

Green Public Procurement: a key to decarbonizing construction and road transport in the EU

SEI report
February 2023

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DOI: <https://doi.org/10.51414/sei2023.007>

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Key messages

- The EU and its Member States have a fragmented approach to Green Public Procurement (GPP). The EU has a role to play in harmonizing and strengthening GPP policies and practices.
 - Public procurement makes up 15% of the EU's GDP, making public authorities' significant players in the market. This leverage needs to be used to achieve the highest societal value for money, creating decent jobs and mitigating climate change.
 - Globally, the construction and transport sectors each represent about 12% of government procurements' greenhouse gas (GHG) emissions.
 - While most of the Member States studied recognize GPP's importance to achieving climate goals, very few binding requirements exist to motivate governments to practice it. GPP-related policies and climate targets need greater alignment.
 - Despite a flourishing list of tools, criteria and good examples, current practices fail to deploy GPP in a focused and consistent manner, and with the scale required to harness the decarbonization potential of this tool.
 - Setting common mandatory requirements, developing standardized reporting methods, providing more tools, resources, and training for GPP would accelerate and harmonize the uptake within and across EU Member States and help countries reach their climate goals.
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Executive summary

Public procurement of goods and services contributes to about 15% of global greenhouse gas emissions. In the EU, public purchasing represents 15% of its GDP, acting as a major influencer on the market through the products and services acquired by governments from the local to national levels. The public sector has a role to play in leveraging this purchasing power to achieve the best societal value for money, particularly as we scramble to bend the curve of our planet's warming.

Globally, the construction and transport sectors each represent about 12% of government procurements' GHG emissions. Furthermore, these sectors' decarbonization efforts demand profound and disruptive technological shifts. Hence, prioritizing these sectors can make the greatest impact towards reducing the environmental footprint of the public sector and support faster decarbonization of key emitting industries. Meanwhile, the EU committed to achieving 55% reduction in GHG emissions by 2030 compared to 1990 levels. Drastic emissions reductions are needed at an unprecedented speed and scale to achieve this goal.

Green Public Procurement (GPP) is the practice of purchasing goods and services using environmental requirements, with the aim of cutting carbon emissions and mitigating environmental harm throughout the life cycle of the product or service.

While the EU and many of its Member States alike have recognized GPP as an important tool to meet climate goals, the formalization of GPP requirements at the EU level or among local and national governments has been fragmented. We call for harmonization to achieve the consistency, scale and focus required to make GPP practices a powerful decarbonization tool.

We surveyed the landscape of GPP in the EU, with a focus on construction and road transport. Through interviews and policy research, we compiled case studies of eight Member States with different profiles: Sweden, the Netherlands, France, Germany, Estonia, Poland, Spain and Italy. We used this information to identify solutions and best practices, and to set forth recommendations on how the EU and its countries can harmonize and strengthen their GPP policies on the path toward cutting their contributions to climate change.

The public sector has a role to play in leveraging this purchasing power to achieve the best societal value for money, particularly as we scramble to bend the curve of our planet's warming.

We call for harmonization to achieve the consistency, scale and focus required to make GPP practices a powerful decarbonization tool.

What we found was a scattered approach to GPP across the board, with few binding requirements, little oversight and scant connective tissue from national to local practices or across different Member States, making it difficult to evaluate progress or compare practices.

Interviewees, including policy makers, procurement experts and procurement officers from the featured Member States, highlighted the lack of time or resources to adopt progressive GPP practices, with no real incentive to pursue it. Furthermore, we found a need for more awareness and clear guidance on how to leverage GPP for impactful societal outcomes. Doing so requires better harmonized processes, data, and ways to track the impact and progress achieved.

That is not to say it is entirely neglected. Most Member States studied highlight GPP in various national plans and have set targets accordingly. Countries, regions, and cities such as the Netherlands, Catalonia and Berlin serve as beacons of GPP with robust goals and higher ambition. They lead the way in showing how GPP can help mitigate climate change.

For example, the Netherlands is one of the few countries that monitors the effects of GPP, and showed that public procurement for eight product groups in 2015 and 2016 led to at least 4.9 metric tons of avoided GHG emissions. Similarly, a monitoring report from 2017 showed that the State of Berlin managed to cut its GHG emissions by 47% through GPP in 15 product groups. Spain's Catalonia region set a goal of 50% of procurements using GPP by 2025, an all-electric in public vehicle fleet and 100% renewable energy powering public buildings by 2030.

Drawing from these findings, we developed recommendations on how to bolster GPP and scale it to its full potential. In governance, policies, monitoring, implementation and uptake, some common themes exist. The need for:

- Better-coordinated policies
- Common metrics for measuring progress and evaluating tenders
- Increased resources such as time, funding and support mechanisms
- Greater collaboration and knowledge exchange among procurers and businesses
- Clearer incentives, binding requirements and enforcement mechanisms, covering operational and embedded emissions

With a concerted and unified movement toward GPP, the EU and its Member States can send strong market signals to the companies that depend on them for business, accelerating the decarbonization process that our planet requires.

Abbreviations

CPR: Construction Product Regulation
CAM: Green Public Procurement Minimum Environmental Criteria (Italy)
DG: Directorate General
EED: Energy Efficiency Directive
EMiF: Estonian Ministry of Finance
EPD: Environmental Product Declaration
EPBD: Energy Performance of Buildings Directive
ESPR: Ecodesign for Sustainable Products Regulation
EU: European Union
GDP: Gross Domestic Product
GHG: Greenhouse Gas
GPP: Green Public Procurement
ISO: International Organization for Standardization
LCA: Life Cycle Assessment
LCC: Life Cycle Costing
MEAT: Most Economically Advantageous Tender
MiEACP: Dutch Ministry of Economic Affairs and Climate Policy
MS: Member State
NAP: National Action Plan
PEFCR: Product Environmental Footprint Category Rules
PEF: Product Environmental Footprint
PIANOo: Dutch public procurement expertise centre
PPO: Polish Public Procurement Office
SDG: Sustainable Development Goal
SPP: Sustainable Public Procurement
TED: Tender Electronic Daily

ACKNOWLEDGEMENTS

The authors would like to thank Breakthrough Energy for their financial support, which made this study possible. More particularly, we thank Pénélope Le Menestrel and Julia Reinaud for their continuous support and valuable feedback.

We would also like to thank the members of our advisory board, Erika Bozzay (OECD), Harald Versteeg (Rijkswaterstaat), Julia Reinaud (Breakthrough Energy), Mark Hidson (ICLEI), Nancy Gillis (WEF), Rana Ghoneim (UNIDO), Stacy Smedley (Building Transparency) and Timothy Suljada (SEI) for their advice and support.

Finally, we thank Laura Turley and Ronja Bechauf from IISD for providing an external review of this report.

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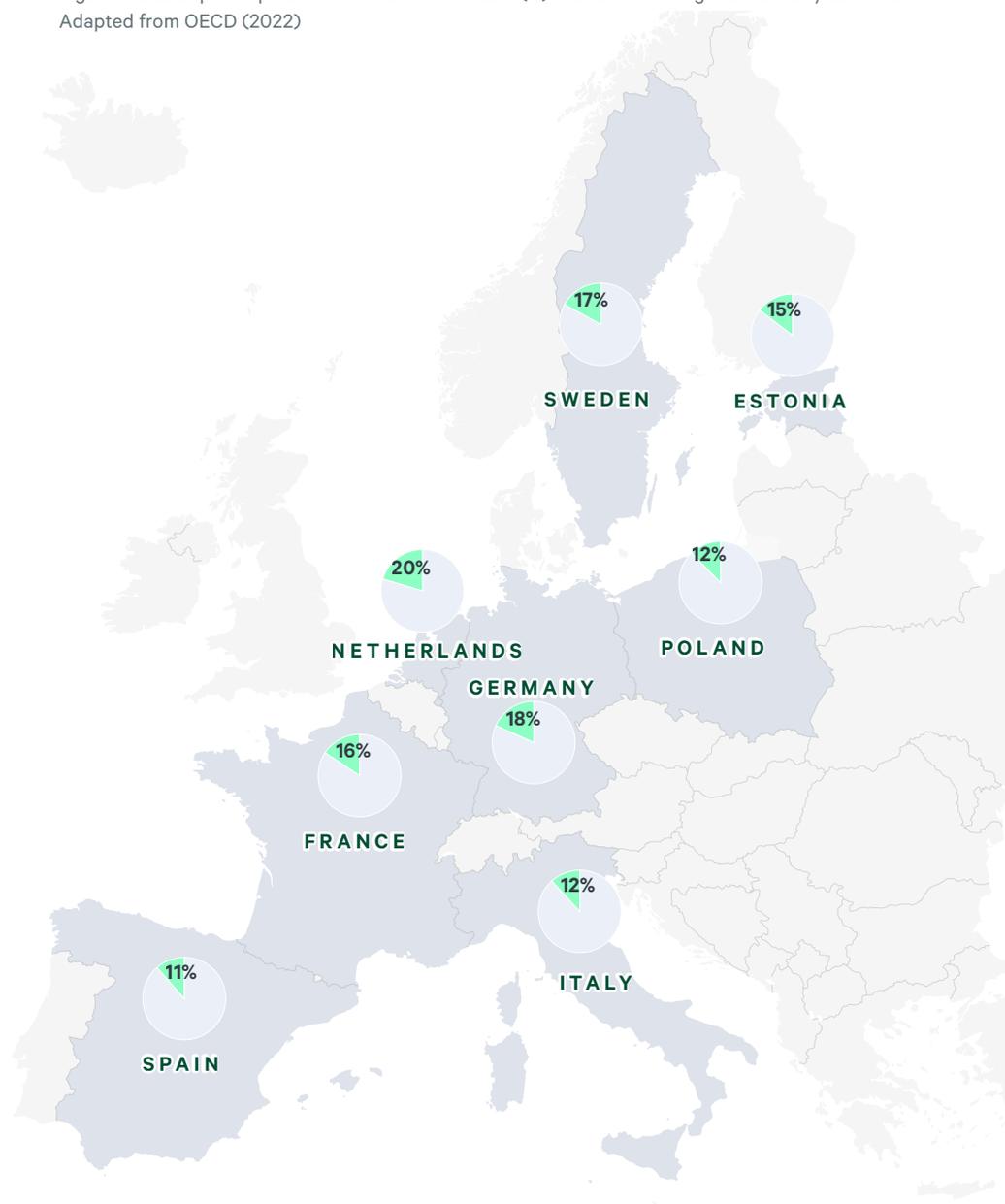
In the EU government expenditure on works, goods and services amounted to about 15% of its GDP in 2020.

1. Introduction

The crucial link between public procurement and climate targets

Sustainable Development Goal 12 (SDG 12) on Responsible Consumption and Production aim to promote public procurement practices that are sustainable, in accordance with national policies and priorities (SDG 12.7). Sustainable Public Procurement, i.e. procuring with environmental and social considerations in mind, is considered an important means to ensure the proper use of public funds and good governance in public procurement, as well as foster positive societal impacts by promoting environmentally responsible business practices and creating job opportunities (One Planet Network, 2021). Indeed, delivering the best societal value for money for taxpayers should be the aim of good public procurement, beyond simply procuring for the cheapest price. In the European Union (EU), government expenditure on works, goods and services amounted to about 15% of its GDP in 2020 (see Figure 1 for country-level data) (OECD, 2022). This enormous purchasing power creates an important lever for public entities to send strong market signals.

Figure 1. Size of public procurement as share of GDP (%) in 2020 in the eight case study countries. Adapted from OECD (2022)



Public procurement activities are responsible for 15% of global greenhouse gas emissions.

In particular, Green Public Procurement (GPP) – a more environmentally rigorous category within Sustainable Public Procurement – is important for mitigating environmental impacts, targeting aspects such as water efficiency, use of hazardous materials, waste management and climate impacts. Public procurement activities are responsible for 15% of global greenhouse gas (GHG) emissions (Mission Possible Partnership & World Economic Forum, 2022). Achieving GHG emissions reductions from public procurement is a necessity for EU Member States to comply with the targets set in the Paris Agreement and the European Green Deal. Broad application of low-carbon GPP practices in key sectors is important means to achieve those goals. Indeed, a significant share of public authorities' procurement is associated with large infrastructure and transport projects, which require large amounts of material resources (e.g. cement, steel, asphalt, energy) with associated high GHG emissions.

However, Member States are slow to implement GPP policies. Current implementation of GPP guidelines among EU Member States is still far below the European Commission's target that half of all public tendering procedures be compliant with core EU GPP targets by 2010 (European Commission, 2021b). In 2012, the total uptake of GPP processes across the EU was still limited and fragmented. The four countries with the highest uptake of GPP (Belgium, Denmark, Sweden and the Netherlands) have an uptake of up to 60% of all procurements with at least one environmental consideration, while 12 countries had an uptake of less than 20% (Renda et al., 2012). Unfortunately, more recent data is missing.

Globally, the construction and transport sectors each represent about 12% of government procurements' greenhouse gas emissions.

Why GPP can accelerate the decarbonization of the construction and road transport sectors

Globally, the construction and transport sectors each represent about 12% of government procurements' GHG emissions (Mission Possible Partnership & World Economic Forum, 2022). While GPP has a high potential to reduce the public sector's environmental footprint and accelerate decarbonization of key industrial sectors, it also presents several challenges. These can include potentially higher costs in the short run, sometimes called the green premium, as well as the complexity of aligning public procurement practices with decarbonization pathways (Mission Possible Partnership & World Economic Forum, 2022; Wuennenberg & Casier, 2018). Overcoming these challenges would help governments and public authorities to reach their climate targets.

Construction and infrastructure

In 2018, the building and construction sector accounted for 36% of final energy use and 39% of energy and process-related carbon dioxide (CO₂) emissions globally in 2018 (International Energy Agency & United Nations Environment Programme, 2020). Twenty to 25% of life cycle emissions of the current EU building stock are embedded in building materials (European Environment Agency, 2022). Indeed, cement and steel, two materials at the centre of the construction sector, account for 7% and 8% of global carbon dioxide emissions respectively, and are considered to be two of the "hard-to-abate sectors" (Mission Possible Partnership, 2022; World Steel Association, 2020). Decarbonizing the steel and cement industries requires significant shifts in production processes. In addition to decarbonizing all energy inputs, increasing energy efficiency and promoting material circularity, both sectors will require profound shifts in production processes to achieve net-zero emissions. Technological solutions have been proven at pilot scale, but require rapid diffusion and scale-up in the coming decade. Policy support such as GPP commitments are crucial to de-risk investments and rapidly deploy these advancements (Rissman et al., 2020).

The public sector accounts for 40% to 60% of concrete purchases and 20% to 30% of revenues in the construction industry.

The public sector is in a key position to influence and support the decarbonization of these industries through ambitious GPP policies and other regulations. Indeed, globally, the public sector accounts for 40% to 60% of concrete purchases and 20% to 30% of revenues in the construction industry, with massive regulating power through building codes (Mission Possible Partnership, 2022). So far, carbon reduction measures in this sector have mostly focused on energy efficiency in buildings (Kadefors et al., 2019; Wuennenberg & Casier, 2018). Over time, the importance of embodied emissions will increase relative to buildings' overall emissions as

Almost one-quarter of direct GHG emissions in Europe come from the transport sector, and road transport accounted for over 70% of these emissions in 2019.

energy efficiency measures do their part to cut emissions (BPIE, 2021). While the sector and policy makers are increasingly aware of the need to target construction materials' embedded emissions, and an increasing use of Environmental Product Declarations (EPDs), which describe characteristics such as life cycle emissions, embedded emissions have not yet materialized in procurement policies.

Road transport vehicles

Almost one-quarter of direct GHG emissions in Europe come from the transport sector, and road transport accounted for over 70% of these emissions in 2019 (European Environment Agency, 2021). In addition, the sector contributes to about 12% of government procurement emissions globally (Mission Possible Partnership & World Economic Forum, 2022). Hence, the use of GPP in road transport is key to reducing the public sector's climate footprint. Cutting the climate impact of road transport can be achieved through changing modes of transportation, e.g. promoting public transport and non-motorized transport solutions, and by upgrading the vehicle fleet to electric or more fuel efficient alternatives. In this report, we focus on the shift to vehicles' energy source.

Decarbonization solutions are better-known for the road transport sector than for construction materials. Since most transport sector emissions stem from fuel consumption (over 80% for internal combustion engines) (Bieker, 2021), the main technical solutions at hand are energy efficiency, a fuel switch to biogas, hydrotreated vegetable oil or electrifying the fleets. However, vehicle manufacturing also has a significant carbon footprint, as it depends on the extraction of raw materials such as steel, aluminium, rubber and plastics. Like in the case of buildings, as operational emissions from fuel combustion decrease thanks to fuel switching and electrification, reducing the embodied carbon component of a vehicle's life cycle emissions will become increasingly important (Transport & Environment, 2020). For electric cars, vehicle manufacture, battery manufacture and maintenance represent about 50% of the life cycle GHG emissions (Bieker, 2021).

Energy efficiency requirements and fuel switches are easily implemented in procurements. On the other hand, electrification requires the development of charging infrastructure and the necessary supply of renewable electricity, which adds complexity to the procurement and use of electric vehicles. As of today, like in the construction sector, embedded emissions of vehicles are not factored into procurement policies.

