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Second Party Opinion

City of Gothenburg Green Bond Framework

Sept. 3, 2025

Location: Sweden **Sector:** Government

Alignment Summary

Aligned = ✓ Conceptually aligned = o Not aligned = ×

✓ Green Bond Principles, ICMA, 2025

See Alignment Assessment for more detail.

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Medium green

Activities that represent significant steps towards a low-carbon climate resilient future but will require further improvements to be long-term low-carbon climate resilient solutions.

Our Shades of Green Analytical Approach >

Strengths

By identifying its most material physical risks and taking short- and long-term action, the City of Gothenburg plans to enhance its resilience for the future. The city engages both municipal and private property owners in collaborative structural measures, supported by comprehensive risk and impact analyses that prioritize the most vulnerable properties.

Buildings financed under the green bond framework will have lower embodied carbon than the business-as-usual scenario. The embodied emissions threshold included in the framework is more stringent than that typically seen in the market because it covers a larger portion of emissions. The city has diligently collected data and insights over recent years to reduce embodied emissions. Consequently, projects finalized in 2027 will be able to achieve a reduction of about 40%-50% compared with the city's own 2020 baseline.

Weaknesses

No weaknesses to report.

Areas to watch

Construction may entail emissions and biodiversity risks. The City of Gothenburg's embodied carbon threshold is a significant step toward reducing material emissions. However, the methodologies and knowledge needed to reduce such emissions are still evolving, and significant reductions are needed to achieve climate-neutral newbuilds. Although Sweden mandates biodiversity risk assessments, national practices might not sufficiently take into account biodiversity and climate risks.

The framework includes some broadly drafted categories. Due to the varying climate and environmental risks and benefits, the projects may have both positives and negatives. However, the process of selecting eligible projects based on the city's own sustainability strategy and the inclusion of relevant experts from the city's other divisions in the process help mitigate these risks.

Shades of Green Projects Assessment Summary

Over the three years from issuance of the financing, the City of Gothenburg expects to allocate approximately 75% of proceeds to green buildings, 11% to water and wastewater management, and the remainder to other project categories such as energy efficiency, renewable energy, and clean transport.

The city expects 85% of proceeds to be allocated to refinancing projects, while 15% of proceeds will be allocated to finance new projects.

Based on the project categories' Shades of Green detailed below, the expected allocation of proceeds, and consideration of environmental ambitions reflected in the City of Gothenburg's Green Bond Framework, we assess the framework as Medium green.

Green and energy-efficient buildings	**Medium green**
New buildings	
Existing buildings	
Major renovations	
Installation, maintenance, and repair	

Water and wastewater management	**Dark to Medium green**
Wastewater collection and treatment	
Water collection, treatment, and supply systems	
Urban wastewater treatment	
Sustainable urban drainage systems (SUDS)	
Nature-based solutions for flood and drought risk prevention and protection	

Clean transport	**Dark to Medium green**
Clean transport and mobility	
Infrastructure supporting clean transport	

Renewable energy	**Dark green**
Wind power	
Solar power	
Bioenergy	
Waste heat	

Geothermal heating/cooling systems	
Transmission and distribution infrastructure for hydrogen and biofuels	
Storage of renewable energy	
Energy efficiency	**Medium green**
Clean, efficient, and reliable networks	
Energy-efficient municipal activities	
Climate change adaptation	**Dark to Medium green**
Adaptation solutions in buildings, infrastructure, and the city as a whole	
Waste management	**Medium green**
Waste collection and material recovery	
Carbon capture and storage (CCS) technologies	
Waste to energy	
Pollution prevention and control	**Medium to Light green**
Technologies and measures that help reduce negative impacts on wildlife, the natural environment, and human health	
Circular economy	**Medium green**
Circular economy products, production technologies, and processes	
Environmentally sustainable management of living natural resources and land use	**Dark green**
Management and conservation of habitats and ecosystems that promote biodiversity	

See Analysis Of Eligible Projects for more detail.

Issuer Sustainability Context

This section provides an analysis of the issuer's sustainability management and the embeddedness of the financing framework within its overall strategy.

Company Description

The City of Gothenburg, located on the west coast, is Sweden's second-largest municipality, with over 600,000 residents. Home to Scandinavia's largest port, it supports diverse industries. To accommodate a projected population of 700,000 by 2035, Gothenburg is expanding its services. The city provides essential services, including healthcare, education, social care, as well as libraries, planning, health protection, waste management, water supply and emergency services. It also offers services like cultural activities and park maintenance. Operations are also conducted via the city's company sector across areas such as housing, commercial premises, wastewater, energy, and port operations. Notably, Gothenburg issued its inaugural green bond in 2013, making it the first city in the world to do so.

Material Sustainability Factors

Climate transition risks

Policymakers have a key role in cutting greenhouse gas (GHG) emissions to address climate change. The City of Gothenburg's responsibilities leave the city exposed to high-emissions sectors such as real estate, transportation, and industry. The Swedish government aims to achieve net zero by 2045 and has a strategy that addresses environmental issues relevant to the City of Gothenburg.

Construction projects contribute to global climate change largely via embodied carbon in key materials such as steel and concrete, as well as greenhouse gases emitted during the operational phase of building. Embodied emissions from building materials are a major source of emissions when assessing the carbon footprint of a building over its life cycle. As a member of the EU, Sweden implements EU rules on energy efficiency in buildings and has more advanced regulations than most European countries regarding embodied emissions.

The city is responsible for the water and wastewater systems in Gothenburg. While the water systems are generally powered by electricity, efficiency and leakage levels are key concerns. The city estimates that leakage levels in Gothenburg are generally low, reporting 15% in 2023. In comparison, in the EU, an average of 23% of treated water is lost during distribution.

Another of the city's responsibilities is public transport; 20% of Gothenburg's GHG emissions stem from transport. The Swedish government aims to reduce the transport sector's carbon footprint by 2030, including a 70% cut in emissions from 2010 levels. However, recent national policy changes in Sweden--such as lower biofuel blending requirements, lower taxes on gasoline and diesel, and the removal of electric vehicle purchase bonuses--are expected to increase transport sector emissions. This creates additional challenges for the city in meeting its climate goals.

