Nordic Council of Ministers

POLICY BRIEF

Nordic Cities and GHG Emissions Reduction

Aligning with the Mitigation Work Programme for Climate-Resilient Urban Development

Contents

This publication is also available online in a web-accessible version at:
https://pub.norden.org/nord2024-039

Introduction

Cities are at the forefront of global climate change efforts, contributing to approximately 70% of global greenhouse gas (GHG) emissions as of 2020, according to the Intergovernmental Panel on Climate Change (IPCC).[1] Rapid urban population growth, land expansion, and the increasing demands of urban infrastructure are driving these emissions. By 2050,[2] cities will house 70% of the global population, with The United Nations estimating that urban infrastructure equivalent to the size of the Swedish capital Stockholm will be constructed weekly until 2050, underscoring the importance of sustainable construction practices. This highlights the critical need for sustainable urban development practices.

Urban areas are major GHG contributors and vulnerable to climate extremes like heatwaves. IPCC[3] has emphasized that achieving net-zero emissions will require deep decarbonization and systemic transformation of cities. Addressing GHG emissions in buildings and urban infrastructure involves the integration of low-carbon materials, energy efficiency measures, and resilient design practices.

This policy brief focuses on key solutions to urban emissions, presented through the lens of the three primary sub-themes of the Sharm el-Sheikh mitigation ambition and implementation work programme (Mitigation Work Programme, MWP) for the second Global Dialogue of 2024: Spatial Planning and Low-Carbon Infrastructure, Electrification and Net-Zero Energy Sources, and Enhancing Carbon Storage through Green and Blue Infrastructure. The Nordic experience provides an exemplary framework for addressing these challenges.

Drawing on insight from Arup's consultation with over 300 stakeholders across academia, municipalities, industry, and supply chains, the findings are summarized under "main findings." Gaps, barriers and best practice in Nordic climate policies are presented alongside policy recommendations.

1. IPCC, 2023: Sections. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35–115, doi: 10.59327/IPCC/AR6-9789291691647 IPCC_AR6_SYR_LongerReport.pdf
2. Urban Development Overview (worldbank.org)
3. IPCC_AR6_WGIII_Chapter08.pdf

Photo: Yadid Levy/norden.org

Nordic context

The Nordic countries lead in ambitious emission reduction goals, demonstrating a strong commitment to a low-carbon future. Each nation exceeds global targets, setting higher standards. For example, while the EU aims for a 40% reduction in emissions by 2030 (from 1990 levels), many Nordic countries set more aggressive targets.[4] Denmark aims for net-zero target forward to 2045 and a net-negative target of 110% in 2050. Iceland targets carbon neutrality by 2040, Finland by 2035, and Sweden[5] by 2045. Norway's carbon neutrality by 2030 stands out, involving offsetting any remaining GHG emissions through projects like renewable energy abroad.

These strategies are interconnected with urban sustainability efforts. Nordic countries embed their emission goals into urban planning with low-carbon infrastructure like energy-efficient buildings and green spaces to enhance life quality and cut emissions. A key effort is the electrification of urban systems and the shift to renewable energy, Copenhagen's 2035 Climate Plan[6] aims for carbon neutrality by 2035, including building retrofits, cycling infrastructure, and increased use of wind and solar power.

Many Nordic cities invest in green and blue infrastructure – parks, green roofs, and wetlands – to boost carbon storage and urban resilience. Oslo's Blue-Green Factor Policy (Blågrønn Faktor),[7] requires new developments to include both green and blue infrastructure like green roofs and permeable surfaces to enhance stormwater management and biodiversity. High energy and carbon taxes support the transition to renewable energy. Iceland's carbon tax and Climate Action Plan[8] focus on reducing transportation emissions, promoting geothermal and hydropower, adopting energy-efficient buildings and electric vehicles. Sweden's Climate Law and carbon tax[9] – one of the world's highest – has driven emissions reductions, incentivising renewable energy and sustainable practices.