The landscape of strategic procurement

Various concepts have emerged over the last decades touching on different goals and societal impacts that can be achieved through public procurement.

Since 2008, the European Commission defines Green Public Procurement (GPP) as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured" (European Commission, 2008b). Examples of environmental impacts are global warming, energy use, water use or eutrophication. Low-carbon procurement is a sub-category of GPP, focusing only on the GHG emissions of public procurement.

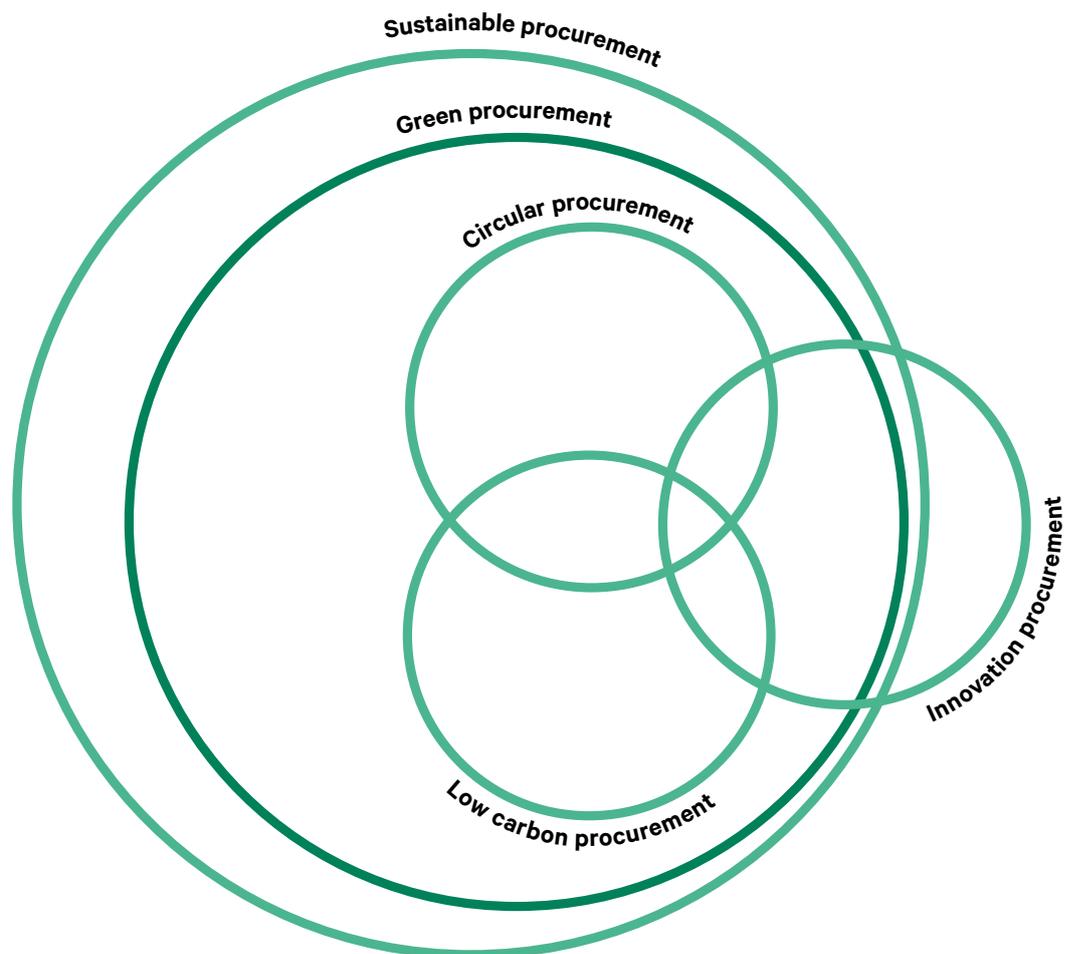
GPP is often also defined as sustainable, but Sustainable Public Procurement is a broader concept that includes social aspects. Circular Public Procurement, however, is a slightly narrower concept than GPP, focusing mainly on material and energy efficiency, as well as waste prevention and reduction.

Innovation procurement is another overlapping, but distinct practice. It encourages the market to create new solutions to a problem or need. This is a means for public actors to use their purchasing power to encourage the private sector to invest in novel products and technologies

(procure2innovate, n.d.). Innovation procurement may or may not be sustainable, green or circular. Figure 2 illustrates how these concepts are linked.

In this report, we focus on the potential GHG emissions savings that public procurement practices may bring. While Member State-level policies focus on either GPP or SPP, EU-level policies focus on GPP. Therefore, we look at GPP policies, using the European Commission's definition. However, because different Member States have strategies and policies linked to SPP more broadly, we sometimes highlight SPP policies and practices.

Figure 2. The different procurement concepts and interlinkages. Adapted from Piirsalu et al (2020)

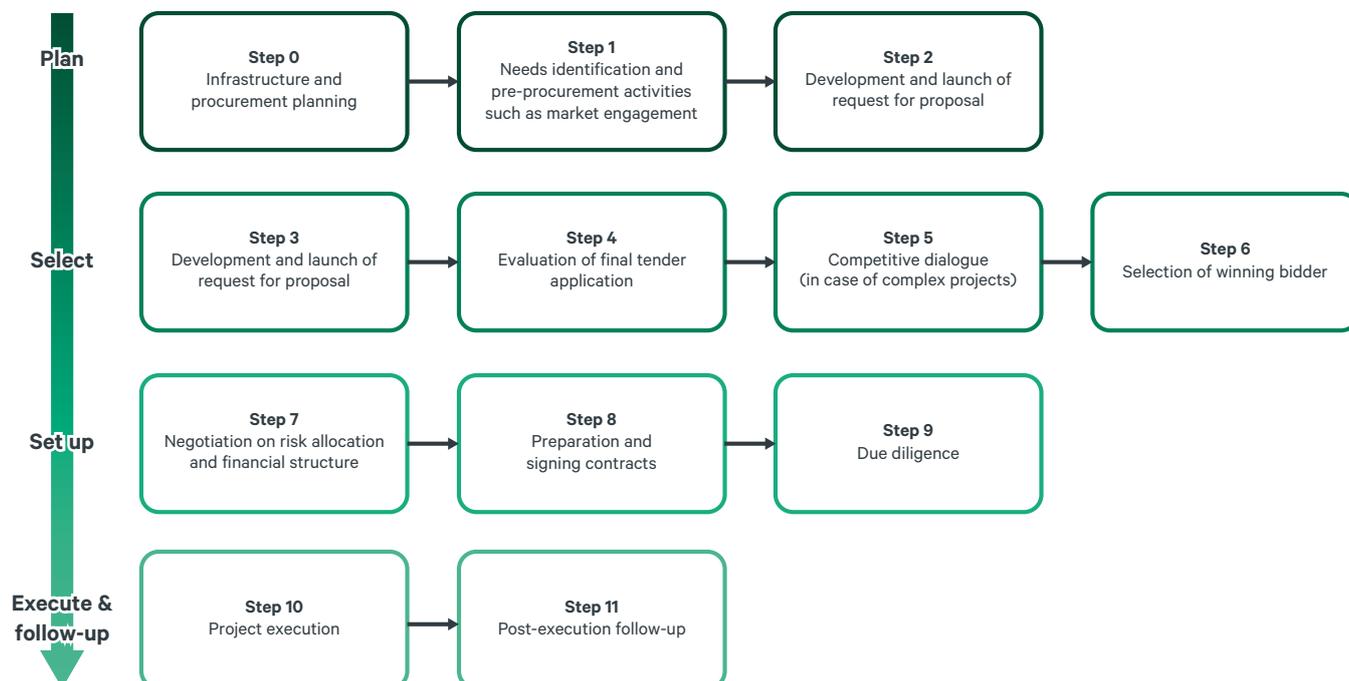


Procuring with positive societal impacts relies on strategic thinking in all stages of the procurement cycle, as illustrated in Figure 3. There are opportunities for GPP to save GHG emissions along the full procurement cycle, for example by setting GHG emissions-saving targets (step 0); performing market research and engagement to identify best available technologies (step 1); developing award criteria promoting low-carbon solutions (step 2); assigning rewards for low-carbon offers (steps 3 to 5); and monitoring the contract execution to ensure that bidders meet the promised GHG emissions levels (steps 10 and 11) (Wuennenberg & Casier, 2018).

Our study

To align GPP policies and practices with national and international climate targets, it is crucial to unpack the existing barriers, and to identify opportunities to accelerate the uptake of such policies by exploring lessons learned and best practices from different EU Member States.

Figure 3 . The procurement cycle. Adapted from Wuennenber & Casier (2018)



The aim of this report is to demonstrate existing discrepancies in the uptake (i.e. the inclusion of at least one environmental consideration) and impact (specifically in terms of GHG emissions) of GPP policies targeting the road transport and construction sectors across selected Member States. The study focuses on transport and construction procurement (embedded and operational emissions) due to their large climate mitigation potential and sizeable public procurement volumes.

The following research questions are posed:

1. What characterizes the GPP policy landscape in different EU Member States?
2. To what extent do GPP practices support the decarbonization of the construction and road transport sectors? How is the GPP policies' impact monitored and measured?
3. What are the recurring implementation barriers to the uptake of impactful GPP practices across Member States?

Using a case study approach, our research aims inform Member States' GPP policy design and implementation. The case study countries are Sweden, the Netherlands, France, Germany, Estonia, Poland, Spain and Italy. These countries comprise a mix of weak and strong GPP performers; large and smaller economies; and countries with centralized and decentralized governance systems. This selection enables us to showcase good practices and drivers for successful implementation, as well as reasons for slow uptake across different types of EU Member States. We will provide clear recommendations to national and EU-level policymakers and identify changes that need to happen at sub-national governance levels.

The report builds on an extensive desk review of existing grey literature, policy documents from each country studied and from the European Union, and a review of the existing tools and support systems in place. In addition, we conducted semi-structured expert interviews with policy makers, procurement experts and procurers from each case study country (two to five in each country) between March and August 2022.

2. European Union-level efforts to lift GPP

Currently, GPP is a voluntary practice in the EU except for some mandatory requirements introduced in sectoral-specific directives. However, the role of GPP as a key instrument in the EU's efforts to become a more resource-efficient economy is recognized in several legislative documents (Directive 2014/24/EU).

The European Commission started promoting GPP in 2003, recommending the adoption of GPP national action plans in EU Member States before the end of 2006. Thereafter, in 2008, the Commission recognized the role of GPP as a policy instrument in the document, "Public procurement for a better environment" (European Commission, 2008a). As an initial measure, the Commission suggested that "at least 50% of all tendering procedures should be green," meaning "compliant with the endorsed common core GPP criteria" by 2010 (European Commission, 2008b) (for more information about core criteria see section 2.3). This was the basis for proposing voluntary GPP criteria among sectors with active public procurement. From this point, some Member States set their own GPP targets, collected in a public shared database of national action plans (European Commission, 2022e).

No timelines have been made public for enactment and implementation of mandatory GPP policies, even though the 2020 New Circular Economy Action Plan states that the Commission will propose minimum mandatory GPP criteria (European Commission, 2020).

At the European Commission, GPP is governed by the Environment Directorate General (DG Environment) and the Directorate General for the Internal Market, Industry, Entrepreneurship & SMEs (DG Grow) (European Commission, 2022i). Two groups support DG Grow and DG Env with this work: the Informal Green Public Procurement Advisory Group, which advises the Commission on GPP policy development and implementation (European Commission, 2022d), and the Commission Government Experts Group on Public Procurement, which provides advice to the European Commission on its public procurement policy (European Commission, 2022a).

GPP implementation varies among Member States. While the majority has opted for a voluntary inclusion of GPP, the European Commission has acknowledged that the introduction of legal environmental obligations for contracting authorities in procurement procedures aids GPP's success, which is the case of almost one-third of Member States (European Commission, 2021e, p. 9). As of today, 23 out of 27 Member States have submitted their National Action Plans for GPP (European Commission, 2022e), however, updated statistics on the uptake of GPP in the EU is scarcely available, which hinders the visualization of up-to-date information. EU's latest report on uptake dates back to 2012 and indicates that GPP criteria were included and applied in 26% of all public purchasing cases across EU on average (Renda et al., 2012, p. 48).

2.1 EU procurement law

The legal background for public procurement is established in two EU Directives. Table 1 presents the minimum procurement values for which the Directives apply.

The legal framework emphasizes the strategic potential of public procurement. Tender evaluation is based on the most economically advantageous tender (MEAT) principle (Casier & Wuennenberg, 2017). The objective of MEAT is to best use taxpayers' money. Therefore, considerations are not only based on the lowest cost, but include other cost and quality considerations such as environmental footprint, life cycle costs or energy performance (Casier & Wuennenberg, 2017, p. 3; Katsimenis, 2018, p. 5). Hence, the Directives allow flexibility for procurers to add technical specifications and promote the use of functional specifications in procurements. Reduced GHG emissions can therefore be made a competitive element of the bidding process. In addition, the legal framework allows procurers to identify the best available technologies on the market.

The Directives also require that the award criteria applied in the tenders are related to the *subject matter of the contract*, meaning they cannot concern general corporate policies but must relate to the product or service procured. To avoid restricting competition, the Directives oblige procurers to accept *equivalent proof* that a company meets the requirements set out by the procuring body.

Table 1. Amended threshold amounts for applicability of procurement-related Directives.

Directive	Contracting authority	Type of contract	Threshold (excl. VAT)
2014/24/EU	Central government authorities	Works contracts, subsidized works contracts	€ 5 382 000
		All services concerning social and other specific services	€ 750 000
		All subsidized services	€ 215 000
		All other service contracts and all design contests	€ 140 000
		All supplies contracts awarded by contracting authorities not operating in the field of defence	€ 140 000
	Sub-central contracting authorities	Works contracts, subsidized works contracts	€ 5 382 000
All services concerning social and other specific services		€ 750 000	
All other service contracts, all design contests, subsidized service contracts, all supplies contracts		€ 215 000	
2014/25/EU	Entities operating in the water, energy, transport and postal services sectors	Works contracts, subsidized works contracts	€ 5 382 000
		All services concerning social and other specific services	€ 1 000 000
		All supplies contracts, all service contracts, all design contests	€ 431 000

Adapted from European Commission (2022)

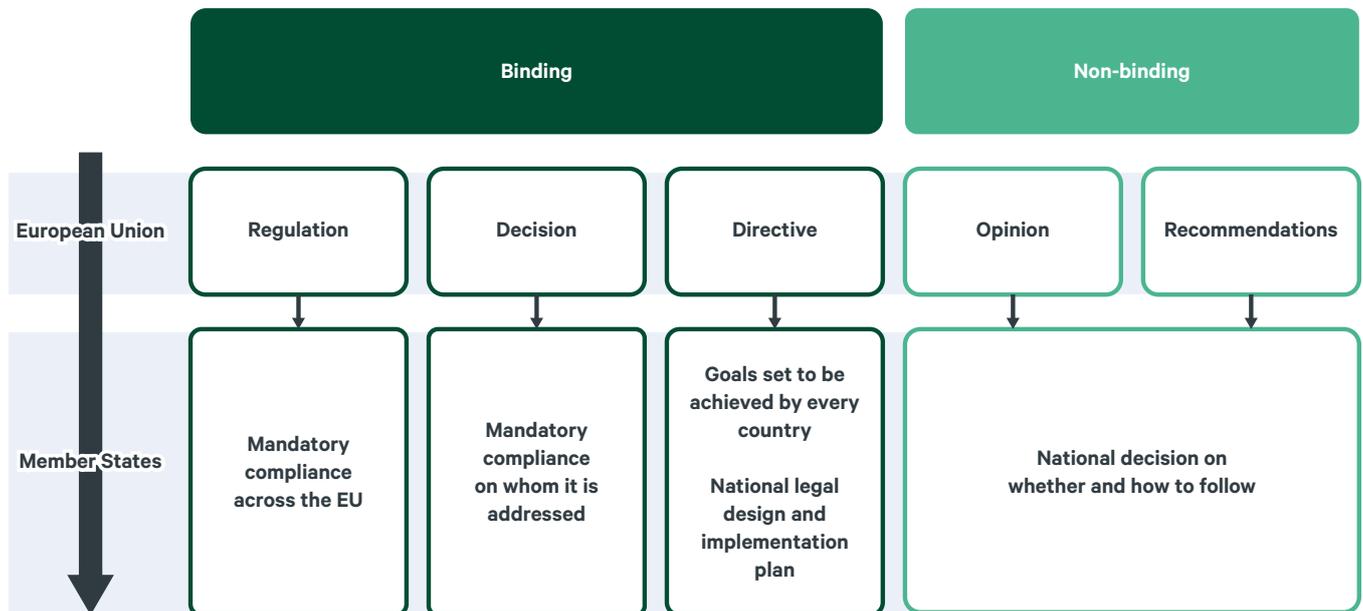
2.2 Related EU legislation – construction and road transportation

Mandatory environmental criteria in public procurements have been introduced in sector-specific legislation. The legislation presented in this section can take the shape of regulations and directives. Regulations are binding laws with applicability to all EU Member States that consist of goals and a common set of steps to achieve them (European Union, 2022; USDA, 2022). Directives also set goals that all EU countries must achieve, however, Member States set their own strategy to reach the goal (European Union, 2022; USDA, 2022) (see Figure 4). Member States must implement “effective, proportionate and dissuasive” penalties to ensure the Directive compliance (Directive 2010/31/EU, art. 27). Buildings, road transport vehicles, and IT are examples of sectors with mandatory GPP requirements. Next, we outline legislation imposing EU-level requirements for the construction and road transport sectors.