Physical climate risks

Physical climate risks can affect many economic activities, and increased GHG emissions will lead to more frequent and severe climate hazards if no adaptation is undertaken. While the physical impacts of climate change and extreme weather will continue to play out globally, the direct effects--including heat waves, flooding, and wildfires--are more localized. The indirect consequences of such events will affect various aspects, such as the volume and pricing of traded goods and services, going beyond administrative areas and cascading through multiple sectors.

Over the past century, Sweden has experienced a rise in average temperatures. A significant increase in recent decades has influenced its ecosystems and weather patterns. Gothenburg is exposed to physical climate risks such as changes in precipitation, including increased flooding, changing snow and ice patterns, and more storms and extreme weather in general.

Other environmental factors

When building infrastructure and undertaking new developments, the City of Gothenburg is exposed to risks related to water, land use, pollution, and biodiversity loss. The challenge is to mitigate the impacts of these risks and safeguard Sweden's natural environment. Preserving natural carbon stocks is key to meeting climate goals, and many habitats, such as bogs and organic soils, store large amounts of carbon. Disturbing these can lead to significant emissions. The natural environment also absorbs carbon dioxide, so conserving 30%-50% of land, sea, and fresh water (as the Intergovernmental Panel on Climate Change recommends) is central to reducing greenhouse gases and adapting to climate change. Some ecosystems, including bogs and topsoil, take a long time to recover, and certain changes are irreversible.

Issuer And Context Analysis

We consider that eligible projects directly address sustainability factors that are material to the City of Gothenburg, such as climate transition and climate change adaptation. The framework aims to finance Gothenburg's various activities, including the construction of new green buildings to support healthcare, education and social care, general improvements to the water and wastewater systems, and other sustainable projects. Many of the eligible projects under the framework, such as construction projects, are also exposed to the impacts of climate change, making the management of physical climate risks a key consideration in our analysis.

The City of Gothenburg has a solid overarching sustainability strategy and clear and quantified sub-targets linked to energy use and emissions for different activities. By 2030, the city aims to achieve a carbon footprint of close to zero. It is targeting a reduction of emissions within the geographic area of Gothenburg by at least 10.3% annually, and of consumption-based emissions by at least 7.6% annually by 2030. The city has set targets both for its own operations and for sources over which it has little control, such as private transport and consumption. Gothenburg reports bi-annually on results and has set different sub-targets, such as:

- The production of energy solely from renewables. By the end of 2025, electricity and heat produced by city-owned subsidiary Göteborg Energi AB is targeted to be 100% based on renewable feedstock, which includes renewable energy, waste heat, and bioenergy.
- The reduction of the climate impact from transport. By 2030, the city is targeting the reduction of GHG emissions from transport by 90% compared with 2010 levels. Emissions from transport decreased by 11% between 2018 and 2021. This was mainly due to an increased mix of biofuels and a larger share of electric vehicles.
- The reduction of the climate impact from the city's purchases of goods, including materials purchased for the construction of buildings, a material source of emissions for the city. By 2025, the city is targeting a 50% reduction in GHG emissions from the construction of new buildings and the renovation of existing buildings, using 2020 as a baseline. The city informs us that most of the projects to be completed in 2027 will be able to achieve a reduction of about 40%-50%, but it will not be until 2029 that completed projects will be able to achieve a reduction of more than 50%.

While the City of Gothenburg is making progress on its ambitious climate targets, it is not fully on track to meet climate neutrality targets. In its 2023 results report, it stated that emissions as a whole had decreased by 8% between 2018 and 2021. It would be necessary to implement drastic measures to reach Gothenburg's climate goals for 2030. One significant constraint is the city's two oil refineries, which convert crude oil into petrol, diesel, and other petroleum products and account for a high share of the city's emissions. The two refineries in the City of Gothenburg together account for about half of Gothenburg's territorial emissions.

By identifying its most material physical risks and working on short- and long-term action, the City of Gothenburg plans to enhance its resilience for the future. The focus of the city's climate adaptation work is on flood risk from torrential rain and heat waves. Both torrential rain and increased temperatures can affect the entire city's geography, with consequences for the built

environment and impacts on many areas of the City of Gothenburg's operations. Consequently, activities, buildings, infrastructure, and technical supply systems must be adapted to withstand the extreme weather events and the climate changes that lie ahead. The city has determined where specific measures for individual properties are needed. The city has also developed a methodology that involves all affected property owners--both municipal and private--in joint structural measures. In addition, the city carries out in-depth risk analysis, which includes a detailed impact analysis of each property's exposure, focusing on those at greatest risk. This analysis results in a vulnerability value and a recommendation for effective, priority measures.

Although it has strategies to address biodiversity, Gothenburg faces biodiversity risks, particularly when developing greenfield areas. The city adheres to legal requirements for environmental impact assessments (EIAs), and the regulatory context of operating in Sweden mitigates biodiversity risks to an extent. However, current practices may not fully account for the complexities of biodiversity and climate risks. The city's Environment and Climate Program seeks to address these challenges by integrating biodiversity considerations into urban planning. This includes assessing potential impacts at all project stages. For instance, the city promotes green roofs and walls to create habitats and improve air quality, and it enhances urban green spaces such as parks and community gardens to support local ecosystems.

Alignment Assessment

This section provides an analysis of the framework's alignment to Green Bond Principles.

Alignment Summary

Aligned = ✓ Conceptually aligned = o Not aligned = ×

✓ Green Bond Principles, ICMA, 2025

✓ Use of proceeds

We assess all the framework's green project categories as having a green shade, and the issuer commits to allocating an amount equal to the net proceeds issued under the framework exclusively to eligible green projects. Please refer to the Analysis Of Eligible Projects section for more information on our analysis of the environmental benefits of the expected use of proceeds.

✓ Process for project evaluation and selection

The City of Gothenburg evaluates and selects green projects for its green bond framework through a systematic process focused on environmental, social, governance, and financial risks. Each project is assessed for compliance with eligibility criteria and its potential contributions to sustainability goals, particularly net zero emissions. Project managers evaluate potential green projects and present them to the Green Bond Committee (GBC), which is responsible for final approvals. The GBC ensures that only projects meeting the established criteria are recognized as green, with all decisions documented and tracked in a dedicated Green Register to maintain transparency and accountability. We consider it a strength that the GBC calls on experts from other city divisions, such as Göteborg Energi, the housing company Framtiden, and the environmental administration, in the selection process if relevant, ensuring a comprehensive assessment.

