Guidance on Negative Emissions for Cities

Summary for Decision Makers

2026

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Why negative emissions matter for cities

Background

Reducing greenhouse gas (GHG) emissions and generating negative emissions through carbon dioxide removal (CDR) are the two building blocks for achieving a state of net-zero emissions. In 2015, the Paris Agreement set a global benchmark: limit the temperature rise to 1.5°C, reach net-zero emissions by the second half of the century, and net-negative emissions afterwards. The European Union (EU) is implementing this ambition with the European Green Deal setting out a roadmap for making the economy sustainable and climate-neutral by 2050. This is enshrined in the European Climate Law.

The EU Mission for Climate-Neutral and Smart Cities (hereafter: Cities Mission) was launched to accelerate and localise this effort. It supports 112 cities from within and beyond EU Member States in achieving climate neutrality by 2030. These cities act as trailblazers and innovation hubs for all European cities to follow by 2050. The Cities Mission prompted the development of the 'Guidance on Negative Emissions for Cities' (hereafter: Guidance), and this 'Summary for Decision Makers' (hereafter: Summary) to help Mission Cities navigate the complexity of residual emissions compensation in their pathway to climate neutrality by 2030. However, they are relevant and useful resources for any city aiming to achieve net-zero emissions and beyond.

Definitions

Negative emissions refer to the net removal and durable storage of carbon dioxide (CO_2) or other greenhouse gases from the atmosphere through deliberate human activities, beyond what would occur through natural processes alone.

Carbon dioxide removal (CDR) is the set of actions or interventions that generate such negative emissions.

A **carbon sink** is a net-absorbing reservoir (natural or human, in soil, ocean, and plants) in which the gas is stored.

Decision makers from all cities with a climate neutrality target who expect to have residual emissions must decide how they will balance them with negative emissions. This comes with challenging questions and valuable opportunities for sustainable impact. How can I use carbon removals without undermining emissions reduction efforts or risking reputational damage? How do I want to compensate for my residual emissions? What type of carbon removal solutions do I want to prioritise? How do I identify the co-benefits I want to unlock? What role should the municipal government take as it engages stakeholders, and which levers can it use? These questions are part of a city's residual emissions decision-making journey. Answering them as part of a detailed, pro-active, and forward-looking planning process can help build a strategy that is effective, transparent, inclusive, and resilient over time.

This Summary presents a concise and actionable roadmap for decision-making and a practical and accessible entry point to the Guidance. Throughout, references to "Section X.X", "Box X", "Figure X" or "page X" serve as links to the corresponding items in the Guidance, for deeper analysis and further reading. The "Navigating the Guidance" annex at the end of this document maps each section of the Summary to the corresponding sections of the Guidance, including related figures, boxes, and best practices.

Further reading

Box 4 defines carbon sinks and carbon removals, while Section 5 provides a definition of CDR. Box 3 clarifies the anthropogenic nature of CDR. Section 9 outlines the EU policy framework governing urban CDR, with particular emphasis on the Carbon Removal and Carbon Farming Regulation (CRCF) and, in Table 12, the LULUCF Regulation.

Residual emissions

As cities set their sight on climate neutrality, they quickly encounter a defining challenge: is it truly possible to eliminate all emissions? This question sparks a deep dive into every corner of urban activity, from energy systems to transport and industry, revealing which sources can be reduced and which stubbornly resist change. In some cases, cities may reach "absolute zero", eliminating emissions entirely. When that happens, the journey to climate neutrality is complete and the city does not need to realise negative emissions for the purpose of compensation.

More often, however, certain emissions (such as those tied to industrial processes or air and water transport) remain difficult, if not impossible, to fully eliminate with current and foreseeable solutions, even after having fully explored and exhausted demand-reduction options. At that juncture, cities must start taking different decisions. The priority must remain to prioritise emissions reductions. In the Guidance we call this the **'Emissions Reduction First Principle'** (Section 6.1), which builds on the following definition and warning:

Definition

Residual emissions in net-zero targets are those emissions remaining at the closure of the target-year inventory period after all technically and economically feasible opportunities for emissions reduction have been implemented.

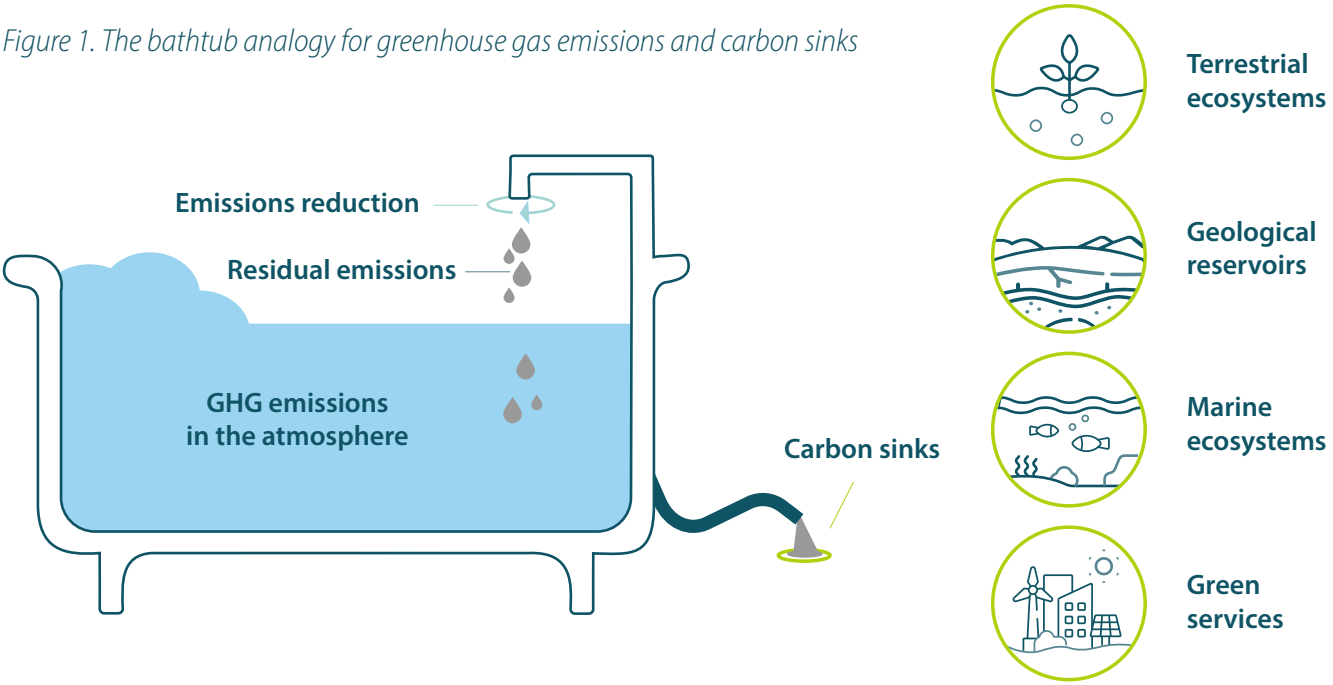
Residual emissions should NOT be defined through target-setting (e.g., 20% of baseline emissions), but via a critical analysis of local sources of emissions and associated mitigation constraints. Residual emissions vary in time due to technological advancements, market dynamics, and the local political and social context. Identifying emissions as truly residual is therefore an ongoing exercise.

Succeeding in this exercise legitimises CDR as the solution to persistent emissions against which reduction and avoidance measures fail or do not yet exist. It also avoids all the potential political, economic, and technological pitfalls of an oversized CDR deployment strategy. As elaborated in Figure 1 below, carbon removal is used as a relief valve for the CO_2 that continues to be emitted and concentrates in the atmosphere as reduction efforts continue.

While carbon removal methods are diverse, the carbon sinks are restricted to geological reservoirs, terrestrial and marine ecosystems, or durable products. In the value chain of a carbon removal project, sinks can cover both the removal and storage section, particularly in natural sinks, or just the storage medium in the case of chemically engineered sinks. When the sink covers the full project value chain, interventions focus on creating, restoring or enhancing the carbon absorption and retention qualities of the sink.

No-regret carbon removal strategies may be pursued for their additional benefits to deliver on a broader agenda beyond net-zero. Such strategies focus on CDR implementation actions that deliver immediate climate mitigation and meaningful ecological, economic, or social co-benefits. Think of strategies that prioritise ecosystem restoration, soil or water quality improvements, and sustainable land management to secure carbon sinks while protecting biodiversity and adapting to climate impacts.