2.2.1 Sectoral legislation introducing mandatory GPP rules

The **Energy Performance of Buildings Directive** (EPBD) requires Members to ensure optimal minimum energy performance of new and renovated buildings (Directive (EU) 2018/844). These performance characteristics must be reviewed every 5 years. EU countries must use an energy performance certification that indicates the building energy rating and ensure schemes are in place to inspect heating and air-conditioning systems’ energy performance. The Directive imposes penalties to ensure compliance. An EU regulation (Commission Delegated Regulation (EU) No 244/2012) establishes a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements.

Figure 4 . EU legislation and its application to other governance levels. Adapted from European Union (2022)



In late 2021, a revision of the EPBD was proposed with the goal of reducing GHG emissions and final energy consumption from the construction sector (Proposed Directive COM/2021/802). The proposed rules aim to ensure all new buildings release zero emissions by 2030 and existing buildings are transformed into zero-emission buildings by 2050 (Council of the EU, 2022).

The EPBD proposal calls for Member States to describe their policies for reducing the whole life cycle embodied carbon emissions and the uptake of carbon removals in national building renovation plans. The proposal calls for national renovation plans, including roadmaps to 2030, 2040 and 2050, to be issued by 30 June 2026 and renewed every five years. The plans would contain three pieces of information: the annual energy renovation rate, the primary and final energy consumption of the national building stock, and its operational GHG emission reductions” (Council of the EU, 2022).

Discussions on the proposal have yielded some agreement on new rules. For instance, at the end of October 2022, Fit for 55 council agreed that “from 2028 new buildings owned by public bodies would be zero-emission buildings” and that from 2030 all new buildings would be zero-emission buildings (Council of the EU, 2022). Additionally, Member States have agreed to the introduction of a voluntary renovation passport for buildings, describing the building’s energy efficiency (Council of the EU, 2022).

The **Energy Efficiency Directive** (EED) applies to products, buildings and services and is intended to set binding energy efficiency measures (Directive (EU) 2018/2002). In its first version (2012), the target was 20% improvement in energy efficiency by 2020 compared to 2005 levels, with a later amendment (2018) that raised ambition to at least 32.5% increase in energy efficiency by 2030. The Directive requires Member States to “establish a national energy efficiency target based on primary or final energy consumption, primary or final energy savings or energy intensity”, “ensure that 3% of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements” and “set up an energy efficiency obligation scheme [to] achieve a cumulative end-use energy savings target [at least equivalent to] 1.5% of the annual energy sales to final customers of all energy distributors” (European Commission, 2021e) .

In 2021, the Commission launched a proposed reform to the EED (Directorate-General for Energy, 2021), which aims to raise the ambition of energy consumption reduction to match the Fit for 55 target. It proposes a 39% cut in primary energy consumption, which encompasses a country's energy demand across all sectors including energy production, and 36% in final energy consumption¹, which accounts for the energy consumed by end users, leaving behind the current target of 32.5% for both primary and final energy consumption (Directorate-General for Energy, 2021; Fuglsang, 2022). The Commission's energy efficiency goals have also raised ambition with the proposal of increasing energy savings from 0.8% to 1.5% of final energy consumption per year, starting in 2024. This goal is said to "encourage greater efforts in key sectors such as buildings, industry and transport via the energy efficiency obligation schemes and the alternative policy measures" (Directorate-General for Energy, 2021).

The proposal says public procurement procedures would be expected "to include more systematic energy efficiency requirements". It suggests a requirement to renovate of 3% of public building floor area and a reduction in annual energy consumption by 1.7% per year (Directorate-General for Energy, 2021).

The **Clean and Energy-Efficient Road Transport Vehicles Directive** aims to stimulate the market for clean and energy-efficient vehicles and to improve the transport sector's contributions to the environment, climate and energy policies of the Union (Directive (EU) 2019/1161). The Directive requires procuring authorities to account for lifetime energy and environmental impacts, including energy consumption and emissions of CO₂ and other pollutants, when procuring certain road transport vehicles (Directive (EU) 2019/1161, p. 188/122).

While complementary regulations have strengthened emissions standards for new vehicles on the market (e.g. 2019/631, 2019/1242, 2018/858), and the Clean and Energy-Efficient Road Transport Vehicles Directive considers life cycle costing (LCC) important for accounting energy and environmental costs, the EU has not yet established a common method for procurers to use in calculating environmental impacts, leading to inconsistent approaches across procuring authorities.

The **Battery Directive** establishes rules for characteristics and disposal of all types of batteries and accumulators. The directive prohibits the use of hazardous substances in batteries, such as mercury, cadmium and lead, and establishes rules for collection, treatment, recycling and disposal of waste batteries (Directive (EU) 2006/66/EC, 2006, p. 4).

A proposal to improve the Battery Directive was published in 2020 and is under negotiation (Halleux, 2022). It includes additional mandatory criteria for all types of batteries including: a carbon footprint declaration, minimum recycled content, minimum environmental performance and durability, replaceability, safety requirements, out-of-service battery collection, recovery of recycled material and battery labelling (Halleux, 2022). The proposal highlights the need for "minimum mandatory green public procurement criteria or targets" (Proposed Regulation COM/2020/798, p. 97).

Finally, the **Energy Star Regulation** includes mandatory energy efficiency requirements for appliance and electronic purchases subject to the public procurement directives (Regulation (EC) No 106/2008).

¹ Primary energy consumption refers to the total energy demand of a country, including the energy consumed by the energy sector itself during production and distribution of the energy. Final energy consumption is the total energy consumed by end-users such as households, industry or agriculture.

2.2.2 Sectoral legislation supporting the implementation of GPP

The **Ecodesign for Sustainable Products Regulation (ESPR)** aims “to reduce the negative life cycle environmental impacts of products” (Proposed Regulation COM (2022) 142). Proposed in March 2022, it would serve as the policy foundation directing the requirements for all sustainable products made in the EU today. It takes the 2009 Ecodesign Directive (Directive 2009/125/EC) as basis.

The Commission sought to build upon this legislation by declaring its vision of making sustainable products the norm. The proposed ESPR text raises Europe’s green public procurement ambition by recognizing that voluntary public procurement criteria make a limited impact and introducing mandatory green public procurement requirements, as well as requiring procurers to use green procurement criteria for all purchases (European Commission, 2022m). It aims to cover most physical goods categories on the EU market and establish a harmonised framework that considers product circularity, energy performance and environmental sustainability (European Commission, 2022b).

The proposal considers mandatory requirements including: i) product durability, reusability, upgradability and reparability, ii) presence of substances that inhibit circularity, iii) energy and resource efficiency, iv) recycled content, v) remanufacturing and recycling, vi) carbon and environmental footprints, and vii) information requirements (European Commission, 2022b).

The **Construction Product Regulation (CPR)**, in place since 2011, sets the rules for trade of construction products. It highlights sustainable use of natural resources, especially reuse and recycling of construction materials, the durability of the materials, and their environmental compatibility. The regulation emphasizes the use of environmental product declarations (EPDs), when available, which is compliant with the ISO 14025 International standard and can help procurers objectively compare products’ environmental performance from a life cycle perspective (Regulation (EU) No 305/2011, p. 88/10).

The European Commission/Council initiated review of a revised CPR in March 2022 that would strengthen environmental standards for construction products traded in the EU Single Market and manufactured in the EU, and create incentives to push the construction sector to meet climate and sustainability goals (European Commission, 2022k). Should this proposal be enacted, it would codify environmental standards in a way that was neglected in previous versions of the law (European Commission, 2022n).

These new standards would be reinforced with a new set of rules and penalties. The proposal also dedicates an article to GPP and calls for mandatory GPP criteria in construction materials sourcing (Proposed Regulation COM (2022) 144). Furthermore, manufacturers would have to disclose environmental information on their products’ life cycle and comply with regulations covering: environmental sustainability of product and packaging design and manufacturing, use of recyclable materials, minimum recycled material content, disclosure of product use and repair instructions, and a product’s ability to be reused, remanufactured and recycled (European Commission, 2022n).

The proposed CPR revision and the Eco-design for Sustainable Products Regulation (ESPR) are inherently intertwined. While ESPR’s objective is to “make sustainable products the norm on the EU market” (European Commission, 2022n) and provides a general framework, the new CPR would then introduce more specific rules (European Commission, 2022n). To date, the proposal remains under first reading by the EU Council (Proposed Regulation COM (2022) 144).

The European Commission has developed a general method to calculate environmental impacts of a product, service or organization based on the standardized Life Cycle Assessment (LCA) methodology, called the Product Environment Footprint (PEF) method.

In addition, the Commission established the **Product Environmental Footprint Category Rules** (PEFCR), a ruleset describing how to calculate the environmental footprint of a specific product group. The aim is to have rules applicable in the entire EU market that facilitate the comparison of the environmental performance of products, services or organizations.

While PEFCR introduces more consistency and reproducibility to LCA (European Commission, 2021d, p. 8), the comparability between products, services or organizations remains limited. PEFCRs exist for construction products such as metal sheets, thermal insulation, and hot- and cold-water supply pipe systems (European Commission, 2021c). No PEFCRs exist for road transportation products, so procurers would use the PEF method to determine their environmental impact (Partl et al., 2021). In late 2021, the European Commission recommended the “use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations” (Commission Recommendation 2021/2279/EU). The suggested measures are voluntary and recommend that Member States and organizations use PEF calculations in their procurements (Commission Recommendation 2021/2279/EU). On the other hand, if a new PEFCR should be created, the PEF method includes the steps that should be followed to ensure an EU-level consensus on the rules (Zampori & Pant, 2019).

Environmental labels can inform environment-based purchasing decisions by standardizing certain technical specifications. Objective, transparent labels granted by independent third parties verify compliance with international environmental standards (European Commission, 2022c). The applicable criteria for EU Ecolabel are included in the Regulation (EC) No 66/2010.

In addition, the **Ecodesign requirements for energy-related products** (Directive 2009/125/EC) provide a framework for developing environmental criteria for energy-related products, which include construction and road transport materials (European Commission & ICLEI, 2016).

2.3 Tools and support systems

2.3.1 Voluntary guidelines

The European Commission formulated voluntary sectoral criteria guidance to support the consideration of environmental obligations in tender formulation and evaluation. The criteria can be used to clarify tender requirements along different steps of the procurement cycle (Figure 3) such as technical specifications, award criteria and contract performance clauses.

The Commission developed criteria and guidelines for 10 priority sectors based on the magnitude of their public expenditure and environmental impact. Construction, transport, and transport services are each included. Additional details on voluntary GPP criteria developed by the Commission for the construction and road transport sections can be found in the annex.

The recommended criteria are divided in two levels of rigor: core and comprehensive criteria. *Core criteria* aim to make a significant environmental impact at minimum additional effort or cost (European Commission, 2008a, p. 15), thus, they should be easy to apply (Hasanbeigi et al., 2019, p. 20). On the other hand, *comprehensive criteria* aim for a higher level of ambition of environmental performance (Hasanbeigi et al., 2019, p. 20) that could require additional administrative efforts or increased costs (European Commission, 2008a, p. 15).

The Commission also points to certain environmental impacts that could be judged as tender performance parameters in the core and comprehensive criteria. These comprise, but are not restricted to, emissions to air (including GHG and other emissions) and water, waste to landfill, hazardous substances, resource use, environmental quality (effects on biodiversity, local environment, noise emissions), and air quality impact (European Commission, 2008a, p. 7).

Verification procedures to assess environmental conformity of tenders and bids are key to successful implementation of GPP requirements. This process tests the relevance of tenders' environmental requirements and verifies that received bids satisfy the tender specifications. The Commission guidance for GPP includes a classification of proposed environmental verification procedures that could be employed by bidders and contracting authorities to assess technical specifications or award criteria (European Commission, 2008a, p. 5) (see Table 2).

Table 2. Verification – types of environmental evidence for product or service compliance proposed by the European Commission

Name	Description	Examples
Type I	Environmental Declaration according to ISO (International Organization for Standardization) 14024	European Ecolabel National or multi-national eco-labels
Type II	Environmental Declaration according to ISO 14021	Self-assessment following ISO 14021
Type III	Environmental Declaration according to ISO 14025	Certified environmental product declaration (EPD)
External – accredited	Statement from accredited third party	
Internal – accredited	Statement from internal accredited laboratory	
Self-assessments	Various forms of self-assessment with random checks or sector acceptance	EU mandatory energy labelling systems Sectoral industrial self-assessment

Source: European Commission (2008a, p. 6)

Bids' environmental performance compliance can be evaluated using award criteria and a scoring system. This process can include awarding a points if the bid complies with a certain environmental standard or awarding points based on performance *beyond* the minimum requirements in the tender's technical specifications (European Commission, 2008a). The Commission encourages prioritizing environmental criteria in the tender evaluation to promote the markets for green materials and services (European Commission, 2008a, p. 6).

2.3.2 Other tools and support systems for GPP

The European Commission provides various tools and learning support to promote and facilitate GPP's implementation in the Member States, summarized in Table 3.

The suggested procedure for GPP in the EU is encapsulated in the Buying Green! Handbook. The European Commission also runs a dedicated website offering access to information. This includes a helpdesk for GPP, intended to support public authorities' purchasing choices (European Commission, 2022i).

Another component supporting EU public procurement is the inclusion of standard digital forms (eForms) in the publication of new tenders in the EU Tender Electronic Daily (TED) database. The eForm fields collect data on green, social and innovative procurement conducted by public authorities (Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2020b, p. 20). The use of these eForms will be required starting 25 October 2023 (Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2020a, p. 8).

Table 3. Selection of tools and support systems for EU GPP implementation

Tool name	Type	Description
Buying Green!	Document	Compilation of EU GPP guidelines and case studies
Public Procurement for a Circular Economy	Document	Brochure
GPP National Action Plans	Document	Details of Member States' National Action Plans
Green Public Procurement (GPP) website	Web page	Information hub for EU GPP
Updated EU GPP criteria	Web page	Links with access to sector-specific technical background reports and GPP criteria
GPP Training Toolkit	Web page	Updated GPP training toolkits
EU Tenders Electronic Daily (TED)	Web page	EU-wide public procurement notice system
EU GPP helpdesk	Communication channels	Support line for stakeholders' enquiries and news alerts
Ecolabel	Label certification	Voluntary label for environmental excellence
Big Buyers for Climate and Environment Initiative (EU)	Member organization	Collaboration promotion between big public buyers. Relevant working groups: Electric vehicles (heavy duty) Circular construction materials Zero emission construction sites

2.4 Statements and efforts to raise GPP ambitions

The Commission has acknowledged opportunities to improve the existing regulatory instruments on GPP and has suggested including minimum requirements, and even benchmarks, based on existing directives and regulations (e.g. in the ESPR). As part of the European Green Deal's "Mobilising industry for a clean and circular economy" strategy, the European Commission advised public authorities, including the EU institutions, to lead by example and ensure that their procurement is green, and outlined a number of actions to improve GPP (Maire & Degiorgis, 2020), such as:

- Include minimum mandatory green criteria and targets for public procurements in sectoral initiatives, EU funding or product-specific legislation. These minimum criteria will set a common definition of a green purchase.
- Phase in compulsory reporting to monitor GPP uptake.
- Expand capacity building support with guidance, training and dissemination of good practices and encourage public buyers to take part in a "Public Buyers for Climate and Environment" initiative to facilitate exchanges among buyers.

In 2022, the Council of the EU on the Single Market shared draft conclusions of public procurement's role in achieving green and digital transformations (European Commission, 2022j, p. 236/2). The conclusions call for Member States to pursue EU's binding targets as a means to ensure significant reductions in greenhouse gas emissions by 2030 and climate neutrality by 2050. Specifically, the conclusions urge the Commission and Member States to map sectors amenable to including sustainable development considerations in public procurement. The report also demands that public procurers support the transition to a green economy by prioritizing ambitious procurement of sustainable products and services, while seeking the best possible value and promoting competition. The conclusions also encourage EU-level coordinated

stakeholder engagement to collect feedback on newly introduced sectoral criteria. Finally, the conclusions suggest sectoral amendments of EU texts by 2030 to include updated sustainable procurement considerations.

GREEN PUBLIC PROCUREMENT IN THE US

Buy Clean is a US public procurement policy aimed at ensuring infrastructure investments are spent on construction materials – particularly steel, concrete, asphalt, and flat glass – manufactured in a cleaner, more efficient and environmentally friendly manner.

