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The Kingdom of Sweden: A Long History of Sustainable Practices

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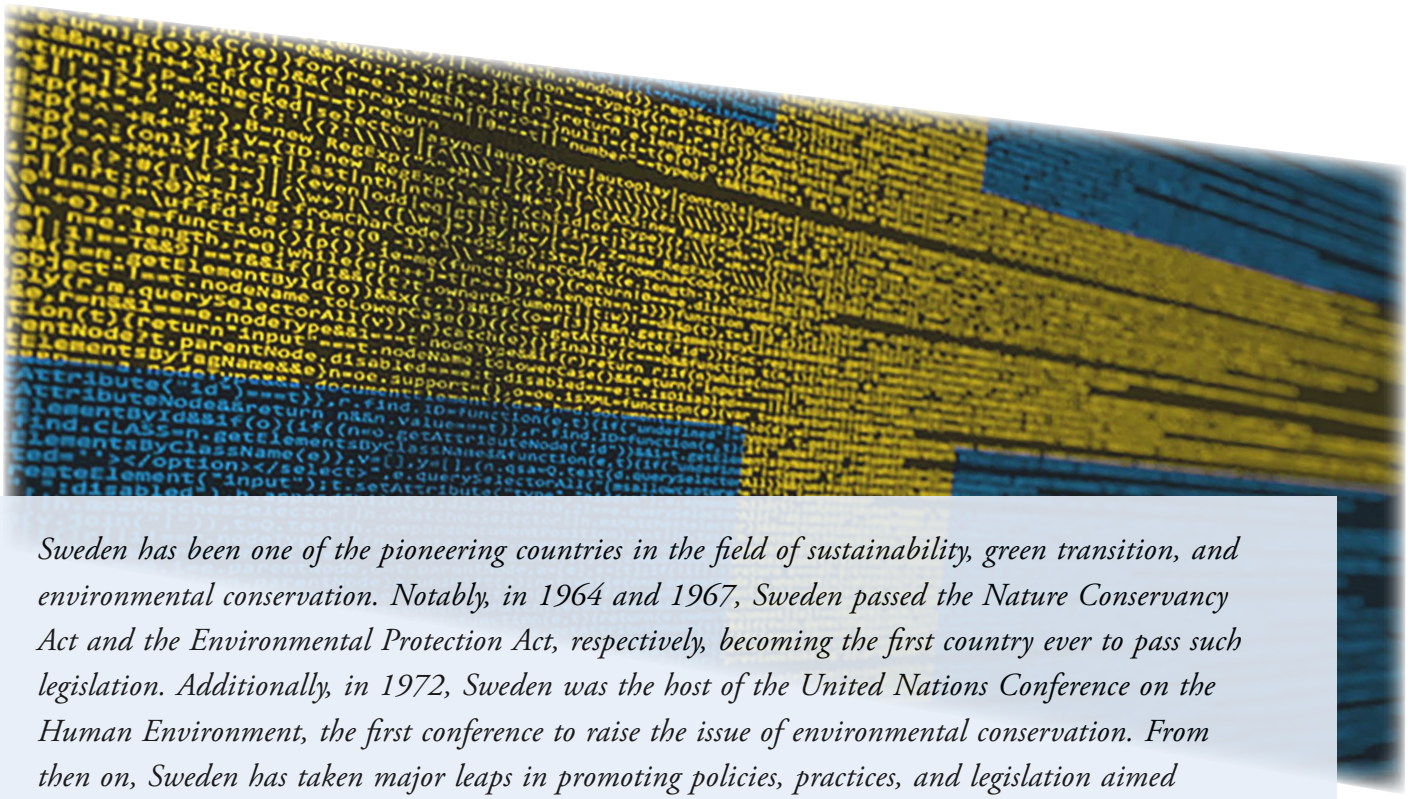

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Sweden has been one of the pioneering countries in the field of sustainability, green transition, and environmental conservation. Notably, in 1964 and 1967, Sweden passed the Nature Conservancy Act and the Environmental Protection Act, respectively, becoming the first country ever to pass such legislation. Additionally, in 1972, Sweden was the host of the United Nations Conference on the Human Environment, the first conference to raise the issue of environmental conservation. From then on, Sweden has taken major leaps in promoting policies, practices, and legislation aimed at substantially reducing greenhouse gas emissions and other pollutants. As of 2023, Sweden is a leading hub for environmental research and green technologies, spearheading decarbonization efforts through clean energy sources and becoming a model globally. This issue brief is the first in a series of publications from ISDP's Korea Center focused on green transition and green technology practices and policies in Sweden and South Korea. It provides an overview of the historical direction and current development of Swedish policies vis-à-vis sustainable development and green technology.