By integrating national targets with city planning, Nordic countries exemplify a holistic approach to climate goals and urban development. They combine funding for infrastructure with knowledge sharing and "urban labs" for experimentation. Helsinki's Carbon-neutral 2035 plan[10] involves

4. Policy Brief: Nordic Stocktake and Visions – Pathways to Climate Neutrality (norden.org)
5. Norway's eighth national communication (regjeringen.no)
6. Climate Plan 2035 | Urban Development (kk.dk)
7. 202308_Vervoort_-Green-roofs-in-Oslo-by-2030_-understand-their-impacts-through-life-cycle-assessment.pdf (urbag.eu)
8. Government of Iceland | Climate Change
9. Sweden's carbon tax - Government.se
10. Carbon_neutral_Helsinki_Action_Plan_1503019_EN.pdf (carbonneutralcities.org)

energy-efficient construction, electric public transportation, and enhanced green spaces. The Kalasatama[11] smart city project integrates sustainable practices and energy-efficient technologies.

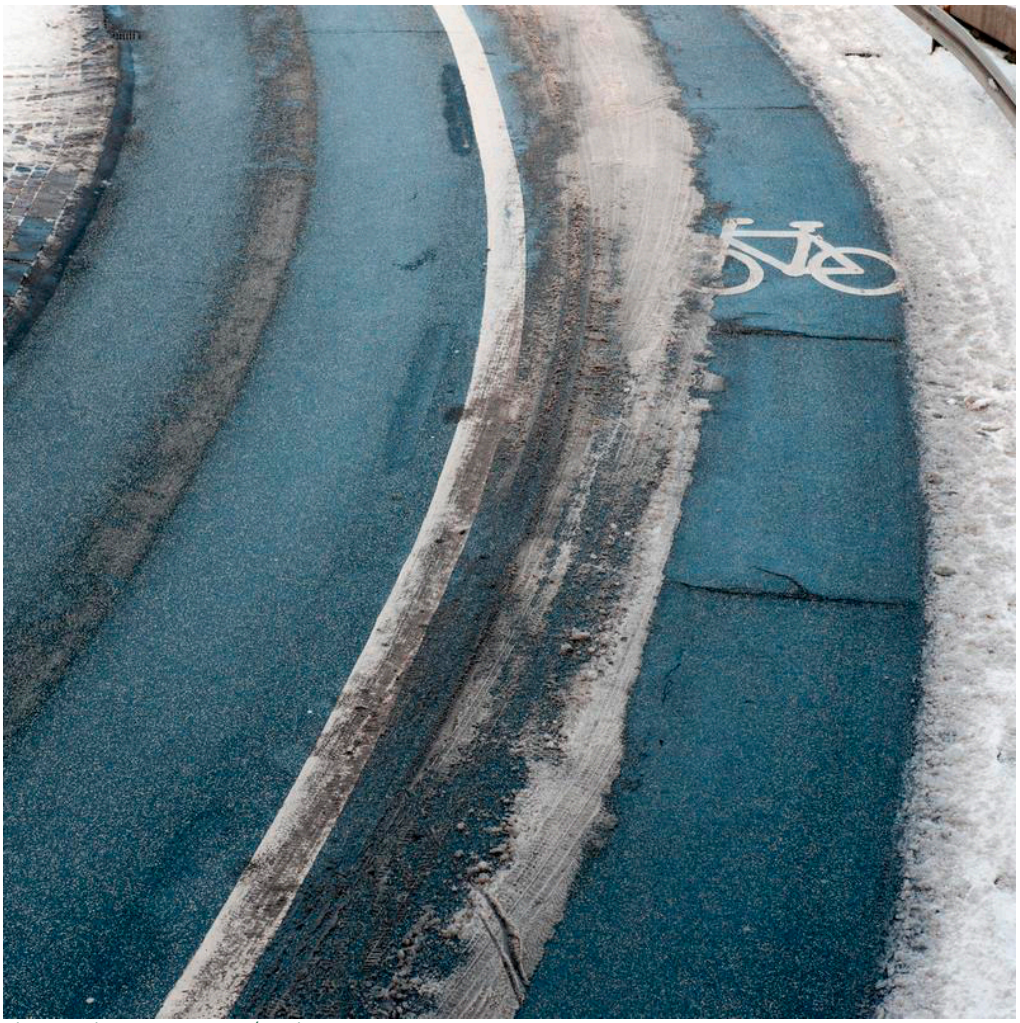

Photo: Johannes Jansson/norden.org

11. Smart Kalasatama - Smart City District of Helsinki | Knowledge Hub | Circle Economy Foundation (circle-economy.com)

Main findings

Spatial Planning and Low-Carbon Infrastructure

The Nordic region emphasizes spatial planning as a key strategy for achieving low-carbon urban development, integrating environmental considerations into urban planning to reduce emissions and improve quality of life. Key approaches include compact, mixed-use urban designs that promote sustainable mobility and improve public health, as exemplified by Bergen's smart mobility hubs[12] and Oslo's electrification of public transport.