Figure 1. The bathtub analogy for greenhouse gas emissions and carbon sinks



Source: Internal analysis

While residual emissions planning should not be based on target setting, setting separate targets for emissions reduction and carbon removal can help cities pursue strategic objectives for no-regrets carbon removal, while preventing the moral hazard of delaying emissions reductions. No-regret carbon removal strategies should however never deter, delay, or sidetrack emissions reduction efforts.

Further reading

Sections 3, 4 and 6.1 discuss the theoretical approach and the operationalisation of the definition of residual emissions to ensure that they represent genuine instruments of climate action. Box 16 discusses the potential benefits of setting different targets for emissions reductions vis-à-vis temporary and permanent sequestration. Finally, Section 5 introduces the use of CDR beyond net-zero targets, further developed in the following sub-sections.

Urban CDR options and potential

For emissions that are truly residual, decision makers can introduce compensation mechanisms. At the highest level, they have the option to either develop local in-boundary carbon removal projects (within the city jurisdictions) and/or buy out-of-boundary carbon removal credits (outside the city jurisdictions).

The origin of the removed GHGs must be atmospheric to compensate for residual emissions. This can be done by either capturing them directly from ambient air or indirectly from biomass. This means that the capture and storage or utilisation of GHGs from fossil sources (like capturing CO_2 from the flue gas of power plants or industrial facilities) is not CDR. It is a form of emissions reduction, or better yet, avoidance and can thus contribute to the overall emissions reduction target. Storage durability should also be meaningful (decades to centuries). Using, re-using or recycling biogenic CO_2 or CO_2 captured from ambient air to produce short-lived products is not a valid compensation strategy.

Cities are critical for scaling carbon removal and achieving global net zero. Early conservative assessments point at a potential of over 1 $GtCO_2$/yr by 2050 globally (Section 5.1.1) with the possibility for the built environment to become a distributed carbon sink. The deployment of carbon removal in urban environments is, however, still in its infancy, best practices are limited, and standardisation has been lacking, making it difficult for decision makers to know what options they have and how to prioritise them.

How should decision makers look at the landscape of carbon removal methods and the different ways of implementing them in urban environments? This starts by recognising that CDR methods differ in their removal process, storage medium, and permanence. They further differ in terms of their technological readiness level (TRL), potential co-benefits, and challenges that come with their implementation. To build an effective carbon removal portfolio strategy, a decision maker should take these metrics into account and apply them to the specific local circumstances of the city. Table 1 offers an overview of the main CDR methods, their global carbon storage potential, cost, and the potential co-benefits that can be realised, as well as the potential challenges (Section 5 and sub-sections).

Well-crafted carbon removal projects can unlock major social, economic, and ecological co-benefits. This increases the impact of individual projects, improves their revenue model, and builds public support. On the contrary, when designed or implemented poorly, they can have detrimental outcomes for local communities, biodiversity, and ecosystems, jeopardising the legitimacy of the entire climate action strategy.

Choosing which compensation mechanism to use is part of a process. The decision to develop local carbon removal projects within the city or buy carbon credits from projects outside the city should be the outcome of a balanced analysis of cost, local co-benefits, and the need for verifiable, durable climate action. The ideal approach is locally rooted and often involves prioritising local projects where feasible, while buying credits to fill gaps. A compensation strategy can also be structured to evolve, depending on the specific compensation needs and opportunities at a given point in time.

Table 1. Overview of CDR methods, showing indicative costs, potentials, benefits, and challenges.

High	High	High	High
Medium	Medium	Medium	Medium
Low	Low	Low	Low

***i.d.* - Insufficient data**

CDR methods and specific implementation options	Potential	Cost	Benefits	Challenges/ risks
Afforestation, reforestation, revegetation: Expanding urban forests and parks; Planting street trees and green corridors				
Improved forest management: Improved management of urban forests and parks		*i.d.*		
Agroforestry: Integration of trees and shrubs into urban agricultural areas		*i.d.*		
Soil carbon sequestration: Land management practices to increase carbon in urban cropland and grassland soils				
Terrestrial wetland restoration: Restoration of wetlands like peatlands for cities with dried or degraded wetland areas		*i.d.*		
Coastal wetland management: Planting or restoration of tidal marshes, mangroves and seagrasses for coastal cities		*i.d.*		
Biochar: Urban biogenic waste conversion into biochar; Soil amendment of urban green spaces; Structural soil for green stormwater infrastructure; Biochar additions to construction materials, such as cement-based materials; Use of biochar for heating or energy production				
Durably harvested wood products: Timber in construction (cross-laminated timber, glulam, wooden bridges, mass timber construction and urban landscaping)		*i.d.*		
Bioenergy with Carbon Capture and Storage (BECCS): Combustion of urban biogenic waste with CO_2 capture; Biofuel production with CO_2 capture; Wastewater treatment with CO_2 capture				
Direct Air Carbon Capture and Storage (DACCS): Modular direct air capture in buildings				
Enhanced Weathering: Spreading of suitable rocks and minerals into dedicated urban soils				
Ocean Alkalinity Enhancement (OAE): For coastal and port cities, artificially increasing alkalinity of seawater				
Ocean fertilisation: For coastal and port cities, performing iron or nitrogen and phosphorous additions, or enhanced upwelling				

Source: Internal analysis

Claiming negative emissions from existing forests and trees without proactive measures to enhance the carbon sink qualities risks accusations of greenwashing and overestimations of impact.

Best practice preview

A number of Mission Cities stand out for the richness of temporary CDR options contributing to their residual emissions strategy: Valencia and Vitoria-Gasteiz (Spain), Budapest (Hungary), Oslo (Norway), Ljubljana (Slovenia), and Glasgow (United Kingdom). This is discussed in Annex 1, on page 169. Notably, Barcelona (Spain) and Sofia (Bulgaria) crafted a comprehensive approach to natural carbon sinks with attention to the preservation of tree health over time (see page 93 of the Guidance).

Concerning permanent CDR options, Stockholm, Helsingborg, Malmö (Sweden) and Oslo (Norway) emerge as best practices as discussed in Annex 2, on page 178. Greater Dunkirk (France) focused on the permanence of its strategy, minimising the risks associated with non-durable emissions sequestration through monitoring and early detection, buffer reserves, insurance and risk management, and durability enhancement (page 39 of the Guidance). Finally, Amsterdam (The Netherlands) was at the centre of a world-first high-level assessment of the carbon removal potential in and around its metropolitan area, discussed on page 35 of the Guidance.

Further reading

Section 5 outlines the difference between atmospheric and fossil CDR and introduces in-boundary carbon removals and out-of-boundary carbon removal credits as the two avenues for the compensation of residual emissions. The two options are then individually elaborated in Sections 5.1 and 5.2 respectively, while conditions for their transparent use, accounting and reporting are covered in Sections 6.2 and 7, with the main conclusions and recommendations condensed in Section 10.

The overall urban CDR potential and most typical urban options (and implementation modalities) are presented in 5.1.1, while Figure 4 offers a decision tree for identifying urban CDR strategies tailored to a city's context. Box 6 synthesises the key facts about the present and future of CDR. The details of individual CDR options are discussed in the three Annexes, dealing with temporary, permanent and non-carbon removals respectively (Figure 9 recalls the global warming potential of different greenhouse gases), with Tables 1, 2, 3 (pages 26-32) and Table 5 (page 64) serving as synoptic illustrations. Section 7.2 and Box 46 focus on the possibility for the built environment to become a distributed carbon sink, while Section 7.1 explores in detail the land sector. In relation to land-based options, Box 3 discusses the pitfalls of claiming negative emissions from existing forests and trees without anthropogenic sink enhancement, Box 8 focuses on carbon farming, Box 31 explains why the emphasis is on forests and trees rather than any other urban greening option, Box 32 illustrates the reasons why a healthy and growing tree is a better service provider, and Box 47 discusses the use of crop residues and purpose grown biomass for CDR.

In addition, Section 7.4 explores potential implications of urban CDR on scope 3 or consumption-based emissions. Durability and permanence of various compensation options are discussed in Section 5 and its sub-sections (including the IPCC classification in Figure 3), as well as in Section 7 (and sub-sections) with respect to urban forests, trees, wetlands (see also Boxes 35-37), and the built environment. Considerations of environmental and ethical integrity are elaborated in Section 6.3, co-benefits in 6.4, while Sections 6.5 and 6.6 outline the positive implications of a diversified portfolio and offer insights on cost-and-time-effectiveness.

Promoting residual emissions compensation

Within their boundaries, cities can support CDR through technological, regulatory, financial, urban planning and political-economy levers. Depending on constraints such as the specific legal competences, alignment with the national government, and the awareness and support from residents, decision makers can use these levers to a greater or smaller extent. This places them in different roles in relation to the carbon removal stakeholder ecosystem: strategiser, regulator, service provider, innovator, funder, convener, or a combination of these (Box 7).