✓ Management of proceeds

The City of Gothenburg uses a Green Register to track the allocation of net proceeds from green bonds to eligible Green Projects. This register ensures that funds are exclusively used to finance these projects or to repay any outstanding green bonds. It serves as the foundation for impact and allocation reporting, with annual adjustments made to reflect the allocations to (re)financed projects. If a project becomes ineligible or is sold, the city commits to substitute the project. Unallocated proceeds are held in a liquidity reserve, managed according to the city's treasury policies, with a maximum holding period of 12 months. Furthermore, temporary investments are excluded from entities focused on fossil energy, nuclear energy, weapons development, environmentally harmful resource extraction, gambling, or tobacco.

✓ Reporting

The City of Gothenburg emphasizes transparency in its green bond reporting. Until the bonds mature, the city publishes an annual Green Bond Impact Report detailing the allocation of proceeds and the environmental impacts of funded Green Projects, available on its website. Allocation reporting includes a summary of bond developments, outstanding amounts, allocations to project categories, financing shares, unallocated proceeds, and descriptions of projects financed. Reporting on commercial paper can be difficult because of the instruments' short tenor. For outstanding commercial paper, quarterly updates report the value of Green Projects. Impact reporting discloses environmental benefits based on the city's share of financing, with methodologies and assumptions clearly outlined. Gothenburg, as a founding signatory of the Nordic Public Sector Issuers' Position Paper, commits to following established impact reporting principles.

Analysis Of Eligible Projects

This section provides details of our analysis of eligible projects, based on their environmental benefits and risks, using the "Analytical Approach: Shades Of Green Assessments".

Overall Shades of Green assessment

Based on the project category shades of green detailed below, the expected allocation of proceeds, and consideration of environmental ambitions reflected in the City of Gothenburg's Green Bond Framework, we assess the framework as Medium green.

Activities that represent significant steps towards a low-carbon climate resilient future but will require further improvements to be long-term low-carbon climate resilient solutions.

Our Shades of Green Analytical Approach >

Green project categories

Green and energy-efficient buildings

Assessment

Medium green

New buildings (building application filed after Dec. 31, 2020) designed to meet the following combined criteria:

- The premises are designed to achieve primary energy demand (PED) that is equal to or lower than:
  - 60 kilowatt-hours (kWh) per sq. m per year for residential buildings, corresponding to a PED that is at least 20% lower than the level required by the national building regulation (BBR 29);
  - 50 kWh/sq. m per year for other buildings (such as schools and commercial buildings), corresponding to a PED that is at least 30% lower than the level required by the national building regulation (BBR 29).
- the building is designed to achieve a climate impact for the construction stage (A1-A5) that is at least 25% lower than the relevant baseline value in 2020;
- the building has undergone testing for airtightness and thermal integrity; and
- the building has undergone screening for material climate risks.

Existing residential buildings and premises (building application filed up until Dec. 31, 2020) that:

- Either (i) have an energy performance certificate (EPC) of class A, or (ii) qualify within the top 15% most energy-efficient buildings of the national building stock, expressed as PED and determined through a specialist study. The existing property portfolio has been screened for material climate risks to identify climate adaptation investment needs.

Major renovations

- Renovations of existing buildings that either (i) lead to an overall reduction in PED per sq. m and year (kWh/sq. m/year) by at least 30% compared with before the investment, or (ii) comply with the applicable minimum energy requirements of the national building regulation for major renovations.

Installation, maintenance, and repair of:

- Energy efficiency equipment (energy-efficient windows, doors and light sources, heating, ventilation and air-conditioning), instruments and devices for measuring, regulating and controlling the energy performance of buildings, electric vehicle charging stations in buildings and parking spaces attached to buildings, and/or renewable energy technologies such as solar, heat pumps, wind turbines, storage units and heat exchanger/recovery systems.

Analytical considerations

- The International Energy Agency emphasizes that reaching net zero emissions in buildings demands major progress on energy efficiency and the phase-out of fossil fuels. All properties must achieve high energy performance. New properties should also cut emissions from building materials and construction. Addressing physical climate risks is also key to strengthening climate resilience across all buildings.
- We assign a Medium green shade to all sub-categories in this project category because we believe that the City of Gothenburg's framework effectively addresses all environmental factors we consider material to existing buildings, renovation projects, and new developments. These factors are energy use, heating sources, embodied emissions, and physical climate risks. The city has also confirmed that buildings with direct fossil fuel heating will not be eligible for financing under this framework.
- The City of Gothenburg expects to allocate half of the proceeds to new developments and half to existing buildings. We view the ambition for existing buildings to be in the top 15% of the national or regional building stock in terms of energy performance as a strong commitment to the transition to a low-carbon society. Similarly, we consider the requirement for renovation projects to result in a 30% lower PED to be ambitious.
- We regard the threshold set out in the framework for embodied carbon as sufficiently ambitious to help reduce emissions compared with the business-as-usual scenario, combined with solid energy efficiency thresholds, as supportive of the Medium green shade. In terms of energy performance, new construction must achieve a 20%-30% lower PED than is mandated by building regulations. The largest source of climate impacts for new construction projects is embodied emissions from materials used such as cement and steel. This threshold included in the framework is more stringent than is typically seen in the market because it covers a larger portion of emissions. Specifically, the city's calculations include emissions from additional sources such as interior surfaces, technical installations, and certain transportation aspects. As a result, the values produced by this analysis cannot be directly compared with standard figures in the market. However, the knowledge and technologies required for zero-emission buildings are still evolving, and construction still entails high emissions in the short term.
- Given the fixed nature of buildings, improving their resilience to physical climate risk is crucial in the transition to a low-carbon real estate sector. All eligible projects and buildings have been screened for physical climate risks using relevant scenarios. For new construction projects, such risks will be mitigated in the design phase of the buildings, while for existing buildings the city is working on a plan to mitigate identified risks.
- Buildings may be constructed on both brownfield and greenfield land, although the City of Gothenburg would only build where permitted. Furthermore, the city's internal policies state that it should work to strengthen biodiversity by protecting green wedges, natural areas, and parks, and protect the natural environment. Nonetheless, any new construction activities on greenfield land constitute biodiversity and land-use-change risks.