[13] Digital tools also enhance energy efficiency and sustainability, as seen in Helsinki's Kalasatama[14] district. Nordic cities lead in low-carbon construction, with modular and adaptable buildings cutting emissions by up to 60% and progressive use of low-carbon materials, showcased by Gothenburg's Hoppet[15] preschool and Norway's Mjøstårnet[16] tower. Challenges remain, including balancing urban growth with environmental protection, retrofitting infrastructure, overcoming misconceptions about modular construction, and navigating fragmented regulations and rigid building codes. Nonetheless, progressive national strategies, such as Denmark's forthcoming stricter CO_2 limits for new buildings declining from twelve kg/m^2/per year until 7.1 kg/m^2/per year in 2025,[17] continue to push sustainability forward. CO-PI[18] is another great example of the Nordic approach to innovation, where public-private collaborations are leveraged to develop sustainable construction solutions that address critical societal challenges such as climate change and environmental sustainability.

12. Smart Mobility | Nordic Smart City Network (nscn.eu)
13. Oslo's 'Climate Budget' Is Building a Cleaner City | World Resources Institute (wri.org)
14. Smart Kalasatama | Nordic Smart City Network (nscn.eu)
15. Hoppet - Sweden's first fossil-free preschool | News - Smart City Sweden
16. Mjøstårnet (moelven.com)
17. https://www.nordicsustainableconstruction.com/news/2024/june/tillaegsaftale-paa-engelsk
18. What is CO-PI? – Centre for Public-Private Innovation