The policy was initially introduced in the state of California in 2017 and similar policies were adopted by several other states since (BlueGreen Alliance, 2022; World Economic Forum et al., 2022). In 2021, the Federal Government launched the Buy Clean Task Force to change procurement practices at the federal level and promote a shift in US construction material manufacturing. The initiative targets pollution reduction, job creation and clean domestic manufacturing by prioritizing the use of “American-made, lower-carbon construction materials” (Office of the Federal Chief Sustainability Officer, 2022).

The 2022 Inflation Reduction Act includes measures that incentivize procuring construction materials with low embodied carbon. The measures apply to road construction materials as well as public buildings (Inflation Reduction Act, 2022). US\$4.5 billion in funding is dedicated to:

- Developing and executing a program create and standardize of environmental product declaration (EPD) criteria. The EPD criteria will include embodied carbon reporting, including for construction materials (Inflation Reduction Act, 2022, p. 256).
- Carrying out a program for low embodied carbon labelling for construction materials used in highways and federal buildings based on EPDs or verification by the Environmental Protection Agency (Inflation Reduction Act, 2022, p. 261).
- Providing incentives for using highway construction materials with low embodied greenhouse gas emissions connected to their production, use and disposal (Inflation Reduction Act, 2022, p. 269).
- Acquiring and installing materials and products with low levels of embodied greenhouse gas emissions in government-owned buildings (Inflation Reduction Act, 2022, p. 267).

In November 2022, the US government proposed a rule suggesting that federal contractors must have science-based emissions reduction targets in line with the Science Based Targets initiative and disclose environmental impacts (Science Based Targets, 2022).

3. Country descriptions

In this section, we describe the current GPP practices of each case study country, including the governance and legal framework, the support systems for policy implementation and the monitoring and follow-up systems.

In 2019, Sweden's public purchases generated over 23 million tons of greenhouse gas emissions.

3.1 Sweden

In Sweden, public procurement accounted for about 17% of its GDP in 2020 (OECD, 2022). In 2019, 68% of public purchases were made by municipalities, 19% by regions and 11% by the national government, generating over 23 million tons of total GHG emissions (Miljömålsberedningen, 2022; Swedish Procurement Agency & Swedish Competition Authority, 2020). The construction and transport sectors represent about 48% and 6% of procurements, respectively, and are among the largest contributors to public procurement emissions (Swedish Procurement Agency & Swedish Competition Authority, 2020).

3.1.1 Governance and legal framework

Broadly, Swedish procuring entities enjoy great latitude in how they formulate their calls to tender, which may or may not include environmental criteria. The Swedish Public Procurement Act from 2016 encourages environmental considerations in public procurements (Swedish Public Procurement Act, 2016).

The Ministry of Finance sets any procurement policies, and in 2017 published a nonbinding National Public Procurement Strategy (Government Offices of Sweden, Ministry of Finance, 2017). Two of the goals it sets forth – “public procurement that drives innovation and promotes alternative solutions” and “environmentally responsible public procurement” – can directly propel the industrial green transition. The Swedish Procurement Agency, created in 2015, supports the implementation and monitoring of the strategy.

In 2022, a political committee presented its findings from a governmental investigation about the possibility of establishing a consumption-based climate target at the national level. As part of its proposals, the committee stated that the public sector should reduce its climate impacts at a faster pace than the rest of society, recognizing its influence in decarbonization as well as its significant environmental impact (Miljömålsberedningen, 2022).

A new law that took effect in 2022 requires that all construction companies state the climate impact of all new buildings (Boverket, 2022). Since 2015, the Swedish Transport Administration also requires the use of an LCA-based calculation through a self-developed tool (Klimatkalkyl) for projects of €5 million or more (Trafikverket, 2022). For projects costing less, product-level EPDs are required for the construction materials. In addition, the Transport Administration introduced a bonus system to reward projects with lower GHG emissions.

Furthermore, in October 2021, the Swedish government proposed a law that demands local authorities to consider climate, environmental, human health, animal rights, and social and labour laws in public procurement. The law, should it pass, would take effect on 1 July 2023 (*En skyldighet att beakta vissa samhällsintressen vid offentlig upphandling*, 2022).

For municipalities and regional authorities, which accounted for the bulk of Sweden's public procurements in 2019, there is a dedicated purchasing centre known as Adda, which is responsible for commissioning the four-year framework agreements for local authorities. Municipalities and regions enjoy fewer restrictions related to procurement than the national government and can choose whether to adopt these framework agreements. Interviews with Adda staff indicated a great level of commitment, time and expertise required to implement GPP principles in their framework agreement procurements. In 2019, about 37% of procurements used framework agreements (Swedish Procurement Agency & Swedish Competition Authority, 2020).

What results from Sweden's scattered approach to GPP is a situation in which Swedish procurement officers from local authorities can choose to develop their own criteria, opt into framework agreements such as the ones offered by Adda, or use criteria developed by the Swedish Procurement Agency or the EU Commission. Interviews also revealed a lack of post-execution follow-up of contracts in Sweden. For example, the Clean and Energy-Efficient Road Transport Vehicles Directive does not yet have any verification, follow-up or penalty mechanisms for not following the law. The lack of monitoring and follow-up on contracts makes it difficult to measure the uptake and effectiveness of GPP efforts.

3.1.2 Supporting systems for policy implementation

To support the procurement strategy's implementation, the Swedish Procurement Agency has developed several tools. These include: i) an online GPP criteria search tool, which features a database of criteria for different product categories, and with three ambition levels; ii) a risk analysis service, detailing where in the supply chain different products pose higher social and environmental risks; and iii) a Life Cycle Costing (LCC) tool, allowing users to calculate the cost of the product or service over its whole life cycle. This does not directly include environmental considerations, but allows users to grasp the cost of, the energy use, for example, over a product's life cycle.

The Swedish environmental institute IVL and the Swedish Transport Administration have both independently developed LCA-based calculation tools using generic data that can calculate the climate impact of buildings (in the case of IVL) and climate impact of transport infrastructure projects (in the case of the Transport Administration) (IVL, 2022; Trafikverket, 2022).

3.1.3 Monitoring and follow-up

While there is no systematic monitoring system for GPP or procurements generally, the Swedish Procurement Agency follows up on the implementation of the National Public Procurement Strategy, issuing a bi-annual survey to all procuring agencies (government agencies, municipalities, regional authorities and state-owned companies) to measure participation and understand current practices and challenges (Swedish Procurement Agency, 2020). The response rate is about 40%. The assessment found that in 2020, current procurement practices contributed by a level of 38% to meeting the national environmental goals, falling behind its 2018 score. According to the assessment system, the score shows there is "a very large development need" for procurement to make the intended positive climate impact.

In addition, the Swedish Procurement Agency estimated the climate impact associated with public procurement from local to national levels by analysing public spending for the year 2019 for a large part of the public sector. They concluded that construction contracts, including road and water construction, are among the purchase categories that generate the highest environmental impact, followed by IT and machinery as well as public transport, passenger transport, and travel agency services. Fuel and electricity and other goods and materials of metals and minerals are also included in nine categories that together account for 52 percent of the total climate impact that arises due to government payments and purchases (Swedish Procurement Agency, 2022). Being responsible for the largest share of the public procurement, almost 50% of municipalities' climate impact is generated by their procurements connected to buildings, property, land and transport (Swedish Procurement Agency, 2022).

3.1.4 Best practices in action

A local example of best practice is the City of Stockholm, a front runner in using GPP for road transport. In 2003, the municipality set a target to have their entire car fleet (almost 900 cars) be clean vehicles, running on renewable energy. In 2022, the city fulfilled that goal (Stockholms stad, 2022). Another positive example is that in 2014, the national trade association for public transport took the initiative to develop green criteria for procurement of public transport to promote GPP uptake across the nation (Partnersamverkan för en förbättrad kollektivtrafik, 2014).

Almost 50% of municipalities' climate impact is generated by their procurements connected to buildings, property, land and transport.

3.2 The Netherlands

In the Netherlands, public procurement accounted for about 20% of its GDP in 2020 (OECD, 2022). Municipalities, provinces, water authorities and central government in the Netherlands have a combined purchasing power of more than €73 billion annually (Ministry of Infrastructure and Water Management, 2021).

3.2.1 Governance and legal framework

As with Sweden, GPP is voluntary in the Netherlands. The country uses the term Sustainable Public Procurement (SPP), and its policy landscape is determined by several governmental departments, each taking a different focus, including circular economy, climate and sustainability (Ministry of Infrastructure and Water Management), social return and central government procurement (Ministry of the Interior and Kingdom Relations) and green transitions and social enterprises (Ministry of Economic Affairs and Climate Policy). The Ministry of Economic Affairs and Climate Policy (known as MiEACP) is responsible for policy development, with a focus on opportunities that sustainable procurement creates for innovation and enterprise.

The Ministry of Infrastructure and Water Management (Rijkswaterstaat) commissions the construction projects, as it is responsible for the design, construction and management of the national infrastructure in the Netherlands. It is considered front runner in mainstreaming sustainable procurement practices due to its work on developing tools to facilitate GPP. One of the recent sustainable construction projects by the Rijkswaterstaat was building a bridge, completed in 2018, made 100% from circular materials, using concrete elements which are suitable for reuse. During the project development phase, an open forum was set up, where 60 participants across various market parties, government agencies and research institutes shared knowledge and experiences.

While GPP is voluntary, the latest Dutch National Plan on Sustainable Public Procurement, which spans from 2021 to 2025, highlights the progress that has occurred since 2015 (Ministry of Infrastructure and Water Management, 2021). 170 public authorities have endorsed a manifesto to boost the uptake of SPP by requiring sustainability criteria in procurement contracts.

At the same time, the assessment of the 2015–2020 plan found that cost most often still beats sustainability as the main driver for procurement decisions, and that SPP must be further developed to realize significant GHG emissions savings. Therefore, the 2021–2025 plan aims to build on positive achievements to create more systematic SPP processes, through, for example, sectoral buyers' groups.

Additionally, the Netherlands government adopted a Procurement with Impact strategy for 2021–2025 to increase the central government's ambitions to use procurement to achieve significant environmental and social benefits. The strategy sets a goal for the central government to be climate neutral by 2030 and fully circular by 2050 (Ministry of the Interior and Kingdom Relations, 2021).

3.2.2 Supporting systems for policy implementation

PIANOo, which exists under the MiEACP umbrella, is the Dutch public procurement expertise centre. It serves as helpdesk for public authorities and provides legal information and training.

The Netherlands' government also offers various resources and tools to help buyers reduce their environmental impact. An online SPP criteria search tool allows procurers to quickly collect relevant GPP criteria for products (Government of the Netherlands, 2022). Furthermore, the CO₂ Performance Ladder is a tool frequently used in procurement. Contracting authorities use it to provide an award advantage to bidding companies that are managing and reducing their carbon emissions. An upgrade is being developed for the CO₂ Performance Ladder, striving to exceed Paris Agreement ambitions (Stichting Klimaatvriendelijk Aanbesteden & Ondernemen, n.d.). In addition, the software DuboCalc, developed by the Rijkswaterstaat, makes rapid calculations

In the Netherlands, cost most often still beats sustainability as the main driver for procurement decisions.

In 2015–2016, the Netherlands' use of SPP for eight product groups led to at least 4.9 metric tons of avoided greenhouse gas emissions.

of sustainability and environmental design variants of ground, road and water construction through an LCA of energy use and materials (DuboCalc, n.d.). Both the CO₂ Performance Ladder and DuboCalc convert assessment results into price deductions from the initial bid, making more environmentally ambitious bids more likely to win the contract. For the CO₂ Performance Ladder, an enforcement protocol, imposes a penalty of 1.5 times the original price discount on the contractor if the project does not meet the environmental performance outlined in the bid. Furthermore, several tools are available to analyse the sustainability performance of projects and suggest concrete improvements for reduced GHG emissions.

In the Netherlands, the tools “Environmental Performance of Buildings” (MPG) and “Economic Cost Indicator” (MKI) use material shadow costs to calculate the embodied carbon score for a project or a product. All new housing and office buildings must fall below a maximum MPG score. Further, a Concrete Agreement enacted in 2018 by public and private actors in the concrete value chain aims for CO₂ neutrality and a circular concrete sector by 2030. In the Agreement, product-level limits are set on embodied carbon using the MKI score (Betonakkoord, n.d.).

As part of the Dutch Procurement with Impact strategy, a self-evaluation tool allows government agencies to monitor and control their own efforts, while at the same time creating an anonymous national picture. The tool will increasingly provide information on the achieved result will, in time, also be able to identify best practices.

Beyond tools, the Netherlands also supports the uptake of GPP through 13 sectoral buyers' groups that unite buyers and clients to jointly work towards innovation, tool development and market change, supported by experts (Ministry of Infrastructure and Water Management, 2021).

3.2.3 Monitoring and follow-up

The Netherlands is one of the few countries that monitors the effects of SPP. The National Institute for Public Health and the Environment's (RIVM) first public procurement report on eight product groups in 2015 and 2016 showed that the use of SPP has led to at least 4.9 metric tons of avoided GHG emissions during the terms of the contracts and that bio-based purchasing has avoided the use of 13 000 tons of oil equivalents (Ministry of the Interior and Kingdom Relations, 2021).

The central government uses an SPP Self-evaluation Tool to monitor procurements. The Dutch Procurement with Impact strategy from 2021 states that all ministries are responsible for their own procurements monitoring and providing insights to the Ministry of the Interior and Kingdom Relations, which is responsible for providing a government-wide perspective by aggregating all data. The data is collected into an annual report (known as the Jaarrapportage Bedrijfsvoering Rijk) (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2022).

All contracting authorities are urged to publish their contract notices and award notices in the TenderNed database, which is a central hub for all procurement notifications and documents. For procurements above the EU threshold, disclosing this information is mandatory, however, for the ones below the EU threshold, the database is voluntary. The TenderNed database feeds into the Public Procurement Monitoring Report of the Netherlands by MiEACP, which states that in 2020, 164 contracting authorities filled in the self-evaluation tool with a total of 2411 contracts, of which over 80% had at least one SPP element included (Ministry of Economic Affairs and Climate Policy, 2021).

In terms of follow-up process, the National Action Plan for Sustainable Procurement (2021–2025) only marginally incorporates SPP in contract management (Ministry of Infrastructure and Water Management, 2021). The Action Plan aims to start a community practice among contract managers to create a collection of knowledge and good practices to demonstrate the importance of contract management. The supplier must report its compliance with the tender's environmental requirements.

While France's 2015 national plan for sustainable procurement set a target of 30% of public procurements including an environmental consideration by 2020, the actual achievement was 17%.

This prohibits the use of only minimum price criterion, but does not guarantee that the environmental criterion will lead to more environmentally ambitious procurements and actual prevention of GHG emissions.

3.3 France

In 2020, public procurement represented about 16% of the French GDP (OECD, 2022), of which about 30% were construction projects, 35% services and 35% provisions in economic value. Here again GPP is optional. In 2020, 19% of procurements included an environmental criterion. While France's 2015 national plan for sustainable procurement set a target of 30% of public procurements including an environmental consideration by 2020, the actual achievement was 17% (Ministère de l'Écologie du développement durable et de l'Énergie, 2015).

The State and public hospitals had 22% of their procurement including environmental criteria, whereas local authorities had 13% (Ministère de l'Économie, des Finances et de la Relance, 2021).

3.3.1 Governance and legal framework

The French Ministry of Economy sets the national procurement policy. In March 2022, the Ministry of Ecological Transition published its new National Plan for Sustainable Purchases (Commissariat général au développement durable, 2022). It aims to promote the use of sustainable public procurement, specifically GPP, but is non-binding. It sets the objective of 100% of public procurements including environmental criteria by 2025, and 30% with social considerations (Commissariat général au développement durable, 2022).

While these targets are voluntary, France acknowledges GPP's importance in its 2021 Climate and Resilience law which states: "Public procurement contributes to the achievement of sustainable development objectives, in their economic, social and environmental dimensions." The law mandates public authorities procuring a minimum yearly value of €50 million to retain at least one environmental award criterion, starting in 2026. However, the law leaves full freedom to the procurer to formulate this criterion. In practice, this prohibits the use of only minimum price criterion, but does not guarantee that the environmental criterion will lead to more environmentally ambitious procurements and actual prevention of GHG emissions.

The French government's Covid recovery plan, published in 2021, includes a variety of actions related to the construction and road transport sectors. One example is funding for replacing existing car fleets with electric and hybrid vehicles for the police, customs and prison administrations. It also includes goals for renovating public buildings, which account for a total of 380 million square metres. These measures would reduce buildings' energy consumption by 40% by 2030 and 60% by 2050 (Gouvernement Français, 2021).

In addition, the legislation *Réglementation environnementale* (known as RE2020) sets GHG emissions limits per square metre for public and private new construction of housing, schools and offices (Ministère de la Transition Ecologique, 2021). The rules took effect in 2022 and include a plan to gradually lower the emissions limits until 2031.

3.3.2 Supporting systems for policy implementation

The National Plan for Sustainable Purchases, currently under implementation, includes 22 actions to promote GPP. Examples of these actions are developing and sharing tools to facilitate GPP, developing and promoting GPP trainings, mapping and expanding buyers' networks involved in GPP, organizing meeting days to exchange practices, awarding annual awards for the best sustainable public procurement initiative, as well as developing and promoting the use of quantitative and qualitative indicators to monitor the evolution and impact of environmental considerations by buyers.