A similar logic applies to carbon removal credits where local governments can act as buyers, investors, or even as project developers. As decision makers prepare themselves, they should identify their main orientation and decide which CDR methods and co-benefits to pursue. This should shape the overall approach to residual emissions management, as well as the governance and policies developed to implement the compensation strategy.

Maximising co-benefits and minimising trade-offs should always be the objective when considering a carbon removal strategy, whether this targets in-boundary removals or out-boundary credits (Section 6.4). Looking at CDR methods for their co-benefits can help increase the social acceptance and political feasibility of public measures by emphasising the positive impacts for local communities.

Urban CDR comes with specific considerations, technical challenges and opportunities, regulatory caveats and advantages, local co-benefits, and engagement avenues for city administrations. Choices about how to support and deploy emissions compensation solutions have long-term consequences: the selection and combination of different options into a portfolio will shape overall cost and time effectiveness, technical and social feasibility, the likelihood of achieving results within target timelines, and the distribution of co-benefits and risks.

Further reading

Box 7 on page 32 outlines the action levers and specific roles cities can take with respect to emissions compensation, with Section 5.2 (notably 5.2.3) deepening the discussion with respect to carbon credits. Urban governance and decision-making around CDR are also discussed in Sections 5.1.1, 6, 7 (notably 7.2), and Box 29 (approach to legacy effects).

Residual emissions decision-making journey

The residual emissions decision-making journey is a long-term journey full of challenging decision-making junctures that require preparation and attention to navigate adequately.

It is moreover a journey that is ongoing as new developments may make certain emissions less 'residual', while carbon removal projects require sustained management to ensure they continue to deliver their climate and non-climate benefits.

1 How do I define my residual emissions?

Defining your residual emissions with high integrity follows an iterative calculation and planning process.

How do I develop a carbon removal strategy? 2

Designing a strategy that is resilient, robust, and anchored in local considerations can follow tried and tested approaches and guiding principles.

- **In-boundary: Project development strategy** - Carbon removal opportunity identification and project development is context-specific, intentional about the positive impacts and controlled with respect to trade-offs.
- **Out-boundary: Portfolio development strategy** - Carbon credit portfolio development involves many choices across areas like quality, project type, geography, which must be navigated with care to ensure the aspired impacts.

3 How can I structure the governance, policies, and funding of negative emissions?

- **GHG inventory management, carbon accounting, and monitoring-reporting-verification (MRV)** - Ensuring accurate carbon removal data management is a condition for successful climate neutrality policymaking.
- **Stakeholder governance and public engagement** - Progress is dependent on working together with a broad ecosystem of internal and external stakeholders.
- **Policy and regulatory instruments** - Supporting the scale-up of carbon removal requires thinking holistically and creatively about the regulatory and policy toolbox.
- **Funding approaches and instruments** - Funding the scale-up of carbon removal is a phased effort that requires targeted and predictable public and private financing.

What concludes the journey? 4

The conclusion of the residual emissions decision-making journey is the start of a new analytical cycle to identify new emissions reduction options.

The rest of this document follows the city's path through these decision-making junctures.

The journey - Residual emissions planning in practice

Any city decision maker who wants to embark on a net-zero emissions journey should pause to ask a set of critical questions about the nature of the expected residual emissions. Answering the following questions helps getting a more accurate assessment of the emissions reduction potential and facilitates navigation through the subsequent decision making stages.

- Are my residual emissions the outcome of a critical analysis of local emission sources and abatement constraints?
- Does my compensation strategy target exclusively emissions that originate from hard-to-abate sources which cannot be reduced with current or foreseeable solutions?
- Is the definition of the emissions reduction target associated with my city's net-zero ambition defined in line with this analytical approach?
- Have I guaranteed transparency on the emissions that will likely remain unabated and is this enough for the credibility and legitimacy of my climate neutrality target?
- Do I have a dynamic planning mechanism that defines the magnitude of residual emissions and carbon removal needs as part of an ongoing iterative process?

1 How do I define my residual emissions?

Overarching considerations

Defining and addressing residual emissions is part of an iterative process that keeps pace with rapid changes in the emissions reduction technology and market developments. Any time when the state of the city's emissions is assessed, for example when the GHG inventory is updated, the expected volume of residual emissions should also be updated (Emissions Reduction First Principle, Section 6.1). Taking an analytical approach to this process will strengthen the transparency and accountability of the climate neutrality target and can be operationalised by taking the following actions (Section 4):

Checklist of actions

- [ ] Start from your baseline emissions and subtract the total emissions reduction associated with your climate neutrality action portfolio. What is left are your "remaining" emissions, not yet your residual emissions. An analytical process kicks in.
- [ ] Dive into the sources of remaining emissions, map available and expected mitigation solutions in the foreseeable future.
- [ ] Understand the underlying reasons and limitations that prevent further reductions, including those constraints that prevent solutions from being implemented. Can you directly or indirectly lift those constraints? If the answer is *No*, those emissions are residual and have to be compensated.
- [ ] If the answer is *Yes* and it is feasible to reduce or avoid emissions further, another planning phase starts and feeds back into the calculation of the total emissions reduction that can be achieved by the target year.
- [ ] Regularly update emissions reduction trajectories as new mechanisms, technologies, and opportunities become available.
- [ ] Update the estimate of residual emissions based on planned and implemented actions at each new assessment point.



Delaying rapid and sustained emission reductions increases the need for CDR in the long term, limits the benefits associated with emission reductions at source at the expense of local communities and future generations, increases reliance on solutions not yet been proven at scale, and eventually amplifies system-wide costs.

When this process is successfully concluded, it is time to start thinking about compensation mechanisms.

Best practice preview

Helsinki (Finland) is exploring emissions compensation options while continuing to search for reduction options. It is working on three technical reports focused on identifying local carbon sinks and compensation challenges. This will guide the delineation of its residual emissions strategy. See more on page 68 of the Guidance.

Further reading

The logical process behind the iterative identification and quantification of residual emissions is presented in **Section 4**, framed within the potential detrimental impacts of CDR overreliance (expanded in **Sections 6.1** and **6.3**). **Figure 1** illustrates the methodology for identifying remaining versus residual emissions in the strategic planning. **Figure 2** includes a list of acknowledged sources of possible residual emissions and abatement solutions, along with a non-exhaustive list of constraints. The analytical steps are translated into key questions and answers, leading to a 6-level scale to rate the difficulty of mitigating remaining emissions. **Box 1** offers an example in the form of the waste sector.

2 How do I develop a compensation strategy?

Overarching considerations

Once residual emissions have been identified, the decision maker starts looking at the compensation strategy. This brings forward a range of questions. What carbon removal methods can I pursue? On what basis should I decide to prioritise in-boundary sinks or out-boundary carbon removal credits? What opportunities are available within the constraints relevant to my city?

Navigating the pitfalls of this process and ensuring an effective compensation strategy becomes easier when following a set of guiding principles, as explained in detail in Section 6 of the Guidance and summarised below.

Guiding principles

- **Emissions Reduction First Principle**: Approach and address residual emissions with a view of prioritising emissions reduction whenever possible (Section 6.1).
- **Transparency Principle**: Report emissions accurately and transparently, enable external analysis of the MRV, and disclose compensation efforts publicly (Section 6.2).
- **Environmental and Ethical Integrity Principle**: Prevent unintended negative impacts on the environment and the society and manage storage impermanence (Section 6.3).
- **Co-benefits Principle**: Prioritise projects that maximise local co-benefits and support other city goals (Section 6.4).
- **Diversification Principle**: Diversify between and within compensation mechanisms to manage risk, maximise impact, and handle permanence (Section 6.5).
- **Cost and Time Effectiveness Principle**: Analyse the costs and benefits of early vs late adoption of specific CDR methods (Section 6.6).

The first two principles are essential in every step of the residual emissions decision-making, from initial quantification and planning to monitoring, reporting and learning. The integrity and co-benefits principles are crucial in the selection of the individual emissions compensation mechanisms. They are complemented by the **Like-for-Like Principle**, which helps choose options that truly realise a “compensation”, meaning the counterbalancing of the source of emissions with sinks that share the same origin and atmospheric residence time (Section 5). Finally, diversification and cost/time effectiveness are powerful principles in combining individual options into effective portfolios.

A decision maker should apply the principles holistically to maximise the impact of residual emissions compensation and avoid unintended consequences. Overlooking these principles may lead to a strategy that fails to

realise the carbon removal volumes needed to meet the climate neutrality target, undermines the legitimacy of climate action more broadly, and makes it more difficult to introduce climate action measures in the future.