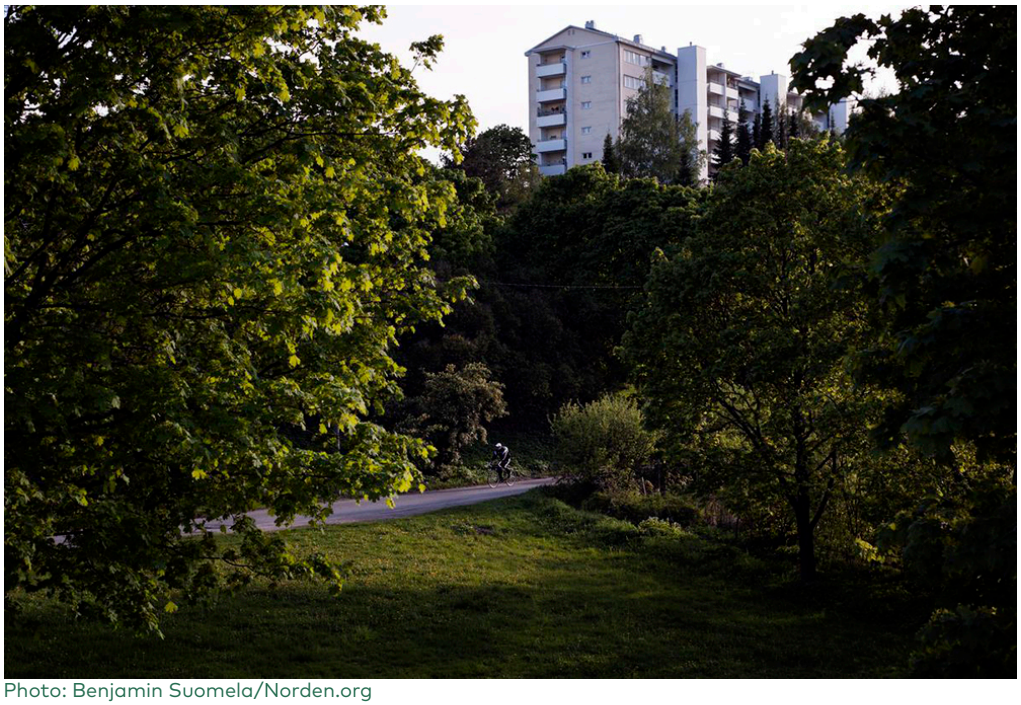

Photo: Benjamin Suomela/Norden.org

Electrification and Switching to Net-Zero Emission Resources

Nordic countries are at the forefront of transitioning to net-zero emission energy sources, with electrification playing a central role in urban decarbonization. Significant progress has been made in integrating renewable energy, such as Reykjavik's[19] geothermal district heating system, which powers 90% of the city's heating needs and contributes significantly to electricity generation. District heating and cooling systems, such as those used in Sweden's Sara Kulturhus[20] further reduce emissions by utilizing renewable energy and advanced technologies like AI. In the transport and construction sectors, cities like Oslo are rapidly decarbonizing through the adoption of electric machinery and emission-free construction policies, as demonstrated by Oslo's emissions-free construction initiative and projects like Stovner Bad[21] and Miljøgate.[22] Heat pump technology also plays a crucial role in reducing reliance on fossil fuels, exemplified by Oslo's Tøyenbadet[23] swimming centre, which integrates renewable energy and water recycling. However, challenges remain, including the need for grid modernization to handle increased electrification and ensuring that the transition remains affordable and equitable for all.

19. Green by Iceland - 90% of house heating in Iceland is geothermal! (islandsstofa.is)
20. Sara kulturhus's energy solution is sustainable and kind - Sara kulturhus
21. Stovner Bad - Oslo Municipality
22. Anlegg Øst well underway with the electrical construction work at Gran | Norwegian Public Roads Administration (ntb.no)
23. New Tøyenbadet - Oslo municipality

Photo: Eyþór Árnason/norden.org

Enhancing Carbon Storage through Green and Blue Infrastructure

Nordic cities are increasingly integrating green and blue infrastructure to enhance carbon storage, biodiversity, and climate resilience. Urban green spaces and forests, such as those in Stockholm's Hammarby Sjöstad,[24] help sequester carbon and mitigate heat islands, while blue infrastructure, exemplified by Oslo's River Renewal Project,[25] improves flood resilience and water quality. The use of bio-based building materials is also gaining traction, as seen in Denmark's Biological House *"Det Biologiske Hus"*,[26] which offers sustainable construction alternatives that contribute to carbon reduction. However, challenges like competing land use, maintenance needs, and regulatory barriers complicate implementation. Projects such as Heidelberg Cement's carbon capture and storage initiative and AquaGreen's biochar technology demonstrate the potential for industry-led innovations to drive sustainability. These technologies reduce CO_2 emissions, produce renewable energy, and enable more resource-efficient urban development. Key enablers for scaling these solutions include supportive policies, green financing, and community engagement, alongside short-term interventions like climate budgeting, preferred procurement practices, and design competitions.

24. Hammarby Sjöstad, Stockholm, Sweden | Urban Green-blue Grids (urbangreenbluegrids.com)
25. Oslo_Reopening_Waterways (urban-waters.org)
26. Det_Biologiske_Hus.pdf (3xn.dk)

Photo: archello.com

Recommendations

These steps enhance climate policy development in the Nordics, addressing national, regional, and local authorities. Coordinated national and local actions are key for deep urban decarbonization.