Sweden's Road to Carbon Neutrality

Sweden's strides toward environmental conservation commence very early during Tage Erlander's term as Prime Minister (1946-1969). The Erlander administration passed the Nature Conservancy Act in 1964 and the Environmental Conservation Act in 1967, in concomitance with the establishment of the Swedish Environmental Protection Agency (Naturvårdsverket). In 1972, Sweden hosted the first United Nations Conference on the Human Environment, which resulted in the Stockholm Declaration and Action Plan for the Human Environment and various other resolutions. The conference served to bring environmental issues to the fore at the global level, kickstarting "dialogue between industrialized and developing countries on the link between economic growth, the pollution of the air, water, and oceans, and the well-being of people around the world."[1]

In the same year, Sweden's first commercial nuclear power plant came online, starting the transition from fossil fuels. The urgency of shifting to a green energy mix was swiftly underscored during the 1973 oil crisis when an oil embargo by the Organization of Arab Petroleum Exporting Countries hit all countries that supported Israel during the Fourth Arab-Israeli War. Notably, Sweden was the first country in the world where essentially almost every household had access to electricity.[2] Accordingly, due to continued economic growth and industrialization, oil imports to Sweden increased exponentially between 1960 and 1970.[3] Given that nearly 75 percent of the total energy supply came from imports, the Swedish government started to attempt to reduce the country's dependency on energy imports. Therefore, Sweden started diversifying supply in terms of countries and types of sources, including gas, while expanding domestic capabilities, predominantly biomass, hydro, and nuclear power.[4]

Nevertheless, Erik Grafström, the former director general of Vattenfall and chairman of the Energy Council, alongside the Social Democratic leadership, exhibited reluctance towards prioritizing small-scale renewables and energy efficiency measures. As a consequence, Prime Minister Olof Palme, supported by council member Jonas Norrby, maintained a strong belief in nuclear power as a viable solution to both energy security and climate change challenges. Unfortunately, while Sweden has made substantial investments in renewable energy research since 1975, the translation of this research into actionable policy recommendations was delayed until the 1990s.[5]

In a speech before the party board in 1975, Palme underscored the importance of long-term planning in energy policy decision-making.[6] Later that same year, in late February, the government adopted the energy plan, reaffirming concerns about the environmental impacts of fossil fuel combustion. Notably, Palme acknowledged the potentially catastrophic consequences of climate change, citing scientific warnings of its catastrophic consequences for society.[7] The energy plan focused on enhancing energy efficiency and investing in nuclear power to reduce reliance on foreign oil and bolster energy security. However, rather than pivoting away from fossil fuels, the plan included further investments in state-controlled fossil fuel operations, such as Petroswede AB and Oljeprospektering AB, indicating a continued involvement in fossil fuel prospecting and extraction.[8]

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In 1978, as Prime Minister Thorbjörn Fälldin (1976-1978) resigned amidst internal conflicts over the issue of nuclear power, a new liberal-conservative minority government proposed an updated energy plan. This updated plan, previously introduced during Fälldin's administration, addressed the issue of climate change while also emphasizing uncertainties surrounding the topic. The government positioned climate change as a global future threat rather than framing it solely as an issue of domestic energy policy. In 1980, Sweden held a non-binding referendum on the future of nuclear power that resulted in the narrow win of the option of phasing out nuclear power.[9] The referendum set the overall policy for nuclear power in Sweden for the coming decades. Throughout the second Palme administration (1982-1986), the country continued phasing out nuclear energy while promoting new energy-efficient technologies and practices, introducing subsidies

and incentives to increase investments in renewable energy sources, and laws and regulations to mitigate environmental degradation.

