

# SWEDEN



**Population:** 9,220,000 (2008)

**Source:** Demographic Yearbook 2008,  
Table 5 Estimates of mid-year population: 1999-2008  
<http://unstats.un.org/unsd/demographic/products/dyb/dyb2008.htm>

**Carbon emissions per country:** 2007: 49 248

**Source:** (CDIAC) Carbon dioxide emissions (CO<sub>2</sub>), thousand metric tons of CO<sub>2</sub>  
<http://unstats.un.org/unsd/mdg/SeriesDetail.aspx?srid=749&crd=>

**Carbon emissions per capita:** 2007, Sweden: 5,3769

**Source:** (CDIAC) Carbon dioxide emissions (CO<sub>2</sub>),  
metric tons of CO<sub>2</sub> per capita <http://unstats.un.org/unsd/mdg/SeriesDetail.aspx?srid=751&crd=>

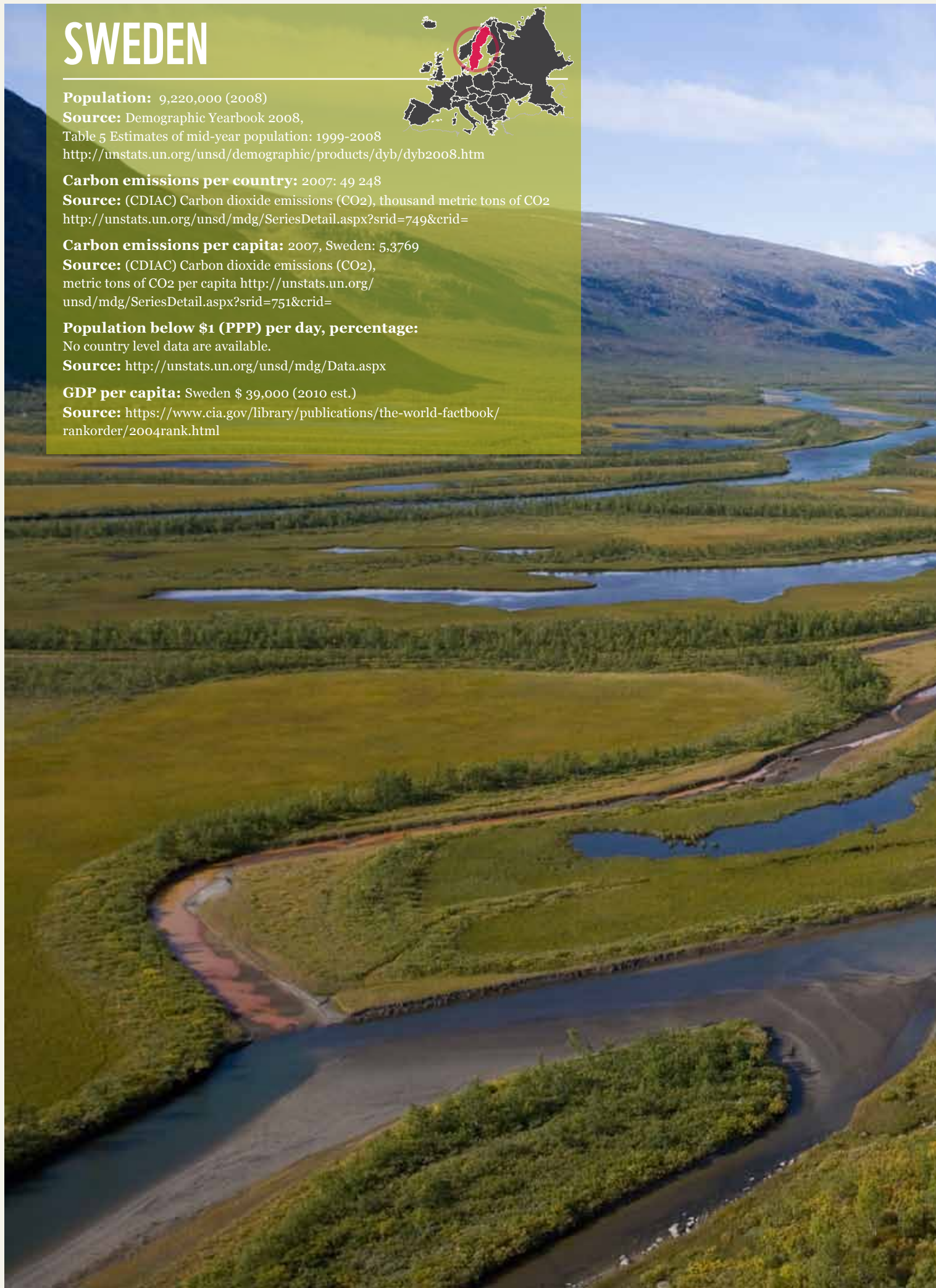
**Population below \$1 (PPP) per day, percentage:**

No country level data are available.