Water and wastewater	
Assessment	**Description**
Dark to Medium green	**Wastewater collection (sewer network) and treatment:** • Construction and extension of wastewater systems with a wastewater treatment plant whose net energy consumption is equal to or lower than 20 kWh per population equivalent (p.e.) per annum for treatment plant capacity above 100,000 p.e. • Renewal of sewer networks or wastewater treatment plants aimed at reducing the net average annual energy consumption by at least 20% compared with the pre-investment energy use level (averaged over three years) in the area where the renewal works are carried out. • Construction, extension, renewal, or installation projects aimed at reducing carbon dioxide equivalent (CO2e) emissions by at least 20% compared with the pre-investment emission level of the area where the construction/renewal works are carried out or that are subject to installation of new technology. **Water collection, treatment and supply systems** • Construction, extension, and renewal of water collection, treatment, and supply systems aimed at enhancing or maintaining a high level of water and energy use efficiency in the system. The city aims to annually reduce total drinking water usage by 2%, improve the conversion rate of extracted raw water into drinking water, and lower energy consumption by, for example, replacing water pumps. High water use efficiency not only conserves water but also reduces energy consumption by decreasing the need for pumping, treating, and distributing water throughout the system. **Urban wastewater treatment** • Construction, extension, upgrade, and renewal of urban wastewater infrastructure such as treatment plants, sewer networks, storm water management structures, and connections to the wastewater infrastructure. The system should contribute to achieving or maintaining the good environmental status and ecological potential of any of the affected water bodies, meet the discharge requirements in the environmental permit, and apply secondary treatment and sludge treatment. **Sustainable urban drainage systems (SUDS)** • Construction, extension, and renewal of urban drainage systems that mitigate pollution and flood hazards by harnessing natural processes, such as infiltration and retention. The system should contribute to one of the following: (i) improved retention of rainwater (with staggered-delay discharge); (ii) an improvement in water quality (through the removal of pollutants before discharge); or (iii) improved management of peak flow through runoff, with a return period in line with the requirements of flood risk management plans. The system should be integrated into the urban drainage and wastewater system and substantially contribute to achieving/maintaining the good status and ecological potential of bodies of surface and groundwater. **Nature-based solutions for flood and drought risk prevention and protection** • Construction and extension of large-scale natural systems to manage floods and droughts, restore aquatic ecosystems, and improve water retention, biodiversity, and water quality.

Analytical considerations

- As a form of natural capital, water is necessary for economic activity, thriving ecosystems, and public health. Therefore, water supply systems are important from a climate change adaptation point of view in securing a future in which everyone has reliable access to sufficient water of adequate quality. Systems are energy intensive and, if not sufficiently managed, can generate significant waste, and exacerbate water stress for other stakeholders.
- The city has abundant water resources, but may face future water-related challenges including droughts, floods, and water shortages. The regulatory framework for water and wastewater infrastructure in Sweden is being impacted by strengthening EU legislation, notably revisions to the Drinking Water Directive and Urban Waste Water Treatment Directive, which require the upgrading and maintenance of treatment plants, distribution networks, and monitoring systems, among others.
- Drawing on the EU Taxonomy, the framework's selection criteria consider drinking water and wastewater projects eligible when they align with either the leakage, energy efficiency, or sewage management thresholds and requirements of the EU Taxonomy's technical screening criteria. The city is mainly planning to finance the renewal of the pipeline network in the coming years, which could reduce leakage levels and energy consumption. In Gothenburg, water supply and wastewater treatment systems are primarily electrified, and its wastewater treatment plant features heat recovery and efficient heat pumps using low global warming potential (GWP) refrigerants. As reported in its 2024 Green Bond Impact Report, the City of Gothenburg's water-related investments take a systematic approach, addressing energy efficiency, biodiversity, climate change resiliency and resource efficiency. Considering the overall environmental benefits of the projects, we assign the project category Dark to Medium green.
- The City of Gothenburg may also finance nature-based solutions for flood and drought risk prevention and protection. While such projects may not achieve a high share of green proceeds, the city is actively looking to finance such projects. One example is the construction of a stormwater pond in the Lärjeån river that will improve the river's water quality and delay the flow of stormwater. We regard such projects as Dark green as they typically have lower emissions and environmental impacts than other projects, while having biodiversity co-benefits.
- In line with the City of Gothenburg's responsibility to provide water services to the population, financing under this category addresses water infrastructure for public needs, rather than projects that serve water-intensive purposes such as industrial and agricultural use, or mining. Furthermore, desalination plants are not eligible for financing.

Clean transportation

Assessment	Description
Dark to Medium green	**Clean transportation and mobility** The purchase, financing, renting, and leasing of the following modes of transport: • Urban or suburban passenger transport with either zero tailpipe CO2 emissions, such as electric or hydrogen buses and trams, or that are fossil-free (fueled by biogas). • Electric or biogas-fueled passenger cars. • Electric two- and three-wheel vehicles and quadricycles, such as bicycles, motorcycles, mopeds and minicars. • Light- and heavy-duty vehicles and machines that have zero tailpipe CO2 emissions, powered by an electric motor or hydrogen or fossil-free engine (fueled by biogas or Swedish Hydrogenated Vegetable Oil (HVO) 100). • Passenger or freight transport vessels at sea or in coastal waters with zero tailpipe CO2 emissions, such as ferries. • The retrofit and upgrade of vessels to electric drive for the transport of freight or passengers at sea or in coastal waters, and of vessels required for port operations and auxiliary activities. The retrofit/upgrade should lead to a reduction in fuel consumption by at least 10%.

Infrastructure supporting clean transportation

The construction, modernization, and maintenance of transport infrastructure, including:

- Infrastructure dedicated to pedestrians and bicycles.
- Infrastructure required for zero-emissions road transport and for operating urban transport, such as: electric charging points, electric grid connection upgrades, hydrogen fueling stations, electric road systems, terminal infrastructure for loading, unloading and transhipment of goods, and signaling systems for trams and rail systems.
- Infrastructure required for zero tailpipe CO2 operation of vessels or the port's own operations, as well as infrastructure for transshipment between modes of transport: such as electric charging, biofuel- or hydrogen-based refueling stations, and shoreside electrical power and/or district heating for vessels at berth.