Hence, we observe considerable efforts and a positive dynamic at the national level towards more GPP, even though the uptake remains low.

France's Covid recovery measures would reduce buildings' energy consumption by 40% by 2030 and 60% by 2050.

3.3.3 Monitoring and follow-up

Since 2005, the French Economic Observatory of Public Procurement has issued a yearly report on public procurement in France, using data reported by procurement officers through a digital platform. The reporting is mandatory for all purchases of more than €90 000 and is recommended for all purchases. This threshold will be lowered to €40 000 EUR as the new Climate and Resilience law takes effect in 2026. GPP is defined broadly for monitoring purposes, and can include metrics for energy efficiency, GHG emissions, resource use and certain pollutants (Observatoire économique de la commande publique, 2022). In addition, the National Plan for Sustainable Purchases includes a bi-annual monitoring procedure to follow up on the 22 actions outlined in the plan, based on a qualitative and quantitative report.

3.4 Germany

Germany is one of the largest economies in Europe, and its public sector awarded contracts worth 18% of its GDP in 2020 to private companies (OECD, 2022).

3.4.1 Governance and legal framework

The general principles and the legal framework for public procurement in Germany are set in the public procurement law. The Federal Climate Change Act (Federal Climate Change Act, 2019) contains a separate section on the exemplary role of the public sector and the goal of making the federal administration climate-neutral as early as 2030. This Act also stipulates that public procurement must give preference to the most climate-friendly products and services.

The German Sustainability Strategy, which was updated in 2016 incorporates the federal government's Programme of Measures on Sustainability (Die Bundesregierung, 2021). It focuses on the public administration becoming climate neutral by 2030, yet does not specify any goals regarding the use of GPP. The Programme includes energy efficiency requirements for construction and refurbishment of federal properties, and public procurement, which aligns with the guiding principles of sustainable development. The Strategy states that for wider implementation of sustainable procurement, further development and growth in the range of training courses on all aspects of sustainable development is needed (Beschluss der Bundesregierung, 2021).

In Germany, federal offices must consider the life cycle costs when they procure energy-consuming products and services. For the procurement of road vehicles, life cycle costs in the form of energy consumption and other environmental impacts such as material sourcing must be part of the award criteria. Further, the Programme of Measures on Sustainability states that federal authorities are committed to sourcing products with the German Blue Angel ecolabel wherever possible. The label certifies a large range of products, which must meet criteria developed by the German Environment Agency.

The German procurement system is highly decentralized. According to one estimate, 58% of procurement activity is done at the municipal level, 30% on the state level and 12% federally (BMWK, 2022). The 16 German states are autonomous in their procurement policy objectives and are not required to have their own procurement laws. Bavaria is the only state without its own unique procurement law, thus it is subject to federal law. The federal, state and local governments work together as part of the Alliance for Sustainable Procurement to exchange information and promote a wider uptake of sustainable procurement practices at all government levels (BMWK & Allianz Für Nachhaltige Beschaffung, 2014).

3.4.2 Supporting systems for policy implementation

In Germany, several national authorities are involved with different GPP-related tasks and many also provide GPP training. The Competence Centre for Innovative Procurement (KOINNO) organizes training and provides targeted information on sustainable public procurement. KOINNO focuses on innovation procurement, while the Competence Centre for Local

In Germany, 58% of procurement activity is done at the municipal level, 30% on the state level and 12% federally.

Development Cooperation (SKEW) focuses on the social implications of public procurements. In addition, The Federal Environment Agency provides a wide range of practical guidance for many product groups.

There are also various tools developed for procurers to calculate life cycle costs. KOINNO and the German Environment Agency organize training and capacity-building for contracting authorities. Furthermore, all procuring agencies can turn to yet another organization, The Centre of Excellence for Sustainable Procurement, for support or browse the Sustainability Compass website, which holds various information on sustainable procurement (Kompass Nachhaltigkeit, 2022).

The Federal Ministry for Housing, Urban Development and Building has developed the Assessment System for Sustainable Building (BNB), which provides a broad methodological basis for assessing sustainable and environmentally sound construction concepts (BMWSB, 2022a). Since 2011, it is mandatory for all federal construction projects to assess five main criteria groups, which produce an overall score for the project: economic quality, socio-cultural and functional quality, ecological quality, technical quality and process quality. Climate impact is included in the ecological quality category and makes up 3.75% of the total score. Further, the Protection of Natural Resources category includes measures such as the use of construction materials which can be reused or recycled, the use of rainwater or grey water, use of renewable energy and more efficient transport of construction materials. The minimum standard for allowing projects to proceed is a total score of 65% across metrics, whereas 80% and above is considered ambitious (BMWSB, 2022a).

For environmental evaluations of buildings, the German Federal Ministry of the Interior, Building and Community has developed the ÖKOBAUDAT database, containing 1400 EPD datasets of building products that are compliant with the BNB assessment. The database is used in life cycle assessments and sets a basis for calculation, which is then showed as a percentage of the benchmark in the assessment system (BMWSB, 2022b).

3.4.3 Monitoring and follow-up

Until recently, there were no nationwide statistics available on GPP in Germany. In 2022, the German Federal Statistical Office collected information from all contracting authorities on the sustainability criteria used in award procedures to develop a picture of GPP practices nationwide. The first oversight report was published October 2022, covering procurement awards in the first half of 2021. The report concluded that sustainability criteria (environmental, innovation and social considerations) were included in 12.4% of the cases reported during that period, which amounted to 31.5% of the total economic value of contracts awarded (BMWK, 2022).

The report concludes that the share lags behind the possibilities of strategic public procurement, since over 62% of the public procurements over the spending threshold for which EU Directives apply and 88% of procurements below that threshold did not include any sustainability criteria.

Additionally, as part of Germany's ambition of becoming a climate-neutral public administration, various indicators track its progress. The annual monitoring report includes measures such as the degree of implementation of the BNB assessment system for sustainable buildings, the energy consumption and share of renewable energy used in federal properties, CO₂ emissions caused by official flights and the share of European Management and Auditing Scheme certifications obtained by federal authorities.

3.4.4 Best practices in action

The city-state of Berlin aims to achieve climate neutrality by 2045, and procurement is seen as one of the key levers for this. In Berlin, the Administrative Regulation on Procurement and Environment establishes minimum environmental criteria for acquiring certain products. The regulation is continuously updated to include more product groups (BerlAVG, 2020). The most

Until recently, there were no nationwide statistics available on GPP in Germany.

The State of Berlin managed to cut its greenhouse gas emissions by 47% compared to the use of conventional products.

recent update is from 2021 concerning climate-friendly, circular and sustainable construction. As part of the general Berlin Procurement Law, it is compulsory for public procurers to formulate environmental criteria for tenders of construction valued over €50 000. A 2016 study by the Ecolnstitut found that by using the environmental considerations in the 15 relevant product groups at the time, the State of Berlin managed to cut its GHG emissions by 47% compared to the use of conventional products. Further, the study determined that environmentally friendly procurement led to a calculated cost reduction of 3.8%, or €38 million, per year (Senatsverwaltung für Wirtschaft, Energie und Betriebe, 2017).

3.5 Estonia

In 2020 in Estonia, 8323 procurements were carried out with a total value of €3.7 billion, which makes up 14% of GDP. However, according to official statistics, just 4.5% of this is considered GPP (Keskkonnaministeerium, 2022). GPP is mostly optional, save for the EU Directives in place and four product categories for which GPP is mandatory – none of which include building construction or road transport.

3.5.1 Governance and legal framework

The main responsible body for public procurement in Estonia is the Ministry of Finance (EMiF), which operates the electronic register where all public procurements are recorded. The Ministry of the Environment is responsible for GPP, cooperating with EMiF to make changes in the procurement register to better support GPP.

Estonia is one of the few EU Member States that does not have any strategic goals or national action plan for GPP. The national Public Procurement Act (RHS) mentions the possibility of including environmental criteria in procurements, but it is not required (Riigihangete Seadus, 2017). The Estonian programme for environmental protection and use of environmental resources for 2021–2025 includes a section dedicated to GPP, which outlines non-binding GPP targets for the coming years, applicable to all public procurements. Accordingly, the national government expects a significant increase in GPP among all public procurements from 3% in the base year 2020 to 25% in 2022 and 30% in 2025 (Keskkonnaministeerium, 2020). While the program includes 3% as the base year in 2020, official statistics is slightly higher at 4.5% of number of procurements and 16% in economic value of public procurements (Keskkonnaministeerium, 2022).

Estonia is one of the few EU Member States that does not have any strategic goals or national action plan for GPP.

The Estonian Energy and Climate Plan for 2030 includes the GPP requirements from EU Directives concerning government building renovation and the promotion of clean and energy-efficient road vehicles (Eesti Riiklik Energia Ja Kliimakava Aastani 2030, 2019). Starting in 2022, Estonia established mandatory GPP criteria for four product groups: office paper, cleaning products and services, furniture, and office equipment. In autumn 2022, Estonia began creating mandatory criteria for another five product groups, including road and building construction.

3.5.2 Supporting systems for policy implementation

In Estonia, the Ministry of the Environment maintains a GPP portal, which includes a contact form for inquiries. To facilitate GPP, green criteria for the four mandatory product groups are built into the procurement register. Criteria for other product groups are under development. EMiF regularly carries out general procurement training that sometimes includes a GPP section. The Ministry of the Environment is responsible for organizing trainings and capacity-building events. However, these events are not regular and have been general. There is a need and expectation by procurers to focus more on the product groups in the GPP training.

Similarly to many EU Member States, the Estonian Ministry of Economic Affairs and Communications commissioned the development of a voluntary carbon footprint calculation method for the construction sector. An Estonian carbon footprint database the construction materials has yet to be developed (E-ehitus teemaveeb, 2022).

In autumn 2022, Estonia began creating mandatory criteria for another five product groups, including road and building construction.

Further, the Ministry of Economic Affairs and Communications launched a contest for smart procurements. The 'Tark Tellija' contest rewards procurers who use well-developed criteria and prioritize cost-effectiveness in a life cycle perspective, measuring energy efficiency, CO₂ emissions savings and alignment with the circular economy (Majandus- ja Kommunikatsiooniministeerium, 2022).

3.5.3 Monitoring and follow-up

In Estonia, EMiF is responsible for developing a public procurement oversight report, which includes the share procurements practicing GPP (Riigihangete ja riigiabi osakond, 2021).

GPP data is collected via an EMiF-operated procurement register, where tenders are published and executed. The Ministry of the Environment helps the EMiF to make changes in the register to better support GPP implementation.

In the procurement register, a procurer can select built-in environmental criteria or formulate its own. In the latter case, the contracting authority decides whether to mark the procurement as GPP. Procurements marked as having environmental criteria would automatically be recorded as 'green' and thus allow for GPP monitoring. Most often, procurement officers do not have sufficient background knowledge of GPP, so they omit labelling the procurement as GPP, which underestimates GPP in the monitoring results. In addition, the register does not give an adequate overview of GPP, because the system only counts the built-in or self-added environmental award and selection criteria. Unless the procurer labels the tenders as GPP, tenders with green requirements in technical specifications or contracts do not come across as GPP. Therefore, Estonia lacks a clear overview of GPP uptake.

The main driver for GPP use – whether conscious or not – is cost reduction through material and energy efficiency.

Through interviews, we found that procurers might use more green criteria than they know. The main driver for GPP use – whether conscious or not – is cost reduction through material and energy efficiency. As an example, road construction tenderers try to minimize the costs by locally sourcing materials from nearby mining sites whenever possible and using recycled materials in the deeper layers of the roads. However, these actions are not always recognized as green criteria by the procurer, nor do they appear in the EMiF procurement register as GPP.

3.6 Poland

In Poland, public procurement accounted for about 12% of its GDP in 2020 (OECD, 2022). While it follows the EU's GPP Directives, the country does not have its own plan, policy or targets on GPP.

3.6.1 Governance and legal framework

There is no GPP-specific strategic document in Poland, but a general State Purchasing Policy for 2022–2025, defines desired activities and outcomes for purchasing sustainable and innovative products and services (Ministerstwo Rozwoju i Technologii, 2022). Until 2020, Poland had a National Action Plan, which integrated the EU GPP Directives (Council of Ministers, 2017). Poland discontinued the National Action Plan, replacing it with The State Purchasing Policy for 2022–2025. The policy advises all public administrations to allocate 20% of their purchasing budget to the public procurement of "innovative" solutions, which may include green materials and services (see Introduction under "The landscape of strategic procurement" and Figure 1). The State Purchasing Policy also foresees the development of a catalogue of products and services which would make the inclusion of green criteria mandatory (Ministerstwo Rozwoju i Technologii, 2022). This ready-to-use set of GPP criteria is expected to be updated every two years.

Green criteria might be applied voluntarily by procuring entities, but there is no requirement to practice GPP. In 2020, the share of GPP in Poland was 1% of all public procurements, with a target set for 7% in 2025 (Ministerstwo Rozwoju i Technologii, 2022).

3.6.2 Supporting systems for policy implementation

The Public Procurement Office (PPO) is assigned with specific GPP responsibilities, such as organizing trainings and disseminating information on relevant regulations and practical examples, including a guide to support contracting bodies in implementing GPP.

Furthermore, the Polish government developed a tool to calculate LCC for buildings. The Building Information Modelling (BIM) tool allows procurers to make optimal decisions related to the construction and helps them assess offers in terms of their environmental impact.

3.6.3 Monitoring and follow-up

PPO conducts monitoring on public procurement. The Polish State Purchasing Policy sets certain aspects to be monitored annually as part of assessing the effectiveness of the policy. Sustainable procurement is measured by the number of procurements using environmental, social and innovative aspects, and contracts that include life cycle costing criteria. The first monitoring report for 2022–2023 is scheduled for release in 2024 (Rady Ministrow, 2022).

3.6.4 Best practices in action

A local good example of GPP is the city of Warsaw, which launched its Green City and Climate Action Plan in 2020. This initiative includes efforts to improve transportation emissions and the energy efficiency of buildings by, for example, procuring electric buses and upgrading the city's heating system in public buildings.

3.7 Spain

Public procurement in Spain represents about 11% of the country's GDP (OECD, 2022). In 2020, 52% of public sector procurements were related to local authorities, while in terms of economic value the regional public sector has the highest weighted percentage of 43%. While GPP is mostly voluntary and managed by a scattered network of government agencies, Spain has set GPP targets and provides logistical support to those to opt to practice it.

3.7.1 Governance and legal framework

The Spanish administrative structure is divided into the national, autonomous, provincial and local levels. The Ministry of Finance and the Ministry for the Ecological Transition are responsible for GPP on the national level. The National Agency for Public Procurement, under Ministry of Finance, is responsible for drafting the national action plan on procurement.

Public procurement is implemented by three administrative organisations: the State Public Procurement Advisory Board, which collaborates with the European Commission; the Committee for Cooperation in Public Procurement, which organizes collaboration within autonomous communities and local entities; and the Office for the Supervision of Procurement, which supervises public procurement at the national level and enforces related legislation. This last body is also in charge of approving the national procurement strategy. A complementary body is the National Markets and Competition Commission, which supervises transparency and competition within public procurement (Ministerio de Hacienda, 2021).

The Spanish Sustainable Development Strategy 2030, enacted in 2007, includes a goal for 2030, to strengthen the ecological transition and compliance with social and labour rights by including social and/or environmental clauses to public procurement. In response, some autonomous regions have pledged to include these criteria in their procurement (Gobierno De Espana et al., 2007). Both the national strategy and the commitments of the autonomous regions are voluntary.

The Ecological Public Procurement Plan for 2018 to 2025 regulates procurements both nationally and for the autonomous regions. It lists voluntary GPP criteria for 20 product groups, which include construction and building management, road construction and maintenance, energy, transport, electricity supply, and office equipment. The road construction sector includes criteria such as using

recycled materials or secondary products and awards additional points if a bidder calculates the carbon footprint of the road during its lifetime of use (Ministero Para La Transición Ecológica y el Reto Demográfico, 2018).

The 2017 Spanish Law on public sector contracts incorporates the EU Directives and additionally prioritizes life cycle analyses as a criterion for awarding contracts. The law replaces the mandate to select the most cost-effective offer with a standard of choosing the best quality-to-price ratio, where economic and qualitative factors are assessed together. The required qualitative criteria include environmental, social and innovative characteristics, as well as technical value, aesthetics, design or even the qualifications and the experience of the personnel assigned to the project (Audiconsultores, 2018).

In October 2020, federal lawmakers started drafting a National Public Procurement Strategy. The Strategy is still a work in progress, but it is expected to include both socially and environmentally responsible public procurement in some form (Gobierno De Espana et al., 2007).

3.7.2 Supporting systems

The Ministry for Ecological Transition, along with the Spanish Climate Change Office, have compiled the Ministry's Carbon Footprint Register, where companies can register voluntarily. The register consists of three sections: calculating their carbon footprint, committing to GHG emission reductions, and offsetting GHG emissions. Contracting authorities can include this in their tenders among other environmental considerations (Gobierno De Espana, 2014). In addition, the Catalanian government developed a voluntary agreement program, in which the participating entities, either private or public, pledge to establish a GHG emissions reduction in Catalonia. The programme offers support for calculating the environmental footprint and promoting the commitment. Further, all the participating entities receive an official certificate for their climate mitigation efforts (Generalitat de Catalunya, 2022).