In general, critical aspects to consider when building the blocks of a residual emissions strategy include the maturity of a CDR method, time and cost-effectiveness, feasibility, challenges for certification, scalability, transferability, replicability, and sustainability. Decision makers must also ensure the management of natural and engineered carbon sinks to mitigate the risk of carbon leakage (Section 7.3).

However, none of these issues are relevant unless there is reasonable assurance that the project delivers net-negative emissions (i.e. negative emissions after accounting for any positive emissions). This assurance depends on a positive answer to the following four questions:

- Are the emissions removed from the atmosphere rather than fossil sources?
- Are the removed GHGs stored in a way meant to be durable?
- Are upstream and downstream emissions connected to the removal and storage process estimated and included in the emission balance?
- Is the total quantity of atmospheric GHGs removed and permanently stored greater than the total quantity of GHGs emitted to the atmosphere with the same activity?

Compensation strategies are associated with upstream and downstream emissions that may transcend the city boundary and contribute to the true realisation of net negative emissions. Considering scope 3/consumption-based emissions (in decision-making, if not in accounting), may unveil a wider spectrum of opportunities for limiting residual emissions, prevent leakage, and deliver ecological, safety, and ethical co-benefits.

Best practice preview

Differdange's strategy for addressing residual emissions is a powerful example of application of the Diversification Principle, as it combines nature-based solutions, technological solutions and carbon credit purchases through a mix of local and international initiatives. See more on page 73 of the Guidance.

Further reading

While the like-for-like principle is presented in **Section 5**, the six core principles to design a robust, high-integrity residual emissions strategy are described in detail in **Sections 6.1-6.6**. Within these sections, **Tables 4 and 5** provide a useful overview of the attributes and positive and negative impact categories associated with specific CDR methods, highlighting their relevance to environmental integrity and urban contexts. **Table 6** describes the potential advantages and disadvantages of late and early compensation of residual emissions. The Transparency Principle is discussed in several contexts throughout the report: in **Section 7.1** and **Box 17** (page 62) in relation to the land sector, with **Box 30** offering additional analysis on forests and trees; in **Section 7.2.1** in relation to the built environment; in **Box 19** (page 67) in relation to carbon

credits and the associated risks of fraud and double counting; and in Section 8 in relation to emissions reporting. Similarly, the Diversification Principle is exemplified in Box 32 for the land sector (page 92) and the Co-benefits Principle in Box 22 (page 71) as concerns potential synergies between carbon removal and climate adaptation. Leakage is addressed in Sections 6.1, 6.3 and in Box 42 (page 112) concerning scope 3 emissions, which in turn are discussed in Section 7.4. Finally, the criteria to verify a net-negative emissions balance are described in Sections 5, 6.2 and 7, as well as in Box 3 on page 20.

In-boundary CDR: Project development strategy

Important considerations

A project development strategy must be prepared once expected residual emissions are identified, and a decision maker decides to compensate them (fully or partially) with in-boundary carbon removals. This should be a phased effort that considers the guiding principles outlined before and is based on the most effective, advanced, and economically viable methods at the time of preparation. The time scale of carbon storage, the wider impact of projects, and the risks associated with individual techniques are critical decision-making parameters to inform a diverse, impactful, and resilient strategy.

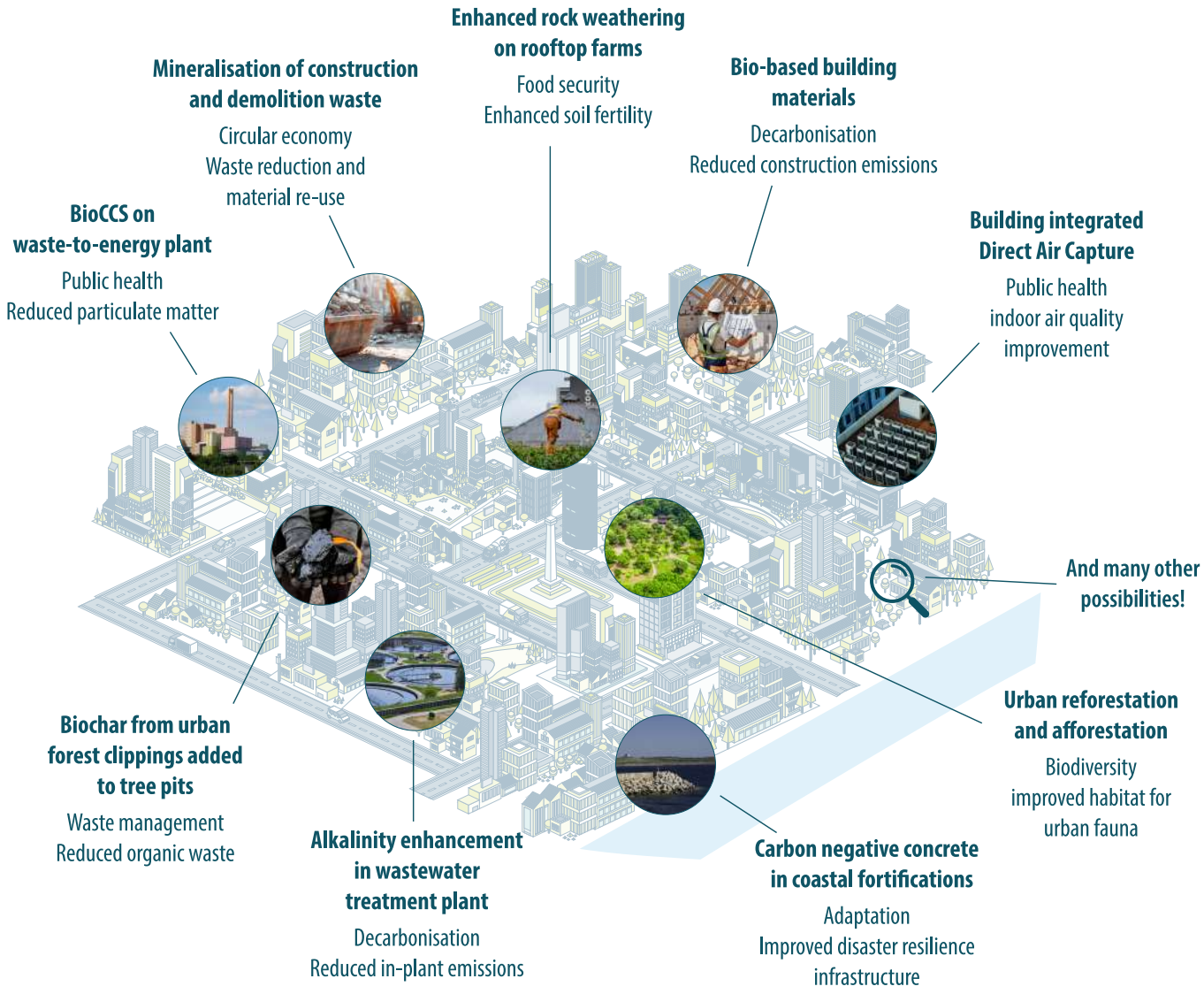
Learning from others is important, but each city will have its own context-specific geographic and jurisdictional particularities to bear in mind. These are not only constraints but also opportunities. Decision makers should aspire to lean into those particularities and create the greatest added value locally. Put differently, an effective strategy builds on the specific considerations, technical challenges and opportunities, regulatory caveats and advantages, local co-benefits, and engagement options for city administrations, in line with the specific CDR method of choice.

Projects can be designed in response to other city needs and targets that go beyond climate change mitigation, with carbon removal delivered as a co-benefit. Good governance mandates that a project development strategy deliberately identifies its positive impacts and the trade-offs that must be managed.

Definition

Embedded CDR Policymaking is a form of policymaking that aims to integrate CDR holistically into urban systems planning, urban infrastructure, public policies, and governance structures (Box 21). This policy approach can help minimise and re-distribute costs, and secure social legitimacy by positioning CDR as part of broader urban sustainability initiatives. It can improve the financial viability of CDR projects and stabilise demand by tying them to essential public services. An illustration is provided below.

Figure 2. CDR integration in urban environments. Every city, irrespective of its form, urban context, development level, or trajectory, has unique opportunities to embed CDR in their systems and fabric.