Analytical considerations

- Mitigating GHG emissions from transport will be crucial for meeting global decarbonization goals. Fossil fuel-powered vehicles and vessels also create air pollution, such as nitrogen oxides and sulfur oxides. Electric road and rail transportation are key to decarbonizing land transport. The decarbonization of all modes of transport will require a significant expansion of low-carbon transport infrastructure. In infrastructure projects, value chain emissions and environmental impacts can be significant and should be carefully managed--for example, by choosing low-carbon construction materials. Physical climate risks are also a material consideration for all infrastructure projects.
- While the City of Gothenburg does not anticipate any major investments in clean transportation over the next three years, it plans to continue investing in the electrification of its fleet and the construction of a pedestrian and bicycle bridge, both of which we view as Dark green investments. While the project category focuses on fully electric modes of transport and enabling infrastructure, it also includes technologies that represent more transitional steps, such as hybrids boats, which we view as Light green. To reflect the variation of climate risks within the project category, we assign Dark to Medium green.
- Hybrid vessels are more climate friendly than conventional fossil-fuel alternatives, and, for some vessels, full electrification is currently not feasible due to technological constraints. However, they are considered a short-term solution, as they still present risks in terms of continued fossil-fuel use and the potential for carbon lock-in. The city has no planned investments in hybrid vessels.
- The city may finance solutions using biofuels, but has no planned investments. In the City of Gothenburg, vehicles using biofuels must follow some sustainability criteria for the sourcing of fuels (which is in line with the RED III thresholds from July 2025). While RED compliance is a positive safeguard in terms of lifecycle emissions improvements and avoiding the main biodiversity and land use change risks, RED allows for diverse sources (including some food and feed crops). While biomass/fuel derived from sources of high biodiversity that competes with food sources is excluded, there are no specific criteria addressing the feedstock used for bio-solutions. This limits our ability to fully assess climate and environmental risks such as deforestation and total emissions. Therefore we assess these projects as Medium green.
- Electrical infrastructure may not exclusively be used by zero emission transport, but could be used for cold ironing--the process of providing shoreside electrical power to a ship at berth while its main and auxiliary engines are turned off. Cold ironing can help reduce air and noise pollution and reduce a ship's emissions, as it does not need to use diesel while at shore. Cruise ships and shipping are, however, associated with significant emissions and other environmental concerns. Nevertheless, electrical infrastructure at harbors fits well with net-zero scenarios that encourage electrification in the transport sector and aligns them more closely with LCCR. We therefore assess these projects as Dark green.

Renewable energy

Assessment	Description
Dark green	Wind power • The construction of facilities generating electricity from onshore or offshore wind power. Solar power • The construction of facilities generating electricity using solar photovoltaic technology, concentrated solar power technology, or solar thermal technology. Bioenergy • The construction of facilities producing or co-generating heating, cooling, and power from bioenergy and facilities generating electricity from bioenergy. The facilities may include bioenergy carbon capture and storage (BECCS) facilities and will use biomass, biogas or bioliquids sourced exclusively from waste-based sustainable sources. • The manufacture of biogas, biochar or biofuels for use in transport and of bioliquids, based on sustainably sourced agricultural and forest biomass Waste heat • The construction of facilities producing heating and cooling using waste heat. Geothermal heating/cooling systems • The construction of geothermal technologies producing or cogenerating heating and cooling and power or electricity generation facilities based on geothermal energy. Life-cycle GHG emissions from the production will be lower than 100g CO2e/kWh. Transmission and distribution infrastructure for hydrogen and biofuels • The construction of new transmission and distribution networks for hydrogen or biofuels. • The retrofitting of gas transmission and distribution networks enabling the integration of hydrogen and biofuels in the network. Storage of renewable energy • Storage facilities for electricity, thermal energy and hydrogen for the purpose of managing the intermittency of renewable energy

Analytical considerations

- Renewable energy sources such as solar photovoltaics, wind, and hydroelectric power are key elements in limiting global warming to well below 2°C. However, these projects may cause land use change and adversely affect local biodiversity, and are exposed to physical risks. Green hydrogen is important in the transition to a low-carbon future due to its low emissions and potential applications in industrial processes and transport that are otherwise difficult to decarbonize. Bioenergy can play a role in the transition from fossil-based energy and transport fuels. That said, risks and impacts depend on the type of feedstock; lifecycle emissions, including consideration of direct and indirect land use changes; degrees of water stress; and levels of biodiversity threat.
- The project category supports what we assess to be Dark green renewable energy projects, including solar, grid infrastructure, geothermal, and energy storage. But it also supports projects that rely on bio-inputs for which zero emission solutions are not yet available and that are subject to feedstock sustainability risks. We consider planned investments in a biomass boiler for electricity and heat primarily using forestry harvesting residues, and smaller projects such as bio-fired

steam boilers, heat pumps, and solar panels as Dark green. This has been the main driver for the Dark green shade of the project category.

- The key investment under this project category is expected to be a biofuel-fired steam boiler at Rya, which will be integrated into an existing combined heat and power plant. Göteborg Energi, the city's energy production subsidiary, aims to use this investment to phase out the use of natural gas by 2025. This investment will facilitate an increased supply of heat generated from recycled wood and forest chips, aligning with Göteborg Energi's goal of producing 100% recycled and renewable heat by the end of 2025. Forest chips and recycled wood from the region will be used as feedstock for the boiler. We view this investment as Dark green.
- Renewable energy projects typically require a change in land use and therefore carry biodiversity and local environmental risks. In line with Sweden's transposition of the EU's EIA directive, an EIA is required for all activities that may have a significant impact on the environment.
- The project category also allows some projects with higher climate risks, such as waste heat projects and potential biomass projects. For bioenergy projects, all feedstock must be waste based and compliant with the EU's RED III. Planned bio-projects are viewed as Dark green. However, because of the broad scope of the eligibility criteria for potential bio-projects, this limits our ability to fully assess climate and environmental risks such as deforestation and total emissions, and there may therefore be some eligible projects in the future more in line with Medium green.
- Waste heat projects from industry make use of heat that would otherwise go to waste, making better use of existing resources. As the overall climate impact will depend on the industry from which the heat is collected, we view it as positive that investments recovering waste heat from fossil energy production or fossil-intensive industrial activities are excluded.