National and Government Levels

- Facilitate Knowledge Sharing: Establish best-practice mechanisms and events for climate policies.
- Commission Research: Focus on climate impacts and collaborate with external experts.
- Integrate Accountability: Embed climate targets in national policies and establish monitoring groups.
- Strengthen Low-Carbon Building Codes: Set stricter CO_2 limits and promote modular construction.
- Invest in Electrification & Renewables: Expand renewable energy sources and upgrade grid capacity.
- Promote Circular Economy in Construction: Standardize material reuse and modular practices.
- Support Infrastructure Retrofitting: Launch funding programs for energy-efficient retrofits.
- Accelerate Carbon Capture & Biobased Materials: Promote sustainable building materials like wood and hemp.
- Develop Urban Planning & Resilience Strategies: Enhance green/blue infrastructure and balanced land use.
- Electrify Public Transport: Set deadlines for transport electrification and invest in infrastructure.

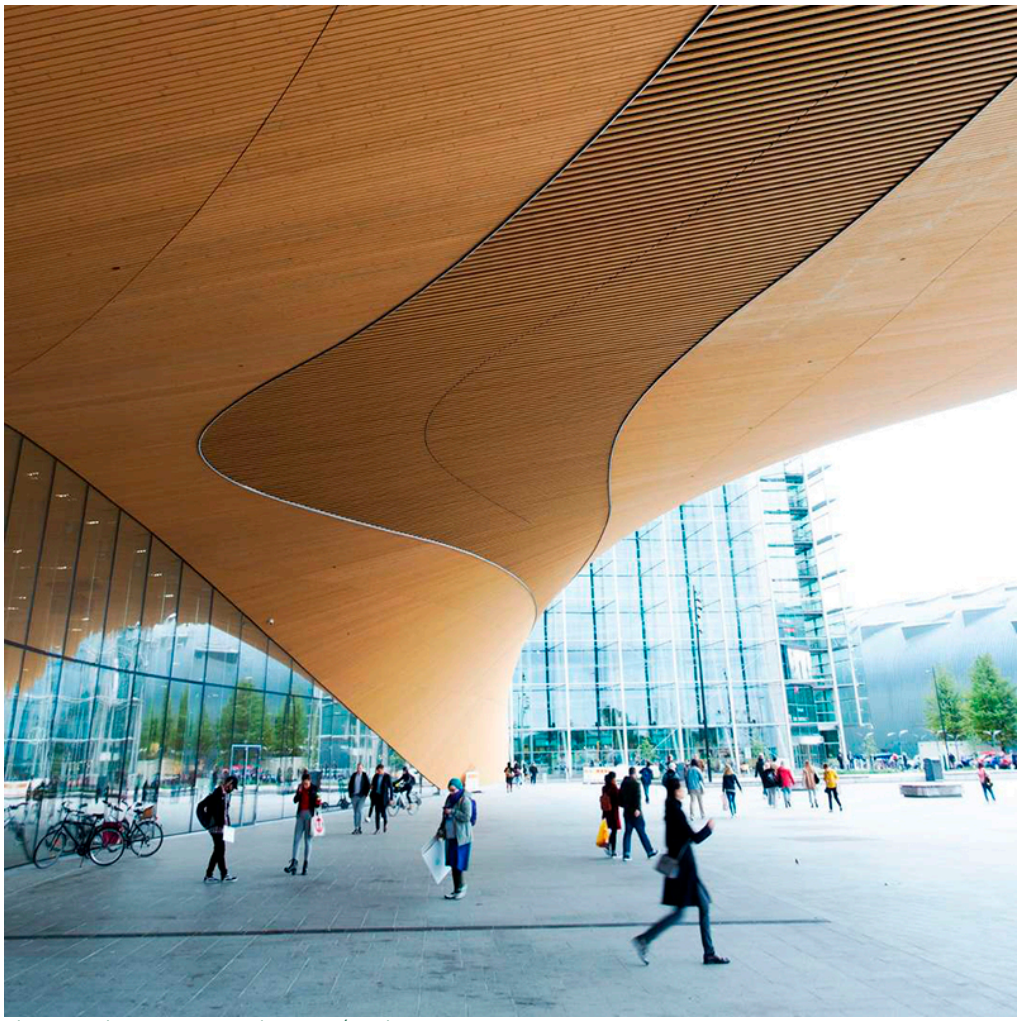

Photo: Anders Vestergaard Jensen/norden.org

Regional and Local Levels

- Use Data for Impact Assessments: Analyze local climate data for decision-making.
- Integrate Climate Indicators: Align local strategies with national climate goals.
- Enhance Knowledge Sharing: Foster scalable solutions between municipalities.
- Provide Staff Training: Implement climate policy training for local staff.
- Support Climate-Resilient Infrastructure: Integrate resilient infrastructure into local planning.
- Promote Compact Urban Development: Focus on mixed-use, low-carbon urban areas.
- Decarbonize Public Transportation: Invest in electrified transport and cycling infrastructure.

- Encourage Modular Buildings: Promote adaptive construction methods.