Source: Internal analysis

Checklist of actions

- [ ] Identify opportunities to strengthen existing natural carbon sinks in the urban, peri urban, and rural landscapes to deliver energy, economic, societal, environmental, and health co-benefits.
- [ ] Consider opportunities for integration into urban systems, infrastructure, and industrial processes, such as waste management, wastewater treatment, and construction.
- [ ] Strengthen transparency and social legitimacy by engaging both affected local communities and the public as part of the strategy development process.
- [ ] Embed CDR policymaking through political and fiscal synergies with public policies for energy, waste, land use, food, wellbeing, urban planning, and climate adaptation.
- [ ] Map potential trade-offs, socio-ecological risks, and storage reversal risks that come with identified carbon removal opportunities and consider possible remediation measures.
- [ ] Design a holistic strategy that manages risks, maximises local co-benefits and policy synergies, diversifies CDR methods, and increases storage permanence.

The social legitimacy and financial viability of CDR projects can rapidly deteriorate when CDR policies undermine rather than enhance existing urban policies and political priorities such as public health or environmental justice. Such scenarios risk turning CDR into an unsustainable burden on municipal finances and political capital. These effects become even stronger when poorly planned projects lead to adverse effects on local communities and ecology.

Any material reversal of stored carbon that is unanticipated and unaddressed (through e.g., extra buffers of carbon removals or a gradual reinforcement of temporary with permanent CDR) will undermine the climate impact, limiting the project's contribution as a residual emissions compensation mechanism.

Further reading

In-boundary CDR options are presented in Sections 5.1, 5.1.1 and detailed in the Annexes, with Figure 3 and Figure 4 offering the IPCC classification and the decision tree to identify urban CDR methods suitable to a city's context. Permanence and risk of reversals are discussed throughout and deepened in Sections 6.3 (in general) and 7.2.1 (as concerns the built environment). Box 21 on page 70 details the pathways to and benefits of embedding CDR in urban policies and systems. Within a broader discussion on the importance of the Transparency Principle for social equity, justice and public support (Section 6.1), Box 18 on page 62 discusses the importance of transparent public engagement in the strategy development process, while Box 20 on page 68 addresses the strategic and equitable utilisation of out-of-boundary sinks. Finally, the complexity of ensuring ethical integrity in the context of CDR deployment is discussed in Section 6.3, while Section 6.4 addresses the equitable distribution of co-benefits.

Out-of-boundary CDR: Portfolio development strategy

Important considerations

What are your options if the opportunities for developing carbon removal projects within the boundary of your city are insufficient? Many decision makers will run into this question. It may be because of limited space or feedstock resources, because of social and political constraints, or for other reasons. Regardless, a decision maker can decide to compensate for the city's residual emissions with verified carbon credits from the Voluntary Carbon Market (VCM), originating from CDR projects outside the city's boundary.

Can I buy in-boundary carbon credits?

Yes, however in-boundary removals do not need to go through the crediting process to be counted towards climate neutrality. Nevertheless, buying in-boundary carbon credits may be an effective way to contribute financially to the realisation of a CDR option (e.g., large-scale BECCS projects).

Such credits will count towards your neutrality goal. On the contrary, if an in-boundary project sells its credits to an external buyer, the city cannot claim those negative emissions for its own climate neutrality target (to avoid double counting).

Choosing the right credits can be challenging. The quality of a carbon credit is directly related to the integrity of the credit-generating activity which in turn depends on its climate and socio-environmental impacts, additionality, baselines, leakage, and permanence. In the EU Cities Mission, **retired** (bought) carbon credits can be used to compensate for

residual emissions only if they are attached to **carbon removal** activities, are **high-quality** certified units as defined by the EU Carbon Removal and Carbon Farming Regulation (any equivalent certification scheme will do) and do **not** originate from activities the city has **excluded** from the target boundary (Section 5.2). This is to avoid the paradox where cities propose exclusions from the target and then claim carbon credits from activities on those exclusions.

Developing a diverse portfolio of credit-generating projects helps distribute the overall risk and responsibility, enables different roles for the city (developer, investor, or buyer), and allows a decision maker to pursue different objectives, combine new and established CDR methods, manage reversal risks, and hedge against market fluctuations. This exercise involves answering questions about the type of project (method and storage durability), its location, the quality standard to follow, co-benefits to unlock, timing of the removal, role of the city in relation to the project, and how to communicate claims in relation to the climate neutrality target.

In terms of portfolio management, decision makers can prioritise credits from projects that better align with broad public priorities, avoid perverse incentives, and promote climate solidarity. Decision makers are advised to build a portfolio that prioritises ex-post carbon credits (those issued once the carbon benefit has materialised). Ex-ante and pre-purchased credits work well for carbon removal projects that are highly innovative and have the potential for large, scalable, and highly durable carbon storage; however, ex post verification of the contribution achieved by target year is required.

Checklist of actions

Follow the step-by-step approach outlined in Section 5.2.3. to guide purchase decisions and craft a strategic, long-term approach. In particular:

- [ ] Choose credits that qualify as high-quality certified units under the EU CRCF or are fully aligned with CRCF quality criteria.
- [ ] Guarantee that the credit is the result of a verified carbon credit project and not a local carbon contribution or carbon offsetting programme or funds.
- [ ] Ensure that the credit is issued in a publicly available registry to ensure transparency and traceability.
- [ ] Prioritise ex-post carbon credits as a portfolio foundation. Consider ex-ante or pre-purchased credits from projects with benefits starting to materialise before the target year.
- [ ] Ensure that the credit portfolio used to compensate for residual emissions increasingly prioritises activities that store carbon with a low risk of re-release into the atmosphere.
- [ ] Consider “local” or “peer solidarity” by buying credits from projects in nearby municipalities, to intensify local co-benefits, territorial cohesion, and inter-city cooperation.
- [ ] Consider the merits of shared public procurement of carbon removal credits to balance residual emissions and foster innovation.

Emissions reduction and avoidance credits are not a valid means of compensation in the Cities Mission in alignment with international best practices.

Excluding activities from your target, such as from the AFOLU sector, and subsequently claiming the negative emissions they generate, is not considered a high-integrity approach to compensation.

Not procuring EU CRCF certified credits, or credits certified under comparable high-quality standards, comes with serious risks, especially for cities that do not have the expertise to navigate this market. It becomes more difficult to quantify the climate and socio-environmental impacts, additionality, baselines, leakage, and permanence. Public finances dedicated to projects that fail to deliver the promised climate impact or cause adverse effects on local communities and ecosystems may lead to reputational damage and reduced social legitimacy.

Best practice preview

The city of **Łódz** (Poland) has a balanced and holistic approach to developing its portfolio strategy for out-boundary carbon removal credits. Its Climate-Neutrality Action Plan specifies the types of projects, their origin, and crediting frameworks along with estimation of negative emissions generated and associated costs. The city of **Tampere** (Finland) has assessed its options for building a long-term carbon credit strategy to meet its 2030 net-zero target. Finally, the city of **Munich** (Germany) proactively sustains local co-benefits by realising and funding regional carbon sink projects in the wide Munich Metropolitan area. See more on pages 57 and 71 of the Guidance.

Further reading

Section 5.2 provides in-depth guidance to decision makers on the use of carbon removal credits as a compensation mechanism, with **Figure 5** showing a simplified classification scheme of the five types of carbon offsets. **Box 11** clarifies potential avenues for cities to purchase Article 6 removal credits while **Section 5.2.1** introduces the voluntary carbon market, with **Box 12** offering further reading on different international initiatives aimed at ensuring the quality of the VCM. **Section 5.2.2** describes the quality considerations related to carbon credits, how to safeguard environmental integrity, and the minimum requirements for EU Mission Cities (deepened in **Sections 6.2** and **6.3**), with **Table 5** illustrating the environmental integrity attributes for carbon credits. **Box 9** (page 43) describes the lifecycle of carbon credits (issued, sold, retired) and introduces the definitions of ex-post, ex-ante and pre-purchased carbon credits and the associated conditions for use in net-zero targets. **Section 5.2** specifies that only carbon removal credits can be used to compensate for residual emissions, with **Box 10** clarifying the role of non-removal credits in the broader climate change mitigation discourse. **Box 13** on page 52 further clarifies the difference between verified carbon credit projects and local carbon offsetting programmes or funds. **Box 14** discusses the merit of shared public procurement, **Box 15** demonstrates how credit revenues can and should be used strategically to unlock higher ambition in climate action, and **Box 23** illustrates typical prices and price determinants. **Table 7** elaborates on the development of a carbon credit portfolio that incorporates credits with different time horizons, **Box 19** discusses how to navigate the risk of fraud and double counting, and **Section 6.4** discusses the importance of solidarity in buying credits from projects in nearby municipalities to intensify local co-benefits. Finally, target exclusions and their implications on carbon credits are discussed in **Box 2** on page 19 and later in **Sections 6.2** and **7**.