Energy efficiency

Assessment	Description
Medium green	Clean, efficient and reliable networks • Construction of transmission and distribution systems for electricity. • Energy-efficient district heating and cooling distribution, including pipelines and associated infrastructure, that complies with the EU Energy Efficiency Directive. System modifications to lower temperature regimes or advanced pilot systems (such as control and energy management systems and Internet of Things) are eligible without a specific threshold. • Electric heat pumps that (i) meet energy-efficiency requirements in the EU Eco-design Framework Directive and are (ii) below the refrigerant threshold of 675 GWP. • Information and communications technology enabling the effective management and distribution of energy, such as smart grid technology. Energy-efficient municipal activities • Energy efficiency measures in various municipal activities, such as replacing traffic light bulbs with LEDs. Investments should improve energy efficiency in the respective area by at least 30%.

Analytical considerations

- Energy efficiency measures are necessary to transition to a low-carbon economy, but their climate benefits and risks vary. They help reduce energy consumption and, consequently, result in decreased emissions. Efforts to improve energy efficiency should be backed by rigorous quantitative performance metrics and should aim to reduce additional environmental impacts.
- District heating systems can contribute to the transition toward a low-carbon, climate resilient (LCCR) future. However, their sustainability benefits heavily depend on their energy inputs, which may be associated with significant emissions and varying sustainability credentials. We expect the majority of proceeds are to be used for a biofuel-fired steam boiler to replace fossil

fuels, while other smaller investments will be used to replace heat pumps with refrigerants that have a lower climate impact and a new wood pellet boiler to produce more bio-based energy.

- According to Göteborg Energi's reporting, in 2023 the majority of energy input into district heating in Gothenburg was from waste-to-heat facilities (30%), waste recovery from industry (35%), renewable energy (19%), and fossil fuels (11%). However, the city has invested in a new biofuel-fired steam boiler at Rya that should significantly reduce the share of fossil used in the near term. Overall, factoring in the current energy mix of the district heating and planned investments, we consider investments in district heating infrastructure as Medium green under this framework.
- The use of heat pumps powered by renewables, and investments in energy efficiency are generally well aligned with a low-carbon future, as it reduces energy consumption and, consequently, emissions.

Climate change adaptation

Assessment	Description
Dark to Medium green	Adaptation solutions in buildings, infrastructure, and the city as a whole • Adaptation solutions (physical and non-physical) in buildings and infrastructure that substantially reduce the most important physical climate risks that the infrastructure is exposed to. • Adaptation solutions (physical and non-physical) that substantially reduce the most important physical climate risks that the city is exposed to, such as flood defenses, heat waves, management of rising water levels, and extreme weather research and monitoring systems.

Analytical considerations

- Climate scientists have been clear that some degree of climate change will take place, even in the most optimistic scenarios. This makes it crucial to plan for and mitigate the potential risks to reduce their financial and environmental effects. For Nordic countries, expected changes include heavier rain and more floods.
- Overall, we assess the project category as Dark to Medium green, as it includes both nature-based solutions and adaptation solutions that entail higher emissions. The City of Gothenburg's climate adaptation plan is used to identify potential projects that focus on managing the long-term effects of climate change, such as torrential rain and heat waves, and creating a resilient society. The High Water Protection Program is a central part of this plan, specifically targeting flood risks and implementing protective measures to reduce these.
- The city has identified some projects that may be financed under the project category, such as projects at Högvattenskydd and Packhuskajen. The program at Högvattenskydd includes the planning, coordination, and implementation of various protection measures along the Göta River and the city's inland waterways. These measures include high-water shelters, ground elevations, shelter gates, and pumping stations to handle high water levels and flows. Packhuskajen in Gothenburg is being adapted to cope with climate change by raising the quay and building riverside protection. This is part of the city's climate adaptation work to protect against flooding from the Göta River and rising sea levels. At the same time, the climate impact is being reduced by using more environmentally friendly materials and methods in the construction project.

Waste management

Assessment	Description
Medium green	Waste collection and material recovery • Waste collection: separately collected and transported non-hazardous waste that is segregated at source and intended for reuse or recycling operations. • Material recovery: facilities dedicated to the sorting and processing of separately collected non-hazardous waste streams into secondary raw materials involving

mechanical reprocessing. At least 50%, in terms of weight, of the processed waste should be converted into secondary raw materials suitable for substituting virgin materials in production processes.

Technologies for carbon capture and storage

- The construction of facilities for CCS and carbon capture and utilization (CCU) as well as BECCS facilities for the reduction, avoidance, or removal of GHG emissions associated with bioenergy plants and waste-to-energy (WtE) plants.
- Transport and permanent underground storage of captured CO2, with CO2 leakage not exceeding 0.5% of the mass of CO2 transported and with an appropriate leakage detection and monitoring plan in place.

Waste to energy

- Waste to biogas: dedicated facilities for the treatment, through anaerobic digestion or composting, of sewage sludge or separately collected bio-waste with the resulting production and utilization of biogas.
- Waste to energy: facilities dedicated to waste incineration to produce heating/cooling and electricity that follows a waste hierarchy to ensure that as much of the waste as possible is reused and recycled before being converted into energy.

Analytical considerations

- Waste management is an important pollution prevention measure that can avoid harm to human health and local ecosystems. If done properly, recycling will reduce emissions and benefit energy and natural-resource use.
- We view the framework's general waste collection, sorting, and recycling systems and facilities as Medium green. Due to the broad eligibility criteria, some financed projects may represent environmental benefits but still carry climate risks, such as WtE projects. The City of Gothenburg does not anticipate any major investments in waste management over the next three years. Given the wide scope of this project category and uncertainty over the expected allocation of proceeds, we assess it as Medium green.
- While eligible activities in the framework include WtE projects, the city does not expect these to receive financing in the short term. WtE projects provide a disposal solution for waste that cannot be recycled, reused, or avoided. Nevertheless, unadapted WtE plants that incinerate municipal waste create significant emissions and only constitute near-term transition steps, which is why we consider such activities Light green. In Sweden, adherence to the waste hierarchy is relatively high; plants meet technology requirements in relevant EU directives, mitigating environmental impacts caused by such plants. Financed facilities can use waste or bio-based inputs, with biomaterials having to comply with RED III.
- To reduce the local climate impact to "near zero" by 2030, Gothenburg must reduce emissions from WtE. While a feasibility study by Renova, which is responsible for waste management in Gothenburg, and Göteborg Energi indicates that CCS could be technically implemented at the WtE plant, significant investment will be required for the technology, as well as for transport and storage. Renova's board has expressed a long-term ambition to invest in CCS, but the final decisions determining the timeline and size of investments have not yet been made by Renova's owner municipalities. We consider CCS critical to an LCCR future and note the importance of adequate leakage monitoring and detection systems, as well as the need to comprehensively assess projects' life cycle emissions.