- Increase Green & Blue Infrastructure: Expand urban parks, gardens, and waterways.
- Promote Low-Carbon Building Materials: Prioritize sustainable materials in local projects.
- Digitize Energy Efficiency: Invest in smart city tech for optimized energy use.
- Build Climate Resilience: Upgrade urban infrastructure for extreme weather.
- Electrify Construction: Transition local construction sites to electric machinery.

Photo: Yadid Levy/norden.org

These steps ensure cohesive climate actions across sectors and levels of governance.

Main barriers

Cities transitioning to low-carbon infrastructure face challenges balancing growth with environmental protection. Expanding urban areas while retrofitting existing infrastructure requires investment and coordination. A key barrier is the misconception that new construction is better than circular practices like reuse and modular buildings, often seen as lower quality. Standardized regulations based on functionality, along with changing public and policy attitudes, are essential for wider adoption.

Assessing biobased materials requires extensive Life-Cycle-Analysis (LCA), accounting for sourcing, use, disposal, and reuse. New EU LCA requirements in 2025 will impact how companies evaluate carbon footprints for buildings over 1000 sqm.

Green and blue infrastructure faces obstacles from competing land uses and sustainability concerns. Long-term maintenance and community engagement are crucial but difficult to prioritize. Uncertainty around carbon capture and negative emissions technologies adds complexity, and electrification efforts require addressing grid capacity, stability, and equity. These challenges emphasize the need for cohesive strategies, investment, and supportive policies for long-term sustainability.