3 How can I structure the governance, policies and funding of negative emissions?

Overarching considerations

Project development is only a part of the journey. Organising the governance, designing your municipal toolbox, and crafting an effective funding strategy are all critical steps that bridge the gap between ambition and implementation. Decision makers can navigate this effort better when they identify the primary role that the city is expected to take within the wider stakeholder environment. Is the city primarily the 'Strategiser' of its carbon removal efforts, 'Regulator' of the operating environment, 'Service Provider' of carbon sinks in the city, 'Innovator' supporting local and collaborative R&D&I, 'Funder' to unlock carbon removal demand, or 'Convener' enabling the local CDR ecosystem?

Knowing your main orientation helps with developing an effective governance framework and set of policies to manage all the issues that come up with the development and implementation of emissions compensation strategies (Box 7). This can include the scale and timing of deployment, accounting, monitoring, reporting and verification of the climate impact, storage permanence and reversal risks, sustainability constraints and challenges, the social legitimacy of certain methods, incentive mechanisms and public investments, public engagement and community involvement, and the need to develop a portfolio that aligns with the nature of the remaining emissions over time.

The municipal toolbox can be highly diverse and creative. There are basically five levers of action that local governments can use to support CDR development:

1. **Technological levers** relate to supporting research, development and innovation efforts, the deployment of demonstration projects and building capacity.
2. **Regulatory and policy levers** help create an enabling environment for CDR investment and adoption, offer certainty and incentives, and reduce red tape.
3. **Urban planning levers** enable a city to integrate carbon removal interventions and solutions into spatial planning and the design of low-carbon urban zones.
4. **Financial levers** allow a city to provide catalytic funding through a diversity of instruments that draw in private sector investment and make the business case for CDR projects such as public-private partnerships, green bonds and other financial instruments, and carbon pricing mechanisms.
5. **Political-economy levers** entail interventions to ensure community buy-in and increase the social license of CDR such as community engagement, citizen education, innovation summits, and participatory governance models.

Municipal interventions, both in and beyond the city boundaries, will fall within these five categories of action. They can be planned according to their function in creating an enabling environ-

ment for CDR: driving demand, developing supply, or building societal legitimacy for CDR more generally.

Depending on its specific constraints, a decision maker can use these levers to a greater or smaller extent, placing the city in different roles in relation to the carbon removal stakeholder ecosystem (Box 7). By determining the main role for the city at the outset, decision makers can inform their toolbox, ultimately guiding their efforts to advance CDR.

Best practice preview

Pages 39-42 of the Guidance provide an overview of different approaches taken to the governance of carbon sequestration covering institutional, regulatory and planning instruments, financial instruments, participative governance mechanisms, and capacity-building initiatives. There are examples from **Warsaw**, **Wroclaw** (Poland), **Angers Loire Métropole**, **Grenoble-Alpes Métropole** (France), **Glasgow** (United Kingdom), **Izmir** (Türkiye), **Münster** (Germany), **Athens** (Greece), **Oslo**, **Trondheim** (Norway), **Riga** (Latvia), and **Zagreb** (Croatia).

GHG inventory management, carbon accounting and MRV

Important considerations

Effective governance of emissions reductions and carbon removals is made possible with a robust inventory. Setting up and managing an inventory that identifies the level and sources of emissions against a base year and within a specific accounting boundary can be challenging. Yet this is the only way to eventually prove a climate neutrality status. It also helps to prevent the risk of fraud and double counting of emissions reductions or removals, advance co-benefits, and guarantee the quality of credits.

Following the Transparency Principle (Section 6.2) means reliably measuring and documenting all positive emissions (emitting activities and sold carbon credits) and negative emissions (carbon removals and retired carbon removal credits), to arrive at a correct and verifiable estimation of the net emissions (positive minus negative emissions) at a given point in time. Any activity contributing to the residual emissions strategy shall be fully accounted for in the calculation. This entails that alongside removals, also emissions or emissions reductions, if applicable, enter the equation.

At the end of the day, progress can only be reported against a transparent baseline that is established for each of the sectors, sources, gases, and geographical areas included in the target boundary. For the AFOLU sector, in particular, this can involve a data-intensive step in the accounting process with significant uncertainty to navigate. Quantifying the amount of removals in the accounting year comes with a need to regularly monitor the permanence of the stored carbon and reflect any reversals and mitigation measures. Any increase in direct and indirect emissions attributable to the carbon removal activity in the

accounting year must be quantified and added to the net emissions calculation.
The uncertainty involved in the accounting of specific carbon removal methods can be daunting for decision makers given the wide diversity of the options. This is especially true for the more temporary forms of carbon removal. As new protocols and standards are developed and trained, decision makers could benefit from participating in inter-city exchanges, research partnerships, and capacity building initiatives. Decision makers should also regularly check the availability of guidance documents, performance standards, accounting equations, formulas, and/or methods.

Checklist of actions

- [ ] Establish a baseline associated with all sectors, sources, gases, and geographical areas included in the target boundary.
- [ ] Separate the reporting of emissions and sold carbon credits from the carbon removals and retired carbon removal credits to arrive at a net emissions balance.
- [ ] Transparently account for both positive and negative emissions associated with the same source and report each contribution clearly. This includes all relevant direct and indirect emissions that can be attributed to the carbon removal activity in the accounting year.
- [ ] Break down each term of the equation by accounting according to sectors, possibly also by source/activity and type of greenhouse gases.
- [ ] Introduce a clear accounting system for all offsetting activities within the city that produce credits and clarify how they are factored into the inventory.
- [ ] Detail the methodological steps used for accounting, monitoring, reporting, and verification, as well as the provisions to avoid double counting.
- [ ] Design a process to track, qualify, and possibly quantify potential sources of error in the accounting of specific removal methods.

Ensuring a high level of transparency is instrumental in building enough evidence and experience to lower the risk profile of compensation mechanisms. Opaque reporting of emissions data hampers certification processes, increases administrative costs, and reduces the positive effects on market demand for carbon removals.

Failing to ensure the transparency of the use case of both in-boundary removals and out-boundary credits can undermine the social acceptance of the residual emissions strategy, provide ground for accusations of mitigation deterrence, and risks double counting. Building on the Emissions Reduction First Principle and the Transparency Principle requires setting out and reporting clearly how CDR is used to ensure it is complementary.

Best practice preview

See pages 110-112 for an overview of different MRV approaches taken by EU Mission Cities, including mapping, cadastres, on-the ground monitoring, remote sensing, and citizen science initiatives. Best practices are emerging for different CDR methods from Dublin (Ireland), Zaragoza (Spain), Helsingborg (Sweden), Leuven (Belgium), Mannheim (Germany), Lahti (Finland), Greater Dunkirk (France), Trikala (Greece), Trondheim, Stavanger (Norway), Rzeszow (Poland) and Zagreb (Croatia).

Further reading

The core ideas behind GHG inventory governance are outlined at the start of Section 3, while Box 27 on page 84 contextualises urban accounting within EU and national frameworks. Section 6.2 considers the Transparency Principle and applies it to the net emissions equation. Section 7 illustrates the rules for emissions accounting that would apply to any CDR method or carbon credit. Box 24 elaborates on potential sectoral asynchrony in the inventory, while Box 25 specifies how to reflect any natural or human caused disturbances to carbon sinks in negative emissions accounting. Specific guidance on emissions accounting in the land sector is covered in Section 7.1. Notably, Box 26 introduces the difference between land use and land cover (as relevant to emissions accounting), Box 28 clarifies that unchanged land use is not unchanged carbon stock, and Box 30 illustrates the cross-sectoral impacts of forests and trees. Boxes 33-34, 44-45, and Tables 8-10 provide additional technical details needed to complete the forest and trees emissions inventory, while Figure 6 is a decision tree for selecting sources of activity data. Overall, the accounting of negative emissions associated with urban trees and forests is discussed in Section 7.1.1 (with sub-sections 7.1.1.1 and 7.1.1.2 delving into the calculation procedure), while wetlands are covered in Section 7.1.2 (along with Figure 7, useful to navigate the Wetlands Supplement to the 2006 IPCC Guidelines). Specific guidance on emissions accounting in the built environment is covered in Section 7.2, with the accounting principles explicitly addressed in 7.2.1, 7.2.2 dedicated to data systems and MRV, and Box 38 offering guidance on the use of building-level data from the EU CRCF.

While data sources, MRV and accounting uncertainty are topics covered in all the above sections, Box 5 on page 23 is dedicated to MRV, along with Boxes 40 and 41 that illustrate monitoring options. Section 6.4 discusses MRV with respect to the co-benefits of emissions compensation. Section 7.3 describes methods to estimate and manage uncertainty in emissions accounting, with Box 39 proposing the method of Probability of Exceedance and Table 11 demonstrating how to grade data quality to ease the estimation of uncertainty.