Pollution prevention and control

Assessment	Description
Medium to Light green	Technologies and measures helping to reduce negative impacts on wildlife, the natural environment, and human health

- Technologies and measures contributing to a substantial reduction of pollution to air and/or water, for example through the installation or upgrade of technologies to reduce emissions of nitrogen oxide to air and water from WtE plants.

Analytical considerations

- Pollution remediation projects have direct benefits for local biodiversity and human health by reducing air and soil pollutants concentration. The treatment and recovery of contaminated soil and polluted water helps to address past environmental damage and enable long-term ecosystem recovery. Overall, because of the broad scope within the project category, our assessments range from Medium to Light green.
- Projects in this category may include any technology for flue gas treatment installed WtE plants. While such investments help reduce pollution, which can avoid harm to health and local ecosystems, they are a requirement of the license to operate for WtE plants, which generate high emissions. Therefore, we view these activities as Light green.
- The Swedish Environmental Protection Agency enforces strict environmental permits under the Environmental Code, which often mandates more stringent emissions controls than required by the EU.

Circular economy

Assessment	Description
Medium green	Circular economy products, production technologies, and processes • Facilities for the recovery of resources for productive reuse in other processes, such as the recovery of zinc from ash generated in WtE plants or the recovery of phosphorus from sewage sludge. • Facilities for the treatment and recovery of hazardous waste source-segregated into secondary raw materials (including chemical substances and critical raw materials).

Analytical considerations

- The sourcing of materials and energy use related to the production of goods, and their final disposal is estimated to account for two-thirds of GHG emissions, in addition to having other negative environmental impacts, such as land and water pollution. Circular economy services are a key part of a low-carbon future because they can contribute to reduced resource use and waste, for example, by extending the lifetime of a resource and reducing the need for virgin materials.
- We assign a Medium green shade to this project category, reflecting the fact that the eligible projects enable material recovery, which can contribute to reducing the amount of waste being sent to landfill while representing a lower-carbon option than virgin materials.
- A zinc recycling plant at the WtE plant outside Gothenburg is being completed. The facility is the first of its kind in which fly ash from the incineration of 550,000 tons of waste will be washed so that the zinc in the ash can be recycled. Results from a pilot study show that about 70% of the zinc can be recycled--about 450 tons--and sold to the metal industry. The main benefit from a sustainability perspective is that it avoids waste being sent to landfill while recovering zinc for use, prolonging its life cycle.
- Phosphorus is a chemical element used in agriculture, industry, and biological systems. Recovery of phosphorus from sewage sludge has climate benefits, as it reduces emissions associated with mining of phosphorus and supports a circular nutrient economy, which is important for food system resilience.
- We view the recycling of hazardous waste while recovering valuable materials and supporting a circular economy as positive. However, we note these processes may pose potential risks related to toxic by-products and energy intensity.

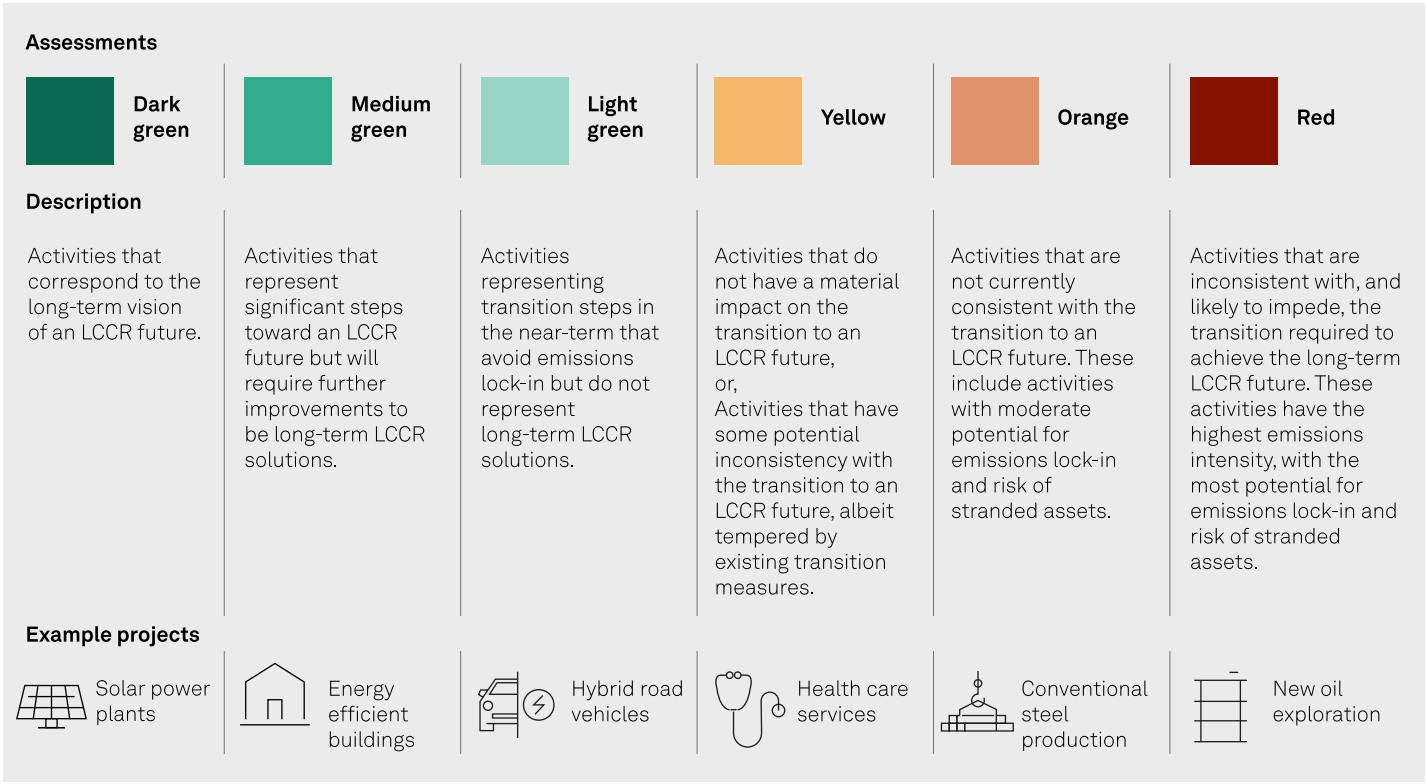
Environmentally sustainable management of living natural resources and land use