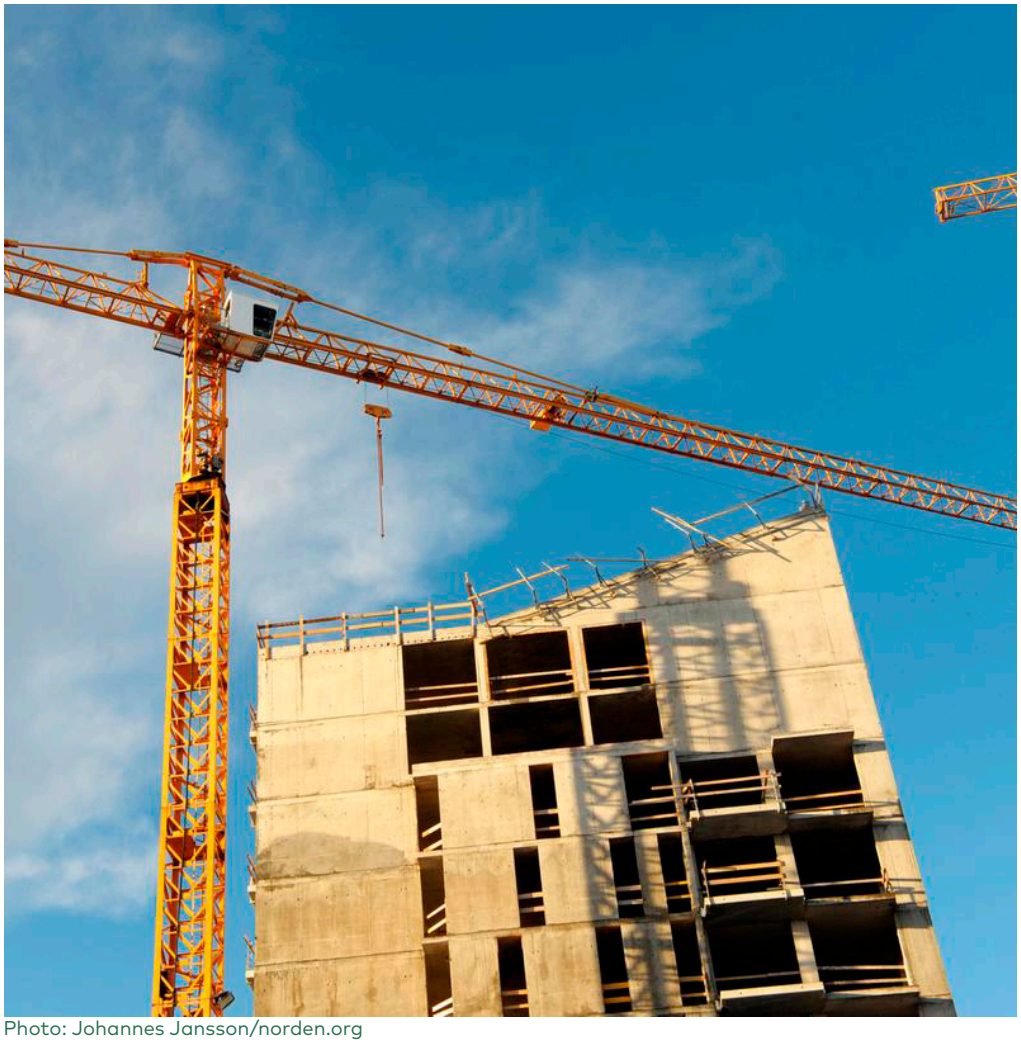

Photo: Johannes Jansson/norden.org

Conclusion

The Nordic region's experience in spatial planning, renewable energy, electrification, and green infrastructure offers a blueprint for how cities globally can advance towards net-zero emissions. However, achieving these goals requires addressing significant challenges, including the need for substantial investments, coordinated action across sectors and actors, and policies that ensure an equitable transition for all residents. The MWP's 2024 focus on cities, buildings, and urban systems presents an invaluable opportunity to leverage these insights and catalyse the deep decarbonization and systemic transformation needed to create sustainable, resilient urban futures.

Note that the insights and recommendations in this document reflect the contributions of participants, though they do not necessarily represent the views of the Nordic Council of Ministers (NCM) or the Nordic governments. This submission is following stakeholder consultation funded by the Nordic Council of Ministers. The Nordic Council of Ministers is an intergovernmental forum established to complement the Nordic Council and promote Nordic cooperation (covering Denmark, Finland, Iceland, Norway, Sweden, Greenland, The Faroe Islands and Åland) to support the Nordic Vision 2030:[27] to become the most sustainable and integrated region in the world by 2030. Representatives from all five countries have participated in the project steering group led by Nordic Working Group for Climate and Air under NCM, sharing inputs for the review through contributing with contacts, relevant documents, and feedback. Several of the steering group members also participated in the focus groups.