Under Prime Minister Ingvar Carlsson's administrations (1986-1991 and 1994-1996) came the first major policy restructuring that laid the foundations of modern Swedish policy, especially vis-à-vis carbon emissions. The Carlsson administration developed and implemented Sweden's Energy Policy of 1991, which positioned Sweden as one of the pioneers in climate governance. The policy introduced a carbon tax, "the first of its kind along with its Nordic parallels," and set targets for reducing greenhouse gas emissions and increasing the share of renewables in the energy mix.[10] The Environmental Objectives System, introduced in the late 1980s, was also expanded under Carlsson's administration, setting specific environmental goals and targets for Sweden. These objectives covered areas such as air and water quality, biodiversity conservation, and climate change mitigation. Under Carlsson's leadership, Sweden actively participated in international environmental negotiations and agreements. The government advocated for stronger climate action and played a key role in shaping global environmental policies through organizations like the United Nations and the European Union.[11]

During his administration, Prime Minister Göran Persson (1996-2006) continued and intensified Sweden's focus on renewable energy and sustainable development. Persson's government implemented policies to promote wind power, biofuels, and energy efficiency measures in buildings and transportation. Sweden played a pivotal role in advancing the European Union's climate agenda during this period. In 1999, Persson's administration introduced the Environment Code (Miljöbalken), a landmark piece of legislation reaffirming Sweden's commitment to reducing greenhouse gas emissions.[12] This act outlined specific targets for emission reductions, setting a clear direction for climate policy in Sweden, and represented a broader and more comprehensive approach covering a wider range of environmental issues. Notably, the act provides a unified legal framework for managing and protecting the environment, streamlining regulatory processes, and ensuring consistency in

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environmental standards and enforcement. Furthermore, Persson's government introduced the Energy Policy of 1997, which prioritized renewable energy promotion, energy efficiency improvements, and reducing reliance on fossil fuels. This policy aimed to increase the share of renewables in Sweden's energy mix while enhancing energy security. Lastly, the Persson administration implemented the Environmental Tax Reform, expanding the taxation mechanism introduced under Carlsson and going beyond carbon tax to include taxes on various pollutants and environmental impacts. These reforms aimed to internalize environmental costs and incentivize greener behavior among businesses and consumers. In contrast with Carlsson's carbon tax, the revenues generated by Persson's taxation mechanism were often earmarked for environmental protection and sustainability projects, ranging from investments in renewables to a greener transportation system. Furthermore, the Persson administration emphasized the importance of integrating environmental consideration into economic policy at all levels of society and government, introducing various regulatory standards, more subsidies and public investments, and broader equity considerations to ensure that environmental

taxes did not disproportionately impact low-income households or vulnerable communities.[13]

The subsequent Reinfeldt administration (2006-2014) established a comprehensive climate policy framework to address carbon emissions across industries, transportation, and buildings. The framework aimed to achieve climate targets by emphasizing collaboration with businesses and municipalities. Moreover, the government provided subsidies and financial support for renewable energy projects, including wind farms and solar installations. These incentives facilitated the rapid deployment of clean energy technologies throughout Sweden, contributing to the country's transition pursuits. Under Prime Minister Stefan Löfven's administration, Sweden witnessed an accelerated push towards carbon neutrality. The government set targets for renewable energy deployment, with a goal of achieving 100 percent renewable energy production by 2040. Energy efficiency measures were prioritized, alongside investments in research and development of clean technologies.[14]

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In 2017, the Löfven administration (2014-2021) introduced a new climate policy framework, which included a Climate Act, updated climate targets, and established the Climate Policy Council. This legislation established binding targets for carbon emissions reductions and outlined milestones for achieving carbon neutrality by 2045. Additionally, Löfven's government brokered a cross-party climate policy agreement in 2017, bringing together political parties to collaborate on climate action. The agreement outlined measures to accelerate the transition to renewable energy, increase energy efficiency, and phase out fossil fuel subsidies.[15]

Current Trajectory

As of 2022, Sweden's annual electricity consumption amounted to approximately 176 terawatt-hours.[16] Sweden boasts a significantly high green energy mix, with renewables playing a dominant role in final energy consumption.[17] Renewable energy sources contributed to 63 percent of Sweden's total energy consumption in 2021, making it one of the leading countries in sustainable energy production.[18] Hydropower stands out as Sweden's primary source of electricity, accounting for approximately 45 percent of the country's production.[19] Biomass, including forest residues and waste, constitutes another substantial portion as the country's main source of renewable energy.[20] In recent years, wind power has emerged as a rapidly growing sector in Sweden's energy landscape, representing roughly 20 percent of total electricity generation in 2022.[21] Meanwhile, nuclear energy remains a significant contributor to Sweden's energy production, contributing approximately 29 percent to the total electricity generation in 2022.[22]