Assessment	Description
Dark green	Management and conservation of habitats and ecosystems that promote biodiversity • Creation and conservation activities, including restoration activities, aimed at maintaining or improving the status and trends of terrestrial, freshwater and marine habitats, ecosystems and populations of related fauna and flora, for example through measures to conserve and develop responsibility biotopes. • Measures to manage and increase the proportion of green and blue spaces in the urban environment for the purpose of contributing to biodiversity and recreation, equalizing temperatures, cleaning the air, and reducing noise.

Analytical considerations

- Healthy ecosystems and biodiversity are an important part of a low-carbon, climate-resilient future, providing natural resources, water and soil management, and pollination services. Protecting or restoring biodiversity also often creates climate co-benefits, such as carbon sequestration and adaptation solutions. Well-designed projects can reduce threats such as unsustainable resource extraction, climate change risks, land use change, pollution, and invasive species.
- The city's 2030 sustainability strategy includes targets relating to biodiversity. The goal is for Gothenburg, by 2030, to have sufficiently numerous, large, and well-cared for areas of different habitat types--such as forests, watercourses, wetlands, coastal and marine areas--so that all species of animals and plants found in the municipality can thrive and remain. The city has developed indicators and target values showing what it needs to do by 2030 to achieve this goal. Key targets include increasing the proportion of well-maintained meadows and pastures to 90% from 55% in 2017 ; protecting at least 16,200 hectares of nature versus 13,230 in 2019; establishing 10-15 municipal biotope protections and natural monuments versus none in 2019; maintaining the area of natural grasslands (2,112 hectares in 2018) and deciduous forest (1,734 hectares in 2011) at their current levels; and improving the proportion of surface water bodies with good ecological status to 100% from 17% in 2019.
- The city of Gothenburg intends to finance projects to support these goals, including planting trees, developing green spaces, ponds, among others. We assess these activities as Dark green.

S&P Global Ratings' Shades of Green



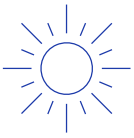
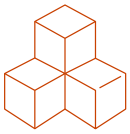
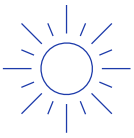
Note: For us to consider use of proceeds aligned with ICMA Principles for a green project, we require project categories directly funded by the financing to be assigned one of the three green Shades.

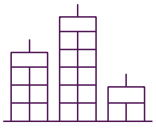
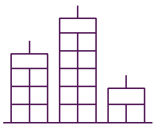
LCCR--Low-carbon climate resilient. An LCCR future is a future aligned with the Paris Agreement; where the global average temperature increase is held below 2 degrees Celsius (2 C), with efforts to limit it to 1.5 C, above pre-industrial levels, while building resilience to the adverse impact of climate change and achieving sustainable outcomes across both climate and non-climate environmental objectives. Long term and near term--For the purpose of this analysis, we consider the long term to be beyond the middle of the 21st century and the near term to be within the next decade. Emissions lock-in--Where an activity delays or prevents the transition to low-carbon alternatives by perpetuating assets or processes (often fossil fuel use and its corresponding greenhouse gas emissions) that are not aligned with, or cannot adapt to, an LCCR future. Stranded assets--Assets that have suffered from unanticipated or premature write-downs, devaluations, or conversion to liabilities (as defined by the University of Oxford).

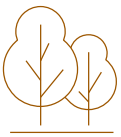
Mapping To The U.N.'s Sustainable Development Goals

Where the financing documentation references the Sustainable Development Goals (SDGs), we consider which SDGs it contributes to. We compare the activities funded by the financing to the International Capital Markets Association (ICMA) SDG mapping and outline the intended linkages within our SPO analysis. Our assessment of SDG mapping does not affect our alignment opinion.

This framework intends to contribute to the following SDGs:

Use of proceeds	SDGs				
Green and energy-efficient buildings	 **7. Affordable and clean energy**	 **11. Sustainable cities and communities***	 **12. Responsible consumption and production**	 **13. Climate action**	
Water and wastewater management	 **6. Clean water and sanitation***	 **7. Affordable and clean energy**	 **13. Climate action**	 **14. Life below water**	Choose a building block.
Clean transportation	 **9. Industry, innovation and infrastructure**	 **11. Sustainable cities and communities***	 **13. Climate action**		
Renewable energy	 **7. Affordable and clean energy***	 **13. Climate action**			

Energy efficiency	 **7. Affordable and clean energy***	 **11. Sustainable cities and communities**	 **9. Industry, innovation and infrastructure***	 **13. Climate action**
Climate change adaptation	 **3. Good health and well-being**	 **11. Sustainable cities and communities**	 **13. Climate action***	
Waste management	 **11. Sustainable cities and communities***	 **12. Responsible consumption and production***		
Pollution prevention and control	 **3. Good health and well-being***	 **11. Sustainable cities and communities***	 **12. Responsible consumption and production***	
Circular economy	 **11. Sustainable cities and communities***	 **12. Responsible consumption and production***		

Environmentally sustainable management of living natural resources and land use	 **11. Sustainable cities and communities**	 **14. Life below water**	 **15. Life on land***

*The eligible project categories link to these SDGs in the ICMA mapping.

Related Research

- Analytical Approach: Second Party Opinions, March 6, 2025
- FAQ: Applying Our Integrated Analytical Approach For Second Party Opinions, March 6, 2025
- Analytical Approach: Shades Of Green Assessments, July 27, 2023

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