27. Our Vision 2030 | Nordic cooperation (norden.org)

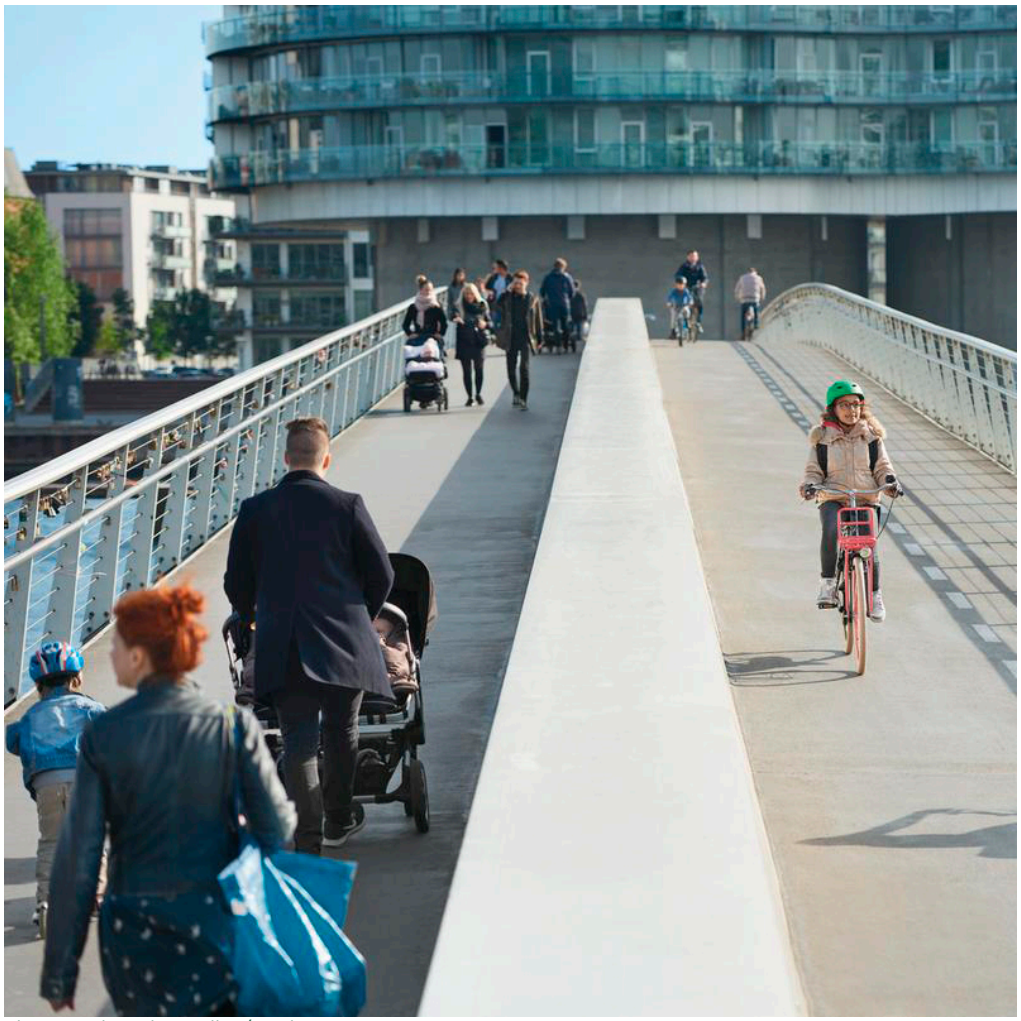

Photo: Ricky John Molloy/norden.org

About this publication

Policy Brief: Nordic Cities and GHG Emissions Reduction – Aligning with the Mitigation Work Programme for Climate-Resilient Urban Development

Hannah Sutton

Nord 2024:039
ISBN 978-92-893-8107-9 (PDF)
ISBN 978-92-893-8108-6 (ONLINE)
http://dx.doi.org/10.6027/nord2024-039

Cover photo: Mads Schmidt Rasmussen/norden.org

Published: 11/11/2024

Nordic co-operation

Nordic co-operation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and the Faroe Islands, Greenland and Åland.

Nordic co-operation has firm traditions in politics, economics and culture and plays an important role in European and international forums. The Nordic community strives for a strong Nordic Region in a strong Europe.

Nordic co-operation promotes regional interests and values in a global world. The values shared by the Nordic countries help make the region one of the most innovative and competitive in the world.

The Nordic Council of Ministers
Nordens Hus
Ved Stranden 18
DK-1061 Copenhagen
www.norden.org

Read more Nordic publications on www.norden.org/publications