Looking ahead, Sweden has set ambitious targets to further increase the proportion of renewable electricity in its energy mix. The government aims to achieve 100 percent fossil-free electricity by 2040, with interim goals of reaching 50 percent by 2030. The commitments entail continued investments in renewable energy projects, the gradual reduction of fossil fuel reliance, and advancements in energy efficiency technologies. Additionally, Sweden is exploring opportunities in emerging sectors, such as hydrogen production, to support its transition. The Ulf Kristensson administration, starting in 2022, has

implemented substantial revisions to Sweden's climate and energy strategies. While the overall objective of carbon neutrality has remained the priority, the Kristensson government changed the means to achieve it by shifting from 100 percent renewables to 100 percent fossil free. This change showed Sweden's complete reversal of decades-old policies and enshrining its commitment to expanding nuclear energy production. This reversal has been dictated by multiple factors, among them energy security due to Russia's war in Ukraine and Sweden's dependency on nuclear power.

In November 2023, the Swedish parliament passed a bill that allowed the removal of previous restrictions limiting the number of nuclear reactors that the country could construct to 10.[23] The bill also allows nuclear power plants to be built in locations beyond the existing facilities at Ringhals, Forsmark, and Oskarshamn. Kristensson's government aims to build two new conventional reactors by 2035 and have about 10 new reactors by 2045. Sweden will also invest in nuclear energy and technology, as proven by the support for nuclear R&D investments through credit guarantees of approximately USD36 billion.[24] Furthermore, in 2023, the International Atomic Energy Agency conducted two nuclear safety review missions to assess the feasibility of the deployment of Small Modular Reactors (SMRs) in Sweden.[25] Through Vattenfall, Uniper, Fortum, and Kärnfull, Sweden has joined the efforts in SMR R&D. As of February 2021, Uniper, in collaboration with LeadCold and the Royal Institute of Technology, agreed to build a demonstration SMR at Oskarshamn by 2030.[26] In June 2022, Vattenfall launched a feasibility study into building SMRs in Sweden.[27] Lastly, Fortum and Kärnfull disclosed in December 2022 their exploration of SMR development in Sweden as part of Fortum's broader feasibility study initiated in October 2022.[28]

Sweden has also embarked on research on how to use hydrogen to achieve its climate goals. Sweden's focus on hydrogen has been driven by a variety of factors, such as the high concentration of heavy industry in the country and the need to decarbonize these industries in order to meet its climate targets. According to Fossil Free Sweden, an initiative started by the Swedish Government in 2015,

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"hydrogen projects in Sweden can achieve a reduction of 7.1 million tonnes of carbon dioxide per year in direct emissions by 2045. That equals 14 percent of Sweden´s national emissions."[29] There are a few projects that are currently using or plan to introduce the use of hydrogen. One of the most notable projects is the one initiated by H2 Green Steel, which has set out to build the world's first large-scale green steel plant in Boden, in the north of Sweden. H2 Green Steel presented the plans to develop its direct reduced iron (DRI) plant in April 2023 and aims to produce 5 million tons by 2030, reducing 95 percent of CO2 emissions compared to traditional steel production.[30] As of September 2023, H2 Green Steel had secured about USD6.9 billion and plans to deliver on its first contracts either in late 2025 or early 2026.[31]

The Future of Sweden's Transition

Though Sweden has been recognized as one of the models for climate action globally, there are still multiple questions that permeate the discussion around the green transition. As assessed by Ekberg and Hultman, the Swedish response to climate change has, over the decades, been characterized by either the expansion or, at the very least, preservation of nuclear

power production and increased participation in or even helming of international environmental conservation efforts.[32] Additionally, while nuclear energy may be receiving greater focus in Sweden, the government might be stumbling upon a few roadblocks. As reported by Svenska Dagbladet, the Ministry of Finance has assessed that the government has underestimated the complexity of the issue and the difficulty in attracting investors for further nuclear power expansion due to the associated costs and risks.[33] Furthermore, as confirmed in a comparative study conducted by Julius Andersson, "abatement costs will be relatively high and, if recent European experiences are to be considered an indicator, the aspirational timelines are likely to be missed." Relying solely on nuclear power without addressing broader societal transformation and ensuring the affordability and feasibility of such policies may not adequately address the challenges posed by climate change.[34]

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The Institute for Security and Development Policy is a Stockholm-based independent and non-profit research and policy institute. The Institute is dedicated to expanding understanding of international affairs, particularly the interrelationship between the issue areas of conflict, security and development. The Institute's primary areas of geographic focus are Asia and Europe's neighborhood.

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