In terms of capacity-building, training seminars and learning courses are organized by the National Institute of Public Administration. These training courses provide the participants with practical tools on specific topics, such as transparency and green and innovative procurement. Further, each autonomous region has created its own training programs for its regional public employees.

The Ministry of the Environment also provides trainings on GPP with the support of private institutes like Ecoinstitut and has established a GPP helpdesk. There are also separate sub-national GPP websites and information desks in governments such as in Catalonia, Basque Country and the city of Barcelona.

3.7.3 Monitoring and follow-up

In Spain, the Independent Office for the Regulation and Supervision of Procurement conducts an annual public procurement oversight report, which does not include GPP.

Recent advancements in electronic public procurement tracking have allowed the country to get a better picture of its GPP performance. The share of green and sustainable selection criteria used in procurements increased by 176% in Spain between 2018 and 2020, according to the Ministry of Finance's Triennial Report on Public Procurement (Ministerio de Hacienda, 2021). In 2020, GPP subject to the EU Directives due to their monetary value accounted for almost 21% of all public procurements in Spain, while GPP falling below the EU spending thresholds accounted for 8.6% of all procurements. The report was conducted for the first time in 2021 based on the national data contained in information systems, as well as equivalents on the regional level. This is possible due to the recent advancement of electronic public procurement registration in Spain (Ministerio de Hacienda, 2021).

Currently the Spanish General-Directorate of Public Procurement, situated in the Department of Economics and Finance, is working on a requirement for national-level departments and public

The share of green and sustainable selection criteria used in procurements increased by 176% in Spain between 2018 and 2020.

authorities to track the fulfilment of environmental clauses in contracts. This requirement is expected to be adopted in 2023.

3.7.4 Best practices in action

The Spanish autonomous regions exhibit varying levels of ambition related to GPP, with some exceeding national standards.

The city of Barcelona is a pioneer in monitoring its GPP achievements. The Barcelona City Council established voluntary technical instructions for the application of environmental criteria in tenders, and a plan for sustainable public contracting with follow-up on main indicators is drafted annually. The monitoring indicators include green electricity supplied, recycled paper purchased, computers and laptops with environmental criteria, chemical content in uniforms, and minimized packaging. In terms of infrastructure, the city annually monitors the share of environmental criteria established in project plans for public spaces and infrastructure (Generalitat de Catalunya, 2019).

The Catalonia region has set a goal of 50% of procurements using GPP by 2025, an all-electric public vehicle fleet and 100% renewable energy powering public buildings by 2030. The region also produces an annual analysis on the use of environmental clauses procurement contracts. In 2020, 40% of public procurements in the Catalanian region included environmental clauses, which is a significant increase from 2017, when the share was 14%. As a best practice example, the Catalonia region carried out a project on sustainable paved surfaces, involving diverse actors into the design, production and construction processes to make pavements more economically and environmentally sustainable. The carbon footprint of the pavement life cycle was reduced by 12% compared to a conventional one (Generalitat de Catalunya, 2019). Another pilot project in the region occurred in the Catalanian capital Barcelona, which reported that at the beginning of 2022, a district in the city received new road surface layering which included 4500kg of non-reusable plastics. It is estimated that the new pavement cuts 17 tons of CO₂ which otherwise would have been emitted using traditional methods and materials (Iolov, 2022).

Additional best practices include the Basque Country, which developed a GPP manual for the region. It not only includes green criterion for tenders, but also recommends better evaluating the need to procure in the first place. The Basque Agency for Environmental Management also hosts a regional helpdesk, which offers help with greening tenders made in the region. Basque, along with Catalonia and the Canary Islands, have included GPP training courses in the official training programs for public administrations.

3.8 Italy

Italy is the only Member State of those studied here to implement wide-ranging GPP requirements. In Italy, public procurement accounted for about 12% of its GDP in 2020 (OECD, 2022). The country is home to over 40 000 public contracting authorities. In 2020, these issued over 174 000 tenders, each valued at more than €40 000. The initial legislation regarding GPP in Italy dates back to 2003, when the government imposed a minimum recycled content of 30% for several product groups, such as plastic, glass, wood and textiles.

3.8.1 Governance and legal framework

The main authority responsible for GPP policy is the Ministry of Ecological Transition. In 2008, the Italian Action Plan for the Sustainability of Consumption in the Public Administration Sector (PAN GPP) was adopted. In the Action Plan, Italy defines GPP principles and Minimum Environmental Criteria (CAM) that the public procurer can include in the tender documents. It also prescribes how to incorporate life cycle costs, including environmental costs, in the procurement process.

While initially voluntary, the Public Contracts Code in 2016 made CAM mandatory. As of 2022, Italy has developed CAM for 18 product groups (Direzione Generale Economia Circolare, 2022), which are priority sectors set in the National GPP Action Plan: furnishings, buildings (construction and

In 2020, 40% of public procurements in the Catalanian region included environmental clauses.

While initially voluntary, the Public Contracts Code in 2016 made Minimum Environmental Criteria mandatory regardless of the procurement's cost.

renovation, building materials), road construction and road maintenance, waste management, public green space management, textile products, and transport vehicles and services (Italian Public Contract Code, 2017).

For construction contracts, the criteria include measures such as the minimum and certified recycled content in all major construction materials and products, a 70% recovery threshold for construction and demolition waste, and mandatory audits. Italy is currently developing the CAM for road construction and maintenance work (Peretti, 2022).

3.8.2 Supporting systems

The Ministry of the Environment and Protection of Land and Sea organizes workshops and events on GPP on both national and local levels. Recently, the Ministry of the Environment signed an agreement with the country's autonomous regions to improve local GPP training programmes and facilitate GPP uptake. The Ministry of the Environment also hosts a website on GPP, a helpdesk service, and publishes a monthly GPP newsletter. Further, Italian NGOs are active in fostering GPP in Italy, such as the Fondazione Ecosistemi and Legambiente.

3.8.3 Monitoring and follow-up

Italian law states that the National Anti-corruption Authority must monitor the application of minimum environmental criteria. An electronic monitoring system for procurements has been in place since 2010. Since 2012, Italian public administrations are obliged to release annual data on public procurements to the Anti-corruption Authority. The Authority centrally collects GPP data, but the government does not highlight it specifically in its annual procurement report and does not list it publicly (Autorita Nazionale Anticorruzione, 2022).

If an agency fails to use CAM, the Anti-corruption Authority may issue a reasoned opinion, and if the contracting authority doesn't comply, an appeal may be sent to the administrative courts. However, no such cases can be found, nor are there consequences for not using CAM.

To make public sector data more accessible and increase transparency, Italian civil society has been active in both monitoring the use of GPP and making the data publicly available. The organization onData runs the AppaltiPOP platform, which converts the procurements database of the National Anti-corruption Authority into a reusable open format.

The NGO Osservatorio Appalti Verdi (The Green Procurement Observatory) also monitors the use of GPP in Italy. In partnership with various Italian universities, they recently conducted a report on Italy's GPP practice. The report is based on questionnaires sent to 111 municipalities in 2021. While the use of CAM is mandatory in Italy, the report suggests that of the 89 municipalities that replied, 35 recorded an implementation rate of the environmental minimum criteria above 80%, of which 18 reached 100%. While the level of knowledge on GPP in municipalities is very high, at 98.9%, the use of monitoring systems is very low (16.2%) (Osservatorio Appalti Verdi, 2022).

Another study in 2020 found that the implementation rate of the GPP minimum environmental criteria for public buildings in particular was still quite low at around 18%, so educational efforts are still important among procurers (Luciano, 2021).

3.8.4 Best practices in action

The Metropolitan City of Rome Capital stands out for its monitoring system in the region. In Rome, all procuring agencies are obliged to disclose environmental procurement criteria in its internal information system and the Department IV (GPP Coordination Office) uses it to carry out a periodic reporting of GPP implementation and perform random checks to verify that the criteria are used correctly. The monitoring system also includes environmental performance, such as CO₂ emission reductions, allowing the city to track its progress (Citta metropolitana di Roma Capitale, 2022). The GPP Coordination Office also provides technical support for the inclusion of environmental criteria in the tender documentation.

While the level of knowledge on GPP in municipalities is very high, at 98.9%, the use of monitoring systems is very low.

The Metropolitan City of Rome Capital stands out for its monitoring system in the region.

4. Results

In the following sections, we synthesize the eight case studies and analyse them around the themes of governance systems, political goals and policies in place, monitoring and support systems, and use of GPP in practice. Tables 4 to 7 give an overview of the countries studied.

4.1 Governance systems

All the studied countries' ministry of finance or economy (or equivalent) is responsible for public procurement policy and legislation. In addition, many countries have another authority responsible for environmental policies under which GPP falls (for example, the Ministry of the Environment in Estonia and Italy, the Ministry of the Ecological Transition in France and Spain, Ministry of Infrastructure and Water Management in the Netherlands). These divided responsibilities, combined with a lack of communication among departments, can lead to incoherent prioritizations and stall the development of ambitious GPP policies (Lingegård et al., 2021; Wuennenberg & Casier, 2018). In Sweden, Poland and Germany, however, there is no such tandem of two ministries for the GPP policy and legislation.

As for policy implementation, some countries require national procurement agencies to implement national procurement plans and policies (Sweden and Poland), while others do not (Estonia, Italy, Spain and the Netherlands).

In Germany, several national authorities are involved with different tasks and many also provide GPP training, in addition to the Federal Environment Agency, which provides a wide range of practical guidance.

France, Italy, Estonia, Sweden and Poland have centralized governance systems, with top-down policies that are followed at the regional and local levels. Estonia has no regional-level governance, so national-level policies are followed. In Sweden and the Netherlands, despite having national policies, targets and agencies, regional and municipal authorities still have a lot of leeway in whether, and how, they practice GPP. On the other hand, the decentralized nature of Germany and Spain's governance system leads to a more fragmented policy landscape within these countries, adding to the already fragmented policy landscape in the EU. In most European countries, sub-national authorities account for at least half of procurement spending, and in most cases over 60% (OECD, 2022). Therefore, it is crucial to have all levels of public authorities (national, regional and municipal) aligned and committed to GPP policies. Insights from interviews with municipal procurers and regional procurement initiatives highlighted the difficulties of keeping up to date with information coming from the regional, national and EU levels. Greater harmonization across the EU is crucial for GPP to be able to play a strategic role in sending clear and concerted market signals to industrial actors.

It is crucial to have all levels of public authorities (national, regional and municipal) aligned and committed to GPP policies.

Table 4. Summarized results – governance

Country	Sweden	The Netherlands	France	Germany	Estonia	Poland	Spain	Italy
Governing bodies	Min. Finance	Min. Infrastructure & Water Management Min. Interior & Kingdom Relations Min. Economic Affairs and Climate Policy	Min. Ecological Transition Min. Finance	The Federal Min. Economic Affairs & Climate Action	Min. Finance Min. Environment	Min. Economic Development & Technology	Min. Finance Min. Ecological Transition	Min. Environment
National implementing bodies	Procurement Agency National Board of Housing, Building & Planning	Min. Infrastructure & Water Management	State Purchasing Department Environment & Energy Management Agency	Federal German Environment Agency Competence Centre for Innovative Procurement	Min. Environment	Public Procurement Office	State Public Procurement Advisory Board Committee for Cooperation in Public Procurement Office for the Supervision of Procurement National Markets & Competition Commission	Min. of Environment & Protection of Land & Sea in cooperation with regional authorities
National vs. regional governance	Strategy for national government, Nationally set targets for state agencies High flexibility for regional & municipal authorities	Strategy for national government Nationally set targets for state agencies High flexibility for regional & municipal authorities	Nationally set rules apply to all levels of government (including sub-national) Some regional voluntary initiatives	Local procurement policies for states, regions & local authorities to replace federal law Bavaria uses federal law as its state-level policy	Nationally set mandatory GPP criteria in four product groups (not in construction or road transport) Rules for national government only	Rules set nationally No regional governance	Nationally developed voluntary GPP criteria for 20 product groups Rules for national government only Local governments, autonomous regions set own rules	Nationally set rules apply to all levels of government (including sub-national)

4.2 Goals, policies and regulations

Most countries have national plans targeting public procurement with some focus on environmental considerations or mention public procurement in national sustainability plans. These plans take different forms, from mentions that GPP should be developed to concrete targets and actions. With its novel National Plan for Sustainable Purchases, France set a non-binding goal of 100% of public procurements at every governance level to include at least one environmental criterion by 2025. The plan also outlines 22 actions to meet this target. Germany has set a similar goal of a climate-neutral federal administration by 2030 with its Federal Climate Change Act. However, contrary to France, the goal does not apply to regional administrations, which perform the majority of public procurements.

Even though Italian law says the use of Minimum Environmental Criteria is mandatory, there are no penalties for non-compliance.

In most EU Member States studied, GPP is voluntary beyond the mandatory criteria in sectoral EU Directives. This is the case for France, Spain, Sweden, the Netherlands, Germany and Poland. A report from the European Commission estimates that about one-third of Member States have introduced legal obligations to consider environmental impact for specific product groups if the contract value is above a certain threshold (European Commission, 2021e).

Among our case studies, one country has established a mandatory application of green criteria on a wide scale: Italy. Indeed, GPP is mandatory for 18 priority groups, which include construction and road transport. The country mandates use of GPP Minimum Environmental Criteria (CAM) for all public buildings and construction contracts, both for new construction and renovation of existing buildings. Italy is currently also developing CAM for road construction and maintenance work. However, even though Italian law says the use of CAM is mandatory, there are no penalties for non-compliance.

Other countries are stepping up their ambition. In Estonia, GPP became mandatory for four product groups in the beginning of 2022. Currently construction and road transport are not covered in these groups, but there are plans to set mandatory criteria for building and road construction. In 2026, France will require at least one environmental award criterion in tenders by all public authorities that spend at least €50 million annually. However, as acknowledged by several interviewees in the study, the law still allows a large degree of freedom in which type of criteria to include, as well as their ambition, and does not necessarily result in lowered environmental impact such as reduced emissions. The main benefit is to oblige all public procurers to start reflecting on the environmental impact of their purchases and their power to contribute to national climate goals.

In 2026, France will require at least one environmental award criterion in tenders by all public authorities that spend at least €50 million annually.

Several measures, other than mandatory requirements, have been taken to support GPP in the construction sector. Most countries emphasize assessing the climate impact of new construction as a means to evaluate offers and select the most environmentally friendly bids. For example, the Netherlands, Germany and Poland have developed tools and methodologies to support such assessments (see section 4.3). In the Netherlands, this information is used to inform price deductions from the initial bids to ensure greater cost-effectiveness from a sustainability perspective and reward the more sustainable offers. In Sweden, the climate impact of all new buildings must be estimated through a climate declaration or else a penalty is imposed. And, for road construction projects, the Swedish Transport Administration requires procurers to perform LCA-based calculations using their tool for projects of €5 million or more. A bonus system rewards projects with lower GHG emissions. For projects below this value, product-level environmental declarations are required for the construction materials. Similarly, in Spain, bidders in road construction projects can earn an advantage if they perform a life cycle carbon footprint calculation. The French government has identified a variety of goals related to the construction sector, such as reducing energy consumption by 40% by 2030 compared to 2010 through renovation of public buildings, but did not outline specific measures or policies.

In addition to these national practices, there are also several examples of good practices from the local and regional levels. The city of Stockholm, for instance, set a target to have its entire car

fleet running on renewable energy. In Berlin, it is compulsory for public procurers to formulate environmental criteria for tenders of construction valued at over €50 000. Spain's Catalonia region has set a goal of 100% electric cars in its public fleet and the supply of energy to public buildings to be 100% renewable by 2030. As a best practice, the Catalonia region reduced the carbon footprint of its new paved surfaces involving diverse actors into the design, production and construction processes.