**Source:** <http://unstats.un.org/unsd/mdg/Data.aspx>

**GDP per capita:** Sweden \$ 39,000 (2010 est.)

**Source:** <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html>





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## Identifying Climate Solvers for innovative clean-tech solutions in Sweden

This section on the Swedish conditions for climate innovations is a summary of the report “12 Climate Entrepreneurs – Revolutionary Innovations for a Carbon-Free Future”, produced by Global FOCUS, 2008). More elaborate description and analysis of Sweden’s national climate innovation system can be found in the original report at [www.climatesolver.org](http://www.climatesolver.org).

The purpose of the Swedish assessment, commissioned by WWF-Sweden in 2008, was to help accelerate the transition from

a fossil-fuel based economy to a low-carbon society. The report highlights winners in this transition, the climate entrepreneurs who make the low-carbon future possible, and suggests how the Swedish innovation system can improve its support for these entrepreneurs. The objectives for this report were:

- To showcase a selection of Sweden-based climate entrepreneurs and the global potential for CO<sub>2</sub> emissions reductions offered by their low-carbon innovations.
- To present ideas and recommendations for faster development, diffusion, and deployment of climate technology globally based on the entrepreneurs’ and other relevant stakeholders’ experience.

The companies presented in the Swedish report were selected by a panel of technology, innovation, and market experts from China, India, and Sweden. Twelve companies were selected based on their climate innovations’ potential to reduce greenhouse gas emissions on a global scale. The twelve companies were divided into five different sectors: Energy Production, Energy Efficiency, Construction, Transportation, and System Innovations. The collective potential greenhouse gas emission reductions (given a set of assumptions on market penetration and share) are 600 million tons of carbon dioxide annually. This is equal to the total combined annual emissions of Australia, Argentina, and Belgium.

Building on the successful introduction of Climate Solver, the concept has become an annual event awarding new non-fossil, non-nuclear technologies that can offer >20 million tons of CO<sub>2</sub> emissions reductions per year within ten years. Since 2008, 24 Climate Solver companies from Sweden have been awarded, with a total CO<sub>2</sub> reduction potential of 1.5 Gigatonnes. To illustrate the global potential for climate innovations, Climate Solver companies from several key markets will be acknowledged within the coming years.

### Challenges and Recommended strategies

In a 2010 follow-up survey with Climate Solver entrepreneurs, a range of barriers and opportunities for commercialization and up-scaling were identified. Together with the original report, findings and experiences of these firms are summarised below, and followed by proposals for how policy makers and the business community can move ahead toward a competitive low-carbon future.

In order to expand into new markets and countries a firm needs to establish local presence. However, it is noted that identifying a local partner to work with is not always easy, and without such a local partnership the firm is on its own in dealing

with cultural differences and putting a lot of effort into finding a common language with customers and other actors in the new market.

It was recognised that in some more proactive countries, SMEs in the cleantech market work in consortium when entering the global markets. Such strategies are perceived to be fruitful and bring many benefits to all involved by sharing costs, risks, resource mobilisation, marketing, etc. Swedish cleantech SMEs do not usually cooperate to such a large extent, possibly due to high competitiveness.

Other challenges identified when moving into new markets are primarily the large differences among countries (even within EU) in regulations for business establishment and for environmental standards and legislation. Cultural differences are also perceived to be significant obstacles in establishing a small cleantech business in a new market.

A challenge in attracting investors is that many require involvement of other investors, which in the end can result in the need to find three or four investors at the same time. Many capitalists are also perceived to undervalue the innovation and the business. Another barrier for investments is that investors are deemed to demand excessively high returns and take too large a share of business ownership. Furthermore, the many steps and long processes involved when working with technologies for the public sector is a major obstacle in attracting investors.

Several of the interviewed entrepreneurs find that Swedish venture capitalists lack sufficient knowledge of clean energy technologies. This results in investors shying away from the clean tech

market, preferring investments in IT or other, to them more familiar, sectors. At the same time, the clean tech concept is also perceived as becoming diluted, encompassing too wide a range of products and businesses. The definition of clean technology should therefore become more restrictive in favour of products and solutions that seriously benefit the environment and mitigate climate change.

A lot of potential is seen in government regulations and public procurement. Strengthened energy-efficiency standards, increased criteria for innovative technologies and clean energy solutions in public procurement are highly requested government strategies. Other measures asked for are cost reductions such as tax-deductible investments in small clean-tech businesses, simplified application processes for public funds, and reduced demands on high co-financing.



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The future for Swedish industry can benefit greatly from climate innovations.

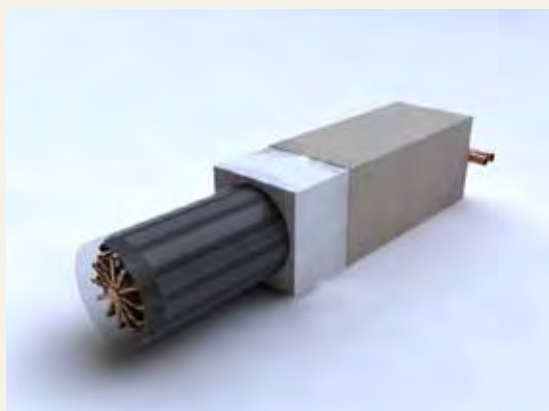
## Conclusions

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Based on identified challenges and opportunities the following section summarises the proposed path forward for...

