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Sweden in a World of Growing Uncertainties

KARL HALLDING, E. ANDERS ERIKSSON, MALIN MOBJÖRK, MÅNS NILSSON, EVA ALFREDSSON, KRISTIAN SKÅNBERG, HANNES SONNSJÖ, MAGNUS BENZIE, HENRIK CARLSEN, ERIC KEMP-BENEDICT

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