Table 5. Summarized results – goals and policies

Country	Sweden	The Netherlands	France	Germany	Estonia	Poland	Spain	Italy
Climate target (GHG emission reduction)	Net zero by 2045 Consumption-based GHG emissions target to come	49% by 2030 compared to 1990	EU target ^a	GHG emissions neutral by 2045	EU target ^a	7% in non-ETS ^b covered sectors by 2030 compared with 2005	EU target ^a : 55% by 2030 compared to 1990, climate neutral by 2050	33% by 2030 compared to 2005, climate neutral by 2050
National GPP plans	National Public Procurement Strategy	Dutch National Action Plan for Sustainable Public Procurement	French National Plan for Sustainable Purchases	German Sustainability Strategy (not procurement-specific)	GPP targets included in the programme for environmental resources 2021–2021	State Purchasing Policy	The Ecological Public Procurement Plan for 2018–2025	Action Plan for the Sustainability of Consumption in the Public Administration Sector
GPP Targets and/or goals	GPP must be increased throughout the public sector Purchasing may be used as a strategic means of achieving environmental goals	Broad embedding of SPP in public organizations Strategic commitments to sectors Integrated approach to SPP Public administration to be climate neutral by 2030 and circular by 2050	100% procurement with at least one environmental criterion by 2030	Climate-neutral federal administration by 2030 (does not include subnational PP)	30% of tenders with environmental criterion by 2025	Target 7% GPP by 2025; advice to use 20% of budget for innovative solutions	Include environmental and/or social clauses in public procurement by 2030	Minimum environmental criteria included in 18 product categories and growing
Mandatory vs. voluntary policies (in addition to EU policies)	No mandatory requirements	No mandatory requirements	No mandatory requirements Starting in 2026, mandatory use of at least 1 environmental consideration in all public procurements	Federal government required to achieve climate neutrality by 2030, use Blue Angel ecolabel in procurements and perform sustainability assessments for buildings	Voluntary GPP except mandatory criteria for 4 product groups Plans to include mandatory building and road construction criteria at a later date	No mandatory requirements	Procurers must select for best quality-price ratio, which accounts for environmental, social or innovative characteristics	Mandatory criteria for 18 priority product groups
Specific construction and transport sector policies (in addition to EU policies)	Climate declaration of new buildings or else 25% penalty Road projects: LCA assessment above €5 mil Bonus system rewards projects with lower GHG emissions	Bids that estimate climate impacts rewarded Penalty if failure to meet outlined environmental performance. New housing and office buildings must meet environmental performance standards Aim for CO ₂ neutral and circular concrete sector by 2030	Reduce energy demand by 40% by 2030 through public building renovation Incremental reduction of GHG emissions per square metre for public and private construction	Federal commitment to source products with Blue Angel ecolabel Compulsory assessment method for the sustainability of construction projects	No policies beyond EU Directives	Government developed LCC tool and a reporting standard applicable for public buildings BIM tool supports optimal decisions related to construction	Reward projects if GHG calculation conducted for use phase	LCC accounted in procurement process for priority sectors incl. buildings, roads, transport vehicles Environmental criteria required in public procurements for construction and road transport

^a 55% CO₂ emissions reduction by 2030 compared to 1990, climate neutral by 2050

^b EU Emissions Trading System, a cap-and-trade scheme covering GHG emissions for certain sectors

While GPP is increasingly upheld as a tool to support decarbonization, data is lacking on its practices, impact and mitigation potential.

4.3 Monitoring systems

While GPP is increasingly upheld as a tool to support decarbonization, data is lacking on its practices, impact and mitigation potential. Studies show that quantifiable indicators increase learning and help advance policy agendas (Dawkins et al., 2021). Thus, understanding how national GPP goals and targets play out over time, and how practices can be improved to achieve environmental benefits including saved GHG emissions, is crucial.

In the selected eight countries, GPP is monitored nationally via surveys or, in most cases, an electronic system. All procurements exceeding the EU spending thresholds (see Table 1) are published on the EU online procurement portal TED. Most studied countries have their own digital platform for publishing all procurement tenders. Ideally, these procurement platforms can be used for EU-wide GPP monitoring. However, the systems in Estonia and Italy present barriers, as in Italy the data is not analysed nor published, and in Estonia the system only recognizes a few select keywords which don't always catch GPP practices. Thus, there is no comprehensive overview of GPP uptake.

While the monitoring system might be lacking on the national level in Italy, some regional authorities have such systems in place. For example, in the Metropolitan City of Rome, procuring agencies must disclose environmental criteria used in procurements in an internal information system. The data is then compiled for periodic reporting on GPP implementation.

France, Spain and the Netherlands each have a well-functioning systematic monitoring system for tracking GPP. The necessary data is collected through a dedicated website and combined into an annual report. Since 2005, France issues a yearly report on the state of public procurement using data reported by producers in a digital platform. Similarly, in the Netherlands, all procurements are collected into one website, allowing the government to record the use of procurement criteria and monitor the number of tenders with sustainability considerations. Spain conducts an annual public procurement oversight report, including the share of green and innovative procurements done on the national and regional levels.

Poland, Sweden and Germany have not monitored GPP systematically. However, Sweden has carried out occasional surveys limited in scope. For example, the National Agency for Public Procurement carried out a minor study based on about 600 tender documents for 30 selected product groups (European Commission, 2022e). In Germany, the first oversight report was published in October 2022, based on procurement awards from the first half of 2021. In Poland, the PPO gathers information from procurers into an annual report, in which environmental and social features are included; however, little follow-up is done on GPP.

France's National Plan for Sustainable Purchases includes bi-annual monitoring to follow up on the actions outlined in the plan. In Sweden, through surveys to procurers, the National Procurement Agency estimates the uptake of GPP, and how current practices align with the National Action Plan. Germany also developed indicators to follow up on the federal government's goal of becoming climate neutral, yet the monitoring of GPP practices has been lacking, with the first openly available data published in October 2022. The Netherlands evaluates the current action plan when developing the next one. Italy and Spain report action plan follow-ups annually. Because Poland's purchasing policy was enacted 2022, its first follow-up is planned in 2024.

For the EU Commission, tenders which apply all core GPP criteria of a product group are considered green (European Commission, 2008b). The Member States, however, count a tender as GPP when at least one environmental criterion is used, setting the bar much lower at the national level than initially planned by the EU Commission and reducing GPP's potential environmental benefit. Additionally, GPP monitoring usually does not make distinctions between the environmental impact of different product groups. That is often the case also with targets, which are set generally on procurements but not to certain products and services that have higher environmental impact. To make tangible progress toward achieving climate targets, more

impactful criteria are needed in procurements, particularly for high-emitting sectors such as construction and road transport.

A related issue is monitoring the quantified impact of procurements, which is rare in the Member States (European Commission, 2021e). One example is from the Netherlands, where a 2016 assessment estimated that the practice of SPP in eight product groups avoided 4.9 megatons of GHG emissions in 2015 and 2016 (Ministry of the Interior and Kingdom Relations, 2021). Similarly, in a study from 2019, the Swedish Procurement Agency estimated the climate impact associated with the majority of the public actors' (from national to local level) procurement by undertaking a detailed spending analysis and using generic emissions data. They concluded that with respect to public procurement, construction and civil engineering, including road construction, are among the sectors that generate the greatest climate impact (Swedish Procurement Agency, 2022).

The lack of data on GPP and its potential multiple benefits for the economy, jobs, health and the environment is a barrier to a broader adoption of GPP.

Other cases of impact assessment of certain product groups have been found, for example, assessing the environmental impact of food procurement in Sweden, Germany, and Italy at the local level (Piirsalu et al., 2022), but these examples are small-scale ad-hoc studies. The lack of data on GPP and its potential multiple benefits for the economy, jobs, health and the environment is a barrier to a broader adoption of GPP.

A best practice in setting targets and measuring the impact can be found in the city-state of Berlin, which aims to become climate neutral by 2045. As a means of achieving this goal, the regional law mandates the use of environmental considerations in public procurements. The state also studies the impact of procuring green alternatives for a set of products. According to monitoring report from 2017, Berlin managed to cut its GHG emissions by 47% through GPP in 15 product groups compared to conventional products (Senatsverwaltung für Wirtschaft, Energie und Betriebe, 2017).

The procurement's final impact also depends on whether the requirements set in the tender documents and the contract are followed. Therefore, the contracts must be enforced to ensure compliance. Our interviews revealed that many countries fall short in this verification process.

Table 6. Summarized results – monitoring systems

Country	Sweden	The Netherlands	France	Germany	Estonia	Poland	Spain	Italy
Monitoring of GPP uptake	No monitoring platform	Data collected through a website & compiled in annual report	Data collected through a website & compiled in annual report	First overview of procurements done in the first half of 2021; published at the end of 2022	Automatic but incomplete GPP monitoring system via electronic procurement register	Online tool for registering procurements; lacks clear overview of GPP	Annual procurement oversight report including annual share of GPP	National electronic monitoring system; monitoring is not made public by authorities NGOs perform monitoring processes accessible to the public Some regions monitor separately.
Follow-up on plans and targets	Annual survey monitoring the progress of the NAP	An evaluation of the current NAP when developing the next NAP	Bi-annual follow-up on the NAP	Indicators regarding the climate neutrality of Federal authorities are monitored annually	No follow-up, as there is no NAP	First follow-up report expected in 2024	Annual follow-up report	Annual follow-up report
Main support systems	Criteria database Risk analysis service LCC tool	Criteria database Assessment tools (CO ₂ Performance Ladder, DuboCalc) Sectoral buyers' coalitions	Regional helpdesks Buyers' network and online platform Online trainings Tools to be developed as part of new NAP	LCC tools Trainings Helpdesk Sustainability Compass website	GPP website Trainings and capacity-building events	GPP website and trainings LCC tool for buildings	Trainings National GPP website and several regional versions Call centre	National trainings Nationally sponsored trainings for autonomous regions GPP website Helpdesk

4.4 Implementation and uptake

The level of GPP's uptake and measurable impact in the analysed countries is difficult to grasp and compare due to the differing monitoring systems. However, the overall indication from the interviews and research is that while most countries under study have plans and targets, these are not yet met.

While most countries under study have plans and targets, these are not yet met.

According to the available data, the uptake of GPP, or the inclusion of at least one environmental consideration in procurement processes, was the highest in the Netherlands (67% of procurements) and Sweden (58% of procurements) among the case studies in 2020. These are also the countries which offer the best-performing support systems for GPP implementation. Since the 2015 adoption of the Dutch National Action Plan for Sustainable Procurements, the use of award criteria promoting GPP has increased from 39% in 2015 to 67% in 2020. Yet, according to the assessment of the 2015–2020 Dutch National Action Plan, there are still missed opportunities to increase GPP through better practices and systematic, integrated policies (Ministry of Infrastructure and Water Management, 2021). The Swedish Procurement Agency reached a similar conclusion in its evaluation of whether GPP practices contribute to Sweden's environmental goals.

In Spain and in France, the share of procurements including environmental requirements was 21% and 17% respectively in 2020. For Estonia and Poland, the share is significantly lower, with 4.5% and 1% respectively in 2020. However, in economic value, the shares are 16% and 7%, respectively, showing how GPP's use in high-value purchases can maximize its impact. Both countries have set goals to increase in uptake in the coming years. In Estonia, the target for 2025 is 30% GPP of all procurements (Keskkonnaministeerium, 2020), while Poland set a target of 7% by 2025 (Ministerstwo Rozwoju i Technologii, 2022). Nearly each studied country exhibits a significant gap between the current practice and stated ambitions in the next few years. However, GPP uptake in Estonia is likely higher than reported due to inconsistencies in monitoring practices, as discussed above.

Nearly each studied country exhibits a significant gap between the current practice and stated ambitions in the next few years.

Germany and Italy do not have sufficient data to give a clear view of GPP uptake due to a lack of monitoring. Though Italy has established the mandatory use of environmental minimum criteria in procurements, its uptake and impact remain unclear. A 2022 report by a consortium of civil society actors and Italian universities concluded that while the knowledge about GPP criteria in analysed Italian municipalities was nearly 99%, the use of monitoring systems was as low as 16% (Osservatorio Appalti Verdi, 2022), regardless of reporting requirements. The study, performed with a sample of municipalities and purchasing centres, also finds that 35% of the municipalities implement environmental criteria in over 80% of their procurements, and the share of municipalities which claim to always apply these requirements has increased significantly in recent years. Similarly, in Germany, a first oversight report was published at the end of 2022 based on data from the first half of 2021 showing that the share of sustainability criteria used in procurements was 12.4% (BMWK, 2022).

An essential part of boosting GPP uptake is offering support and guidance to public authorities. Training and capacity-building events are provided in all the analysed countries. However, guidance often focuses on how to integrate green criteria, but fail to explain how to assess criteria when evaluating tenders (European Commission, 2021e). In most cases, the responsible ministry or agency also manages a dedicated website and a helpdesk. In countries with decentralized governance structures, such as Germany, Spain and Italy (but also in France, a more centralized country), capacity-building efforts occur both on the national and regional levels.

Sweden and the Netherlands have developed criteria databases that help procurers quickly find relevant GPP criteria for products. Similarly, in Germany, the Sustainability Compass website includes the Sustainability Standards Comparison Tool, which allows procurers to analyse labels corresponding to selected criteria and legal requirements in certain product groups (Kompass Nachhaltigkeit, 2019). In addition, the Netherlands offers a self-evaluation tool that procuring authorities can use to monitor their efforts.

In addition, various tools have been developed in the case study countries. Life cycle costing (LCC) or life cycle assessment (LCA) tools have been developed in the Netherlands, Sweden, Germany and Poland to calculate the environmental impacts of products and services over their lifetimes. The Dutch CO₂ Performance Ladder offers a complementary step, allowing agencies to assess bids based on their GHG emissions performance. Bids that meet the requirements of the CO₂ Performance Ladder receive systematically earn a competitive advantage. Germany also developed an assessment system for sustainable buildings that is compulsory for federal procurers. It helps assess construction projects through five main criteria groups, which produces an overall score for the project.

Another necessary component to promoting GPP is collaboration among procurers. For that, the French Ministry of Ecological Transition has developed a platform for peer-to-peer knowledge transfer for procurement officers. Germany's collaboration platform was built to foster better cooperation and knowledge exchange between procuring entities at the federal, state- and local levels, working together as part of the Alliance for Sustainable Procurement (BMWK & Allianz Für Nachhaltige Beschaffung, 2014). In the Netherlands, sectoral buyer groups allow the public and private sectors to better collaborate on common goals and find solutions for innovative procurements and tools.

The most widespread barrier across the case studies is related to training and capacity development needs.

Despite these efforts to support GPP, many barriers to growth remain, resulting in the low uptake levels compared to targets. From the interviews conducted, we found that the most widespread barrier across the case studies is related to training and capacity development needs. This was also highlighted in an EU Commission report (European Commission, 2021e). Despite the trainings and helpdesks available, personnel need training about greener alternatives available on the market and how to procure more creatively. As GPP is still nascent, particularly in countries such as Estonia and Poland, procurers need to show an additional level of knowledge, time, and motivation to find new ways of performing their job.

Lack of time is also a barrier that is almost systematically mentioned. Interviews with German and Estonian subjects highlighted that the background research required to learn about alternative market offers and develop the most appropriate criterion is time-consuming and must be done in addition to the everyday tasks of a public authority. The Swedish Procurement Agency found that half of procurers lack time and human resources to consider environmental impacts, and 41% say they lack the expertise to do so (Swedish Procurement Agency, 2020). Indeed, in an average Swedish municipality, only one procurement officer is responsible for the entire city's procurement of goods and services. Similarly, another survey of Swedish municipalities pointed to similar findings and found that a major barrier is the lack of tools to support their monitoring and assessment of procurement impacts (Axelsson et al., 2019).

Even where support is available, procurers simply do not have the time to engage with the different tools available to them. Discussions with a person in charge revealed that during the first half-year in 2022, the EU GPP Helpdesk received less than 100 questions. Interviews with a French regional procurers' network described not having the time to engage with the regional, national and EU-level trainings, voluntary criteria and tools.

Interviewees in the Netherlands and Italy mentioned wishing for more cooperation between procurers in the form of a national platform with uniform standards where entities can compare building designs, analyse success stories, and share good practices. Similarly, in Sweden and Germany, interviewees believe more dialogue between the private and public sector is crucial to align industrial transition efforts and support GPP practices. An Estonian study indicates that procurers need to collaborate and network with each other to exchange knowledge and experiences, but this is not available in Estonia (Piirsalu et al., 2020).

Another important barrier to uptake is a lack of product-specific environmental data that is standardized, reliable and produced with commonly accepted methods that procurers can easily

use in their work, confirming previous findings (European Commission, 2021e). To be able to create criteria and requirements for the tenders, procurers need easily accessible, reliable, clear and comparable information about the environmental impacts of products. Interviewees from Germany additionally brought up that it should be mandatory at the EU level for companies to disclose product-specific environmental data, to facilitate the work for procurers.

Even though procurement officers can use environmental requirements in the procurement, they often struggle to correctly comply with the legal framework. One example is the term “*or equivalent*” in the EU Procurement Directive, which obliges procurers to consider potential alternative proof that a company meets the set criteria. Similarly, procurement officers do not always see clearly how to tie the environmental award criteria to the contract’s subject matter or find that the link to the project is not strong enough. This raises concerns that GPP practices might lead to litigations and disputes, which interviewees highlighted as one of the main barriers to GPP implementation in the EU (European Commission, 2021e).

Innovative and ambitious examples often stem from creative practices of committed procurers and government officials willing to put in the effort to overcome these barriers.

In addition, procurement officers still feel that the mandate to use public procurement as a tool to reach climate targets is weak. This is particularly true for countries that lack ambitious climate targets, such as Poland. However, procurers also claim this in Sweden, where a survey among municipalities found that about 25% of the municipalities refer to lack of local political support as another important barrier, preventing the municipality from assigning the necessary resources to the task (Axelsson et al., 2019). Furthermore, officers in Estonia cite a fear of higher prices of green products and services – whether true or not – and insufficient budget due to that lack of political support (Piirsalu et al., 2020). The lack of clearer political mandates combined with the fear of litigation result in procurers with less experience and confidence being reluctant to apply environmental criteria in the tenders.

