self-regulation within the beekeeping community, harnessing beekeeping as a 'gateway' experience for a broader rapprochement between urban residents and nature, and recognizing the political-ecological context of beekeeping with respect to matters of socioecological justice. Beekeeping unto these ends need not and should not involve high densities of colonies, and healthy urban beekeeping requires self-understanding and self-regulation on the part of urban beekeepers.

Example from a city – Oslo

(Stange et al, 2017) - Municipal authorities in Oslo, Norway have proposed establishing eight "precautionary zones", within which placement of honeybee hives could be more strictly regulated. We propose a mapping and assessment approach for informing zoning decisions regarding urban honeybees, utilising a model of an urban landscape's biophysical capacity to support pollinating insects (ESTIMAP). Together with an additional model describing the approximate distribution of honeybees in Oslo, we identify areas in the city where domestic honeybees may be more likely to exhaust floral resources.

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