### ... Politicians

- Design national strategies for transitioning to smart low-carbon solutions by phasing out fossil-based technology – in collaboration with businesses and other organizations – and with a global perspective in mind.
- These strategies call for specific, long-term climate technology goals with quantifiable and measurable annual targets for numbers of businesses created and magnitude of exported emission reductions. To reach these targets, a well-funded centre for climate entrepreneurs should be created – a public programme to facilitate the entire innovation process, from research and development to commercialization and export. The centre should coordinate all existing forms of support and provide one-stop-shopping for climate entrepreneurs. Its staff should proactively seek out climate entrepreneurs and offer them help with the innovation, commercialization, and export processes. Four funds, with considerable financial resources, should be linked to the centre and give support throughout the innovation process.
- Policy makers and public authorities should continuously interact with the centre, to gain understanding for how legislation and regulation need to be improved to support the new low-carbon economy transition. The government should engage in capacity building abroad by promoting the formation of similar centres in other countries.
- Public funds should assist climate innovations to reach the global market faster by supporting the establishment of climate innovation zones where low-carbon innovations can be demonstrated in full-scale operation in a relevant context (e.g. energy or transport systems).
- The climate challenge is not just, or mainly, an environmental issue, but a matter of fundamental importance throughout the political arena. Climate change has to be handled as a long-term and strategic task within all political fields, but most importantly in all commitments regarding innovation, trade, finance, enterprise, energy, research and development, export, and infrastructure.
- Low-carbon innovation needs to be supported not only on the supply side but also on the demand side, through public procurement programmes and public construction investments with climate innovation quotas. Public-private technology procurement programmes should be promoted so as to involve the private sector and expand the market. Another policy measure to promote new technologies that has proven to be successful is feed-in tariffs, in use in Germany since 2004 and now being introduced in several other countries.
- Policies need to break away from current technology lock-in and patterns of excessive energy and resource consumption. This cannot be accomplished by consulting only large corporations with a dependency on conventional solutions, when planning infrastructure development and public investments. This means that supporting technology innovation requires financial innovation, to allow clusters of innovations to be implemented on a large scale as system solutions, especially within energy, construction, and transportation.
- Conventional climate-damaging technologies should be firmly phased out with the implementation of new legislation and regulation, especially where climate-smart solutions are already more cost-efficient and new investment has a quick payback. Where climate-smart technologies are available but not yet cost-competitive, urgent policy



A systems-wide approach is needed for Swedish climate innovations to contribute to a resource-efficient economy domestically and globally.

measures are needed to enable the transition and to build up economies of scale.

- Major investments are needed to promote energy efficiency and to completely end any further funding or expansion of fossil-fuel based energy production worldwide. Increasing fossil production capacity is unacceptable; more than half of the energy produced today is wasted and is not being used to meet energy needs at the end user. New technology can make the use of energy radically more effective and increase energy productivity.
- Export policies and the financial regulatory framework should be adjusted to guarantee international support for climate-smart development – not the opposite.

Government-controlled pension funds, export support, and official export loan facilities should be used to support the transition to a low-carbon world, not to support fossil-dependent technology and maintain a high-carbon economy. Developed nations need to act on the advice from several trustworthy institutions and commit percentages, rather than fractions of a percent, of GDP to the transition to the low-carbon society should be obvious.

- The focus will need to be system-wide, not fragmented or marginal. New investments as well as existing solutions need to be transformed within many sectors, especially energy. Climate efficiency must be an integrated part of societal and economic systems, rather than being reduced to a matter of individual consumer involvement. Market failures need to be addressed by smart policies and empowered institutions.

### ...businesses

- The third industrial revolution has already started, and has sustainability at centre stage. Fossil-dependent technologies will be replaced by greener solutions. Infrastructure will be modernised, and our buildings and transportation systems will be improved. Linear resource flows with input, process, and waste will be replaced by cyclical flows, which are more respectful of natural resources and climate impact. For businesses, these changes will pose new challenges and present new opportunities. Businesses hoping to survive the transition to a low-carbon economy have to start preparing strategy and operations now.
- For a business, managing the transition mainly involves:
  1. Minimising the emissions of greenhouse gases through the whole chain from suppliers to customers, not least to avoid future difficulties with internalized costs, legislation, and regulation.
  2. Transforming or modifying products and services, in order to maintain competitiveness and ensure demand in the future market. As we enter the low-carbon economy, fossil dependent products will become increasingly incompatible with the new and modern technological and institutional context. There are today great opportunities for lowering climate impact while at the same time increasing margins and profitability and radically reducing future risks.
- Low-carbon, climate-smart innovations should be the core of business strategies and be incorporated into all main activities. If some area of activity is not compatible with the low-carbon economy, executives need to seriously reconsider what business development is about. Climate entrepreneurs from all parts of the world are living proof of a wide range of powerful approaches to initiate this change. The potential offered by their climate innovations reflects what will be mainstream demands in a low-carbon future.