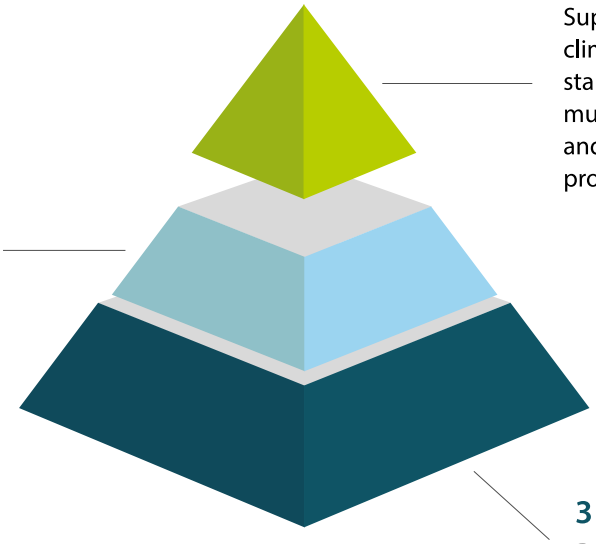
Along with uncertainty, double counting is another common challenge. In the Guidance, it is addressed from multiple perspectives in Section 6.2 and Boxes 19, 30 and 42. Box 42 contains accounting considerations relevant to scope 3 emissions, while Box 43 and Figure 8 anticipate which additional forms of accounting guidance may become available in the future. Finally, Section 8 offers a summary of key emissions reporting requirements.

Multilevel governance and public engagement

Important considerations

Urban decision makers can venture more confidently into residual emissions strategies when they realise they do not operate in a vacuum. They will be better prepared when factoring in their vertical and horizontal dependencies within the wide group of other stakeholders relevant to the development of carbon removal projects in their city. Coordination with neighbouring municipalities, regional and national authorities, and private sector actors is critically important for developing viable removal systems. It helps with knowledge sharing, pooling resources, coordinating infrastructure development, managing logistics needs, stacking funding instruments, organising joint ventures, and public private partnerships.

Figure 3. Example of a vertical multilevel governance of urban carbon removal



1 - City Government

Supports local projects, integrates them into climate plans, and collaborates with local stakeholders. Cooperates with neighbouring municipalities, research institutions, utilities, and private companies to develop shared projects and value chains.

2 - National and Regional Government

National level integrates carbon removal into their climate strategies and establishes incentive mechanisms, such as funding programmes, innovation support, or carbon markets. Regional level coordinates land-use planning and infrastructure development relevant to removal systems, including biomass supply chains or CO_2 transport and storage networks.

3 - Supernational Government

Develops standards for carbon removal accounting and certification, and offers long-term policy and funding support.

Source: Internal analysis

An enabling multilevel governance system for urban CDR involves well-defined roles, competences, and goal alignment between different levels and entities involved in the public governance of carbon removal policies and projects, and the systems and infrastructures that may be leveraged. In practice, cities often operate in more fragmented governance environments which can limit their ability to develop and implement carbon removal strategies. To manage such constraints, city decision makers benefit from mapping their interdependencies and making the necessary arrangements as part of their residual emissions strategies. This will strengthen the feasibility of their strategy and scalability of specific compensation mechanisms.

Multilevel governance also includes policy-level public engagement and project-specific community engagement as part of strategy development and project management. This is critical for ensuring public support for carbon

Figure 4. Example of a stakeholder ecosystem for urban carbon removal.



Source: Internal analysis

removal policies and projects. City decision makers should consider the needs and potential impacts of individual projects on local communities early in the planning process. They should develop strong governance principles, integrated plans, and publicly available intervention frameworks to guide their engagement with other stakeholders and secure the social legitimacy needed for projects to succeed.

This makes it possible to adapt project plans, address specific concerns and needs, and prevent the perpetuation of historical injustices.

Checklist of actions

- [ ] Map governance interdependencies with public and private entities and determine the needs and forms of structural collaboration arrangements.
- [ ] Identify vulnerable communities and incorporate equity and environmental justice principles into the residual emissions strategy.
- [ ] Enable public participation in decision-making processes and provide clear and accessible information about project details and potential impacts.
- [ ] Build coalitions and inter-city collaborations to share knowledge, coordinate strategies, advocate collectively, and create economies of scale.
- [ ] Develop urban–regional partnerships to align urban demand for removals with landscapes, resource needs, and logistics of project value chains.
- [ ] Implement pilot and demonstration projects to test governance arrangements, demonstrate feasibility, generate evidence, pull investment, and build public support.
- [ ] Set up inter-departmental task forces to coordinate the integration of carbon removal into existing urban systems, infrastructure, and policies.

Decision makers who fail to consider the multilevel governance of carbon removal and residual emissions planning at an early stage, risk undermining or even preventing the realisation of the intended climate impact. Competences for specific project implementation questions that are held at other public governance levels will not be geared for use at the time of need. Private sector stakeholders may not respond to public interventions without being acknowledged and involved in the decision-making process. The public can withhold its support for scaling CDR, while equity and environmental justice for local communities may be undermined.

Further reading

Decision-makers considering the vertical and horizontal governance coordination required for residual emissions planning are encouraged to consult Section 5.1.1, which outlines the specific considerations, technical challenges and opportunities, regulatory caveats and advantages, local co-benefits, and engagement pathways associated with implementing individual CDR methods in cities. Decision-makers should also pay close attention to Box 7, which examines the levers available to, and roles played by, city administrations within a multilevel governance framework, with further discussion provided in Section 9 and Box 27. Reading Section 6.2 on transparency will help decision makers shape their public engagement planning, while Section 6.3 on environmental and ethical integrity supports decision makers in identifying which pathways are most compatible with environmental protection, sustainable development, and human rights. It offers a detailed overview of how to improve local acceptance, navigate positive and negative CDR impact categories (Table 5), and use local out-of-boundary sinks strategically and equitably (Box 18). Finally, decision makers are invited to review Section 6.4 to develop residual emissions strategies that prioritise co-benefits and synergies with existing urban policy priorities, systems and infrastructure (Boxes 21 and 22).

Policy and regulatory instruments

Important considerations

The governance of carbon sequestration in cities involves a range of institutional, regulatory and planning instruments, financial instruments, participative governance mechanisms, and capacity-building initiatives. Depending on the specific local context, the municipal toolbox can include a wide diversity of different approaches. When scoping their policy and regulatory toolbox, decision makers benefit from looking beyond the traditional competences in the domains of climate and environmental action and consider which other policies can be leveraged to advance carbon removal and carbon sink development within their city.

For most decision makers, the use of regulatory and policy levers to create an enabling environment for CDR and manage uncertainties and adverse effects, will be constrained. Multilevel governance is particularly sensitive in this context. Cities will have to abide by supranational, national, and provincial or state-level regulations. A national urban policy will frame their scope for urban planning and design, while matters such as the regulation of the end-of-waste status of materials that can be used for carbon removal will be out of reach. It is vitally important to understand what falls within a city's sphere of control and its sphere of influence as this shapes a decision maker's authority and capacity to act on carbon removal and carbon sink planning.

Checklist of actions

- [ ] Explore policy domains beyond climate and environment for the embedding of objectives that can foster carbon sequestration as a co-benefit.
- [ ] Explore the regulations and policies associated with the management of specific urban systems and infrastructure that allow for the integration of CDR solutions.
- [ ] Map the regulatory and policy tools at the city's disposal and plan their use in a way that they mutually reinforce each other and are sequenced effectively.
- [ ] Take into account the guiding principles as part of both the construction and continuous evolution of the municipal regulatory and policy toolkit.
- [ ] Consider a policy that requires project developers to adopt 'community benefit plans' as a framework for integrating communities in project development and deployment.



Decision makers who do not map the governance interdependencies associated with carbon removal planning may face challenges in designing regulations and policies for CDR at scale. Failing to map the existing regulatory and policy landscape and how it can be leveraged for carbon removal may lead to siloed policymaking with limited ownership across municipal departments.

Further reading

Section 6.4 offers guidance on approaches to maximise the impact of public interventions. See Box 21 on embedding CDR in urban policies and systems to get a better understanding of comprehensive carbon removal policymaking.

Funding approaches and instruments

Important considerations

Designing a diversified funding strategy for CDR deployment can be a real challenge for decision makers. When solutions are dedicated exclusively to delivering the service of removing carbon from the atmosphere, it may be difficult for decision makers to justify using public funds. CDR can then be seen as a sunk cost that does not deliver any immediate benefits to the individual residents of a city. Decision makers are called upon to think creatively about their funding approaches and the instruments they can use. It is vital to rely on a variety of funding sources to reduce risk and uncertainty over time.

Leveraging public funding opportunities will be where most decision makers will start. With municipal budgets often stretched thin, finding additional resources that can be used to fund CDR will be a challenge for most. There may not be a need for new budget lines when CDR solutions are used to deliver public services that are already accounted for in municipal budgets, while also sequestering CO2 as a co-benefit. Similarly, integrating CDR solutions into existing urban systems and infrastructure can benefit from using standing capital investment planning cycles. In addition, city decision makers can often access national

and EU level funding opportunities. Non-profit organisation Carbon Gap has compiled an open-source searchable database that decision makers can use to identify grants, incentives, and support schemes by country and at EU level, funding type, and storage method. This is discussed and linked in Section 6.6.

However, complementing public support with private financing and philanthropic grants will often be important for CDR solutions with high upfront capital costs or high operating costs.

Public funding can then be used to catalyse private sector investments. Depending on the CDR method, there is a range of climate finance instruments that can be used to support urban CDR development. Carbon credits remain a fundamental revenue stream to get CDR projects off the ground, but credits sold to external buyers do not count towards the city's climate neutrality target. Revenues should be channelled into high-impact, local climate measures so that the net emissions reduction and co-benefits exceed the amount of removal that has been sold.

Checklist of actions

- [ ] Explore the city's financial levers, such as targeted polluter-pays taxes, carbon pricing mechanisms, green bonds, and public-private partnerships.
- [ ] Consider the merits of a local voluntary carbon contribution programme to raise capital for targeted catalytic carbon removal investments.
- [ ] Explore opportunities for pooled funding with other cities to jointly procure carbon removal credits or support demonstration projects.
- [ ] Assess the available funding mechanisms at a national and EU level and consider aligning CDR focus areas accordingly.

Further reading

Explore Table 2 which gives a summary of CDR methods and urban-specific implementation options, along with an overview of price ranges in the voluntary carbon market. Box 14 provides greater details on the pros and cons of collective public procurement programmes, while Box 15 explores situations in which cities operate as carbon credit sellers and how credit revenues can be used strategically. In addition, Box 23 helps understanding carbon credits prices and their key determinants, offering some indicative figures, while Table 7 discusses the potential advantages and disadvantages of carbon credit purchases with different temporal horizons. Sections 6.4, 6.5 and 6.6 explore more in general how investments and revenues interact with the principles of co-benefits maximisation, diversification of the action portfolio, and cost/time effectiveness.

4 What concludes the journey?

The decision-making journey concerning the management and compensation of residual emissions is a structural addition to climate policymaking at the municipal level. There is no natural end to this journey. A virtuous cycle lies at the heart of how residual emissions are defined. Decision makers will constantly be updating their compensation strategy as new solutions are developed and enter the market, or local socio-political circumstances change and new forms of mitigation become viable. This will continue beyond reaching a state of climate neutrality. In that sense, the end of the journey is a new beginning.

The integrity of climate neutrality involves the ongoing governance of the carbon sinks, whether the carbon has been stored for decades or centuries. In addition, decision makers may pursue no-regrets carbon removal strategies that actively aim to harness the non-carbon impacts that different carbon removal solutions can realise. This further enriches the journey and ultimately contributes to climate restoration once a state of global net-zero emissions is achieved.

Conclusion

The compensation of residual emissions to achieve a state of climate neutrality is a journey that many cities are or will be going on sooner or later. The 112 European cities in the EU Cities Mission have embarked on an ambitious effort to reach climate neutrality by 2030. Decision makers in these cities are at the foreground of defining their residual emissions and considering how they can compensate them over time in a way that is anchored in the local opportunities and challenges of their city. But they are not alone on this journey. Cities all over the world are pursuing increasingly ambitious climate action and the use of carbon removal solutions as part of this effort will continue to grow.

This Summary and the underlying Guidance provide a framework for cities and urban decision makers navigating the complexities of net-zero targets. It guides them in how they can define their residual emissions through robust analysis and with high integrity and transparency. It provides recommendations for designing carbon removal project development strategies and carbon credit portfolios in ways that maximise the realisation of co-benefits, while increasingly realising more durable forms of carbon storage that are aligned with the nature of the hard-to-abate emissions. Intended as resources for cities, this Summary and the Guidance contain principles and decisional roadmaps that may inspire any governance level in bringing about a climate neutral future.

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Annex - Navigating the Guidance

(p.X) - Refers to the page number in the Guidance

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	Boxes
	• This cannot be stressed enough: carbon removals originate from deliberate anthropogenic activities Box 3 - p.20 • Carbon sinks and carbon removals Box 4 - p.22
	Tables
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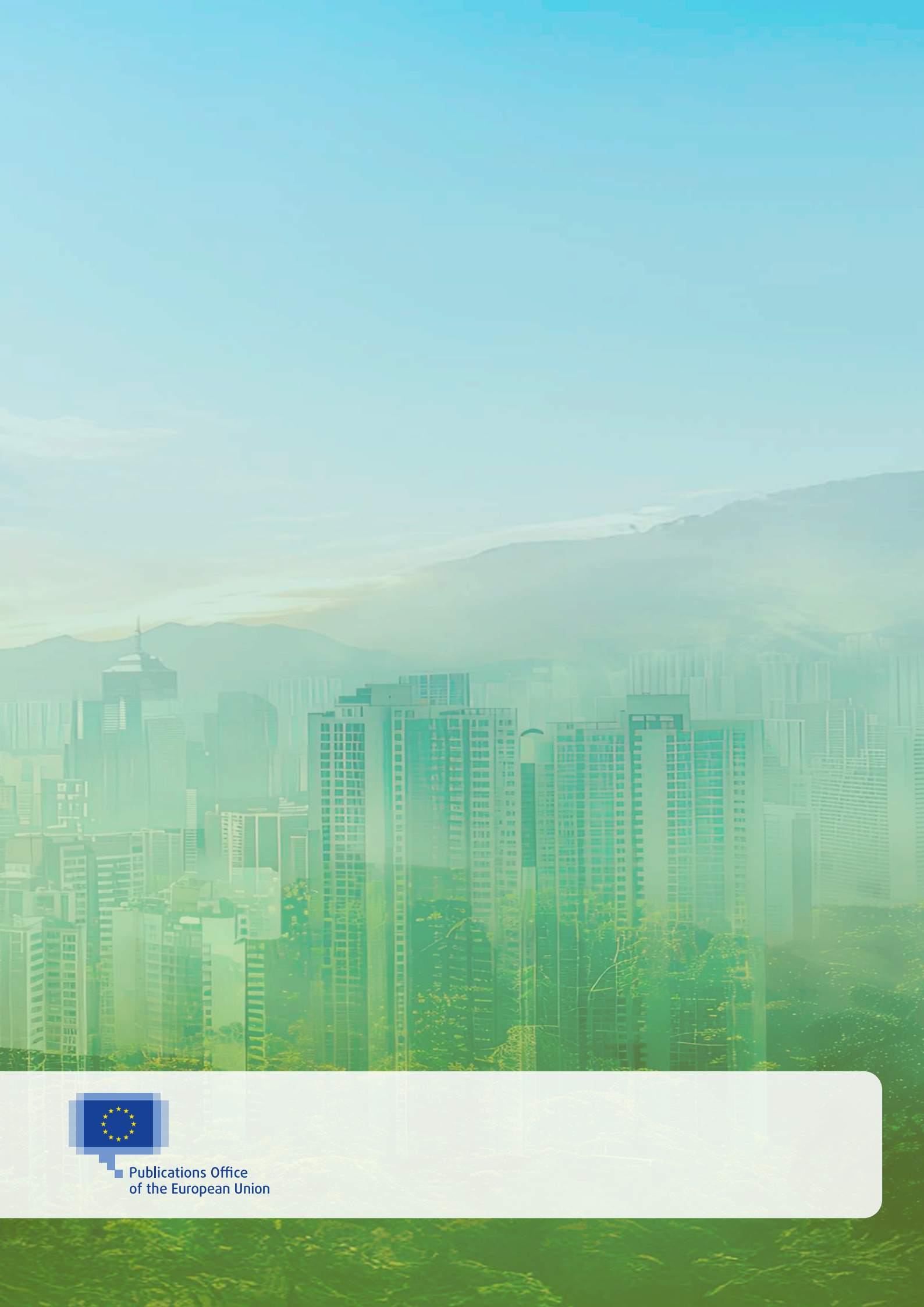
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