Taken together, the barriers prevent GPP uptake from reaching its potential. Therefore, innovative and ambitious examples often stem from creative practices of committed procurers and government officials willing to put in the effort to overcome these barriers (Dawkins et al., 2021). Similarly, active participation on knowledge sharing platforms and networking events mostly attract already interested and committed civil servants. The challenge remains: How can these innovative procurement practices be normalized to achieve significant environmental impact, including saved GHG emissions?

Table 7. Summarized results – implementation and uptake

Country	Sweden	The Netherlands	France	Germany	Estonia	Poland	Spain	Italy
GPP uptake	2020: 58% of procurements included environmental requirements	2020: 67% of procurements included at least one criterium from its database	2020: 17% (19% in economic value) of procurements included at least one environmental requirement	Based on the first half of 2021: 12.5% of procurements and 31.5% of procurement value was labelled as GPP	2020: 4.5% (16% in value) of procurements included a green or innovation criteria	2020: 1% (7% in value) of public procurements were considered GPP	2020: 21% of all public procurements were considered GPP	Unclear data at the national level some studies available for regions or a sample of municipalities
Main implementation barriers	Lack of time and human resources Too little follow-up of contracts Lack of special competence Call for data reporting standardization	Call for data reporting standardization Lack of dialogue between private and public entities Shortage of professional buyers	Lack of resources, knowledge, and capacity of local procurers Lack of knowledge exchange between peers	Lack of capacity by procurers Lack of data available on environmental aspects of products	Lack of mandatory requirements lack of knowledge and experience weak support system for GPP fear of higher prices of green products and services	Lack of mandatory requirements lack of knowledge and experience	Lack of capacity among procurers	Lack of capacity among procurers Lack of cooperation between central purchasing bodies

Current practices fail to systematically harness the tremendous potential that GPP can offer to accelerate the decarbonization of the construction and road transport sector.

The EU has an important role to play in supporting the implementation of impactful GPP practices.

5. Discussion and recommendations

A deep dive into the public procurement landscape of eight EU Member States confirmed that while GPP is increasingly seen as a key policy tool to meet climate targets, the implementation remains extremely fragmented across and within case study countries.

Many challenges remain due to the legal, technical and behavioural complexity of public procurement. Despite a flourishing list of tools, criteria and good examples, current practices fail to systematically harness the tremendous potential that GPP can offer to accelerate the decarbonization of the construction and road transport sector, which in turn will mitigate environmental impacts and create jobs that support responsible business practices.

As the EU and its Member States intensify efforts to meet their climate targets, it is imperative to coordinate efforts toward public procurement that target direct (operational) and embedded emissions in sectors with high emission levels. The focus of public procurement needs to be on achieving highest societal value for money across the full life cycle of the product. Bridging the gap between stated procurement targets and the implementation of GPP practices at the national, regional and municipal levels represents a significant opportunity for the public sector to lead by example and send strong market signals that industrial sectors need to secure their decarbonization efforts. The EU has an important role to play in supporting the implementation of impactful GPP practices, through standardized reporting methods, tools and sectoral mandatory requirements.

In the following sections, we summarize key insights, best practices and solutions, and recommendations for the areas of governance, political goals and policies, monitoring systems, and implementation and uptake of GPP.

5.1 Governance

Introducing mandatory green requirements in public procurement is easier in countries with a centralized governance structure. Decentralized governance structures allow regional authorities to form their own regulations. On the one hand, that makes it more difficult to create uniform rules for public purchasing, and mandatory EU rules help overcome this issue. On the other hand, higher degrees of freedom of regional and municipal authorities allows some cities or regions such as Berlin and Catalonia to be more ambitious in their quest to become climate neutral or achieve climate targets through public procurement practices.

In many countries, the responsibility for procurement-related matters is divided between different ministries, which can impede ambitious policy processes. Some countries also have mandated national procurement agencies to implement and follow up on GPP plans and execution. Successful GPP implementation requires strong cooperation and coordination between these different ministries and agencies. These national efforts to develop GPP goals, policies, tools and support mechanisms add to the EU-level efforts, creating a complex governance landscape which is difficult for procurement offices to track and can hamper cross-Member State coordination.

As noted by the 2022 conclusions of the Council of the EU on the Single Market, more coordination is needed within EU institutions, expert groups, and Member States (European Commission, 2022j, p. 236/2). In addition, international collaboration, through the EU or international initiatives such as the UK- and India-led Industrial Deep Decarbonization Initiative (IDDI), coordinated by the United Nations Industrial Development Organization (UNIDO), help avoid fragmentation of standards and approaches, and accelerate progress. With a focus on steel and cement, IDDI strives to set international GPP commitments, minimum standards and common reporting mechanisms on low-carbon construction materials, in particular steel and concrete.

Recommendations

1. **Foster collaboration and coordination to align environmental and economic targets with procurement policies and practices:**
 - across national ministries and agencies
 - with and within EU institutions
 - across Member States
2. **Establish stronger international collaboration to harmonize approaches and accelerate progress across nations**

5.2 Goals and policies

In most of the studied EU Member States, GPP is voluntary beyond the mandatory requirements introduced in EU Directives, making it difficult to spread GPP practices (European Commission, 2021e). Italy is currently the only case study country where GPP is mandatory at a wider scale.

National goals and policies targeting GPP differ in their scope and ambition level. Often, the formulations relate to including at least one environmental criterion for contract values over a certain cost threshold. In practice, this means that procurements and criteria can be set in ways that fall below the value threshold or lead to no environmental benefit. Setting harmonized criteria across the EU would reduce the administrative burden for procurers, multinational companies, and small and medium enterprises, and would avoid distorting the single market (European Commission, 2021e). Furthermore, we find a lack of follow-up on contracts and effective penalties for projects that do not meet set criteria, which undermines the intended effect of GPP.

The larger number of national policies and tools targeting GPP in construction compared to road transport vehicles can probably be motivated by its complexity. Construction projects are typically larger, involving more funding and stakeholders, as well as requiring different solutions and types of materials. Additionally, public authorities do not source materials directly. This means the exact environmental impact is more difficult to assess.

To meet long-term climate targets, the EU and Member States need to not only address the direct emissions but also embedded emissions from the whole supply chain (known as Scope 3 emissions). Furthermore, procurements should avoid purchasing unnecessary products and materials when possible. To truly set an example, the market signals sent by GPP policies should be clear, aligned with industry decarbonization plans, and achieve considerable GHG emissions mitigation.

Recommendations

3. **In collaboration with trade associations, set EU-level product-specific carbon baseline values and targets, and establish mandatory product-level minimum carbon criteria that are gradually sharpened.**
4. **Introduce EU-level reward systems for best-performing bids**
5. **Expand EU Directives to include embedded emissions**
6. **Impose EU-level minimum penalty thresholds if established criteria are not met**

To meet long-term climate targets, the EU and Member States need to not only address the direct emissions but also embedded emissions from the whole supply chain.

Quantifying the potential societal benefits of GPP, including greenhouse gas emissions savings, can help create political buy-in.

5.3 Monitoring systems

Monitoring the multiple benefits of GPP for society in terms of health, environment and jobs is crucial for transparency on how taxpayer money is used, proving best value for money, and following progress over time. Ultimately, successful monitoring can showcase the value of this policy tool.

Several countries have insufficient monitoring methods (e.g. Estonia and Italy) and the definition of GPP differs from one country to another. They often rely on the procurers' level of awareness and knowledge of GPP and environmental criteria, which may also vary significantly. This leads to a lack of comparable GPP data across the EU.

Impact assessments of green procurements remain anecdotal. Their impact depends on whether the environmental requirements are followed during the procurements' execution. Many countries have shortcomings in following up on the contracts. Quantifying the potential societal benefits of GPP, including GHG emissions savings, can help create political buy-in. A first step to overcome the lack of information on procurements' green, social and innovation aspects is the introduction of eForms, which will be mandatory in the EU starting October 2023.

Recommendations

- 7. Develop EU-level harmonized systems for GPP definitions, methodology for monitoring and reporting that will support:**
 - Following up on the use of environmental considerations in MS' procurements
 - Assessing the environmental impact, including GHG emissions, of bids
- 8. Introduce EU-level mandatory annual reporting on MS' environmental impacts from public procurement and GPP uptake**
- 9. Develop tools allowing procuring entities to monitor GPP uptake and impacts at the organizational level, allowing them to align internal goals and incentives and facilitate reporting efforts**

5.4 Implementation and uptake

Due to the lack of harmonized monitoring systems, it is difficult to compare GPP uptake in the studied countries. Overall, results show that while most countries in this study have plans and targets, their degree of GPP implementation consistently fails to meet them.

Results show that while most countries in this study have plans and targets, their degree of GPP implementation consistently fails to meet them.

The main barriers to GPP implementation are the lack of capacity, knowledge and time to build up the experience of civil servants performing public procurements. Further collaboration and networking among procurement officers and with the market could help overcome this barrier, but successful cooperation examples are lacking among studied Member States. This could be achieved through networking events and platforms, open monitoring tools, as well as more dedicated time for research ahead of procurement processes for procurement officers. Even though support system elements (e.g. tools, helpdesks, training) are present in all Member States and at the EU level, procurers do not use them to a great extent. In addition, the lack of mandate and fear of litigations and disputes also hold back procurers from changing their practices. Good practices rely on a few motivated, informed individuals. Political leaders must stress the importance of GPP to meeting climate targets and enable procurement officers to more systematically invest the necessary efforts to introduce strategic thinking in the different stages of public procurement (Wuennenberg & Casier, 2018).

Access to standardized and reliable product-specific environmental data is another important barrier that hinders procurers' successful use of environmental criteria in tenders.

Recommendations

Facilitating implementation

- 10. Further develop, harmonize and promote available tools and support material at the EU level to ensure easy accessibility to procurers**
- 11. Develop standardized reliable, product-specific methods at the EU level to calculate and report environmental data**
- 12. Develop harmonized national training programs, including components that support assessment of innovation potential as well as actual procurement needs**
- 13. Simplify terminology and/or provide implementation guidelines for EU Procurement Directives**

Uptake, mandate and resources

- 14. At the national and sub-national level, ensure authorities give procurement officers a clear mandate and adequate financial resources to play a strategic role in implementing and monitoring GPP practices**
- 15. At the EU level, develop educational material demonstrating the societal and monetary value of GPP practices to build stronger political buy-in**

Collaboration

- 16. Deepen public-private collaboration through sectoral buyers' groups to develop shared visions and strategies at EU and Member State levels**
- 17. Enhance collaboration between procurement officers at the national level**

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Annex - Voluntary criteria for the construction and road transport sectors developed by the EU Commission

A.1 Construction sector

A.1.1 Road design, construction and maintenance

Environmental impacts of roads include vehicle fuel consumption and emissions, as well as the biodiversity risks that could stem from the construction of new roads. Including road construction in EU GPP criteria is critical to minimizing environmental impacts of roads throughout their life cycle (European Commission, 2022g).

i. Scope

The scope of the EU GPP criteria for road design, construction and maintenance considers three possible types of road procurement activities, presented in Table A1.

Table A1. Types of road procurement activities for which the EU Commission has proposed GPP criteria

Road construction	Preparation and building of a road
Road maintenance	Actions undertaken to maintain and restore the level of service of roads
Road reconstruction	Upgrade of road section

Source: European Commission (2016b)

Similarly, the GPP guidance identifies six stages of a road's life cycle where procurement occurs that should include green criteria (Garbarino et al., 2016):

1. Preliminary scoping and feasibility
2. Detailed design and performance requirements
3. Construction and major extensions
4. Use of the road
5. Maintenance and operation
6. End of life (decommissioning)

Depending on the type of road procurement activity and the construction stage, the suggested environmental criteria can be selected for the procurement design.

ii. Sector-specific criteria

Table A2 presents a summary of some of the environmental requirements suggested in the EU GPP criteria for road construction. Interestingly, bidding companies are evaluated for their experience and expertise as well as the technical performance of the road project.

Table A2. Road construction EU GPP criteria

Environmental requirement	Award criteria	Example
Tenderer experience	Ability of the tenderer	Previous experience in similar projects
Technical performance	Pavement-vehicle interaction	Earthworks and groundworks, rolling resistance
Life cycle performance	Resource-efficient construction	Materials choice, production and transportation
	Maintenance and rehabilitation strategies	Preventive maintenance plans
Environmental impact	Congestion	Traffic mitigation plan
	Water and habitat conservation	Drainage
	Noise	Noise in construction process and road noise

Source: European Commission (2016b, 2022g), Garbarino (2016)

A.1.2 Office building construction

i. Scope

The EU recently developed suggested criteria for office buildings. The focus is mainly on buildings that provide space for administrative, financial, professional or customer services. Major renovations of office buildings are also included. Parking lots, however, are outside of the scope of the suggested criteria (European Commission, 2016a). The guidance for this sector considers a total of eight stages in the construction process where GPP could be used, listed below:

1. Preliminary scoping and feasibility
2. Detailed design and applications for permits
3. Strip-out, demolition and site preparation works
4. Construction of the building or major renovation works
5. Installation of energy systems and the supply of energy services
6. Completion and handover
7. Facilities management
8. Post-occupancy assessment

ii. Sector-specific criteria

The criteria guidance suggests a set of technical specifications, award criteria and contract performance clauses for each of the eight building construction stages. Considerations include emissions, energy use, material sourcing and environmental performance. A selection of the criteria included in the commission staff working document is presented in Table A3:

Table A3. Office building construction EU GPP award criteria

Emissions	Low- or zero-carbon energy sources
	Building life cycle Global Warming Potential (GWP)
	Performance requirements for CO ₂ e emissions from the transportation of aggregates
Energy	Minimum energy performance requirements
Material sourcing	Incorporation of recycled or re-used content in concrete and masonry
Environmental performance assessment	Performance of the main building elements: Aggregation of environmental product declarations
	Performance of the main building elements: Carrying out of a life cycle assessment

Source: European Commission (2016a)

Apart from the proposed GPP criteria, four EU Ecolabels exist to standardize the sourcing of certain construction materials. The EU Ecolabels for construction include: i) indoor and outdoor paints and varnishes, ii) hard coverings, iii) wooden floor coverings and iv) water-based heaters (European Commission, 2022f).

Overall, the applicability of the GPP criteria for the eight proposed stages for office building construction is complex. Selecting the best-fitting GPP criteria is subjective to the type of project and the procurement objectives. This complexity is reflected in the staff working document with GPP criteria for office building design, construction and management (European Commission, 2016a).

A.2 Road transportation

i. Scope

The most recent documentation regarding GPP for road transport was published during 2021 and 2022. The information is available in the shape of a Commission staff working document (European Commission, 2021a) and a technical report (Vidal-Abarca Garrido & Rodríguez Quintero, 2022). This document introduces five categories for road transportation options. A summary of the categories and their characteristics is presented in Table A4.

Table A4. Procurement scope – vehicles included in the EU GPP road transport criteria

Scope Category	Definition	Examples
Category 1	Purchase, lease or rental of cars, light commercial vehicles (LCV) and L-category vehicles	Cars, vans
Category 2	Procurement of mobility services	Car sharing, taxi, cycles
Category 3	Purchase or lease of heavy-duty vehicles	Coaches, buses, trucks (including waste collection services)
Category 4	Outsourcing of public road transport services	Bus services, waste collection services
Category 5	Procurement of post, courier and moving services	N/A

Source: European Commission (2021a)

ii. Sector-specific criteria

Sector-specific criteria is available for each of the transport categories in Table A4. Environmental requirements cover emissions, energy use, air pollution and technical requirements. Table A5 presents a summary of the applicable criteria mentioned in the Commission staff working document for road transport (European Commission, 2021a).

Table A5. Road transportation EU GPP award criteria

Environmental requirement	Award criteria	Scope category				
		1	2	3	4	5
Emissions	Lower CO ₂ emissions	X				
	Technological options to reduce GHG emissions			X	X	
	CO ₂ emissions limits		X			X
Energy	Energy efficiency	X				
Air pollution	Air pollutant emissions limits		X		X	X
	Improved air pollutant emissions performance	X		X		
	Zero tailpipe emission capability	X				
	Air conditioning gases			X		
Vehicle and service technical characteristics	Speed limiter	X				
	Extended warranty	X				
	Auxiliary units			X	X	
	Noise emissions				X	
	Vehicle noise	CC		CC		
	Lubricant oils, hydraulic fluids and grease		CC		CC	CC

X: category-specific criteria, CC: common criteria

Source: European Commission (2021a, 2022h)

There is no specific EU Ecolabel for road transport, but there are some national versions, such as the German Blue Angel ecolabel for car sharing and the Swedish *Bra Miljöval* (good environmental choice) for passenger and transportation of goods (European Commission, 2022h). Nevertheless, lubricant oils, hydraulic fluids and grease have an EU Ecolabel that could be employed for verifying project compliance (Commission Decision (EU) 2018/1702).

Though the EU's Battery Directive outlines minimum conditions for these components, the GPP transportation criteria establish battery durability requirements according to the international standard EN 62660: "the tenderers need to provide a minimum battery warranty of 160 000 km or 8 years of capacity of at least 70% " (European Commission, 2021a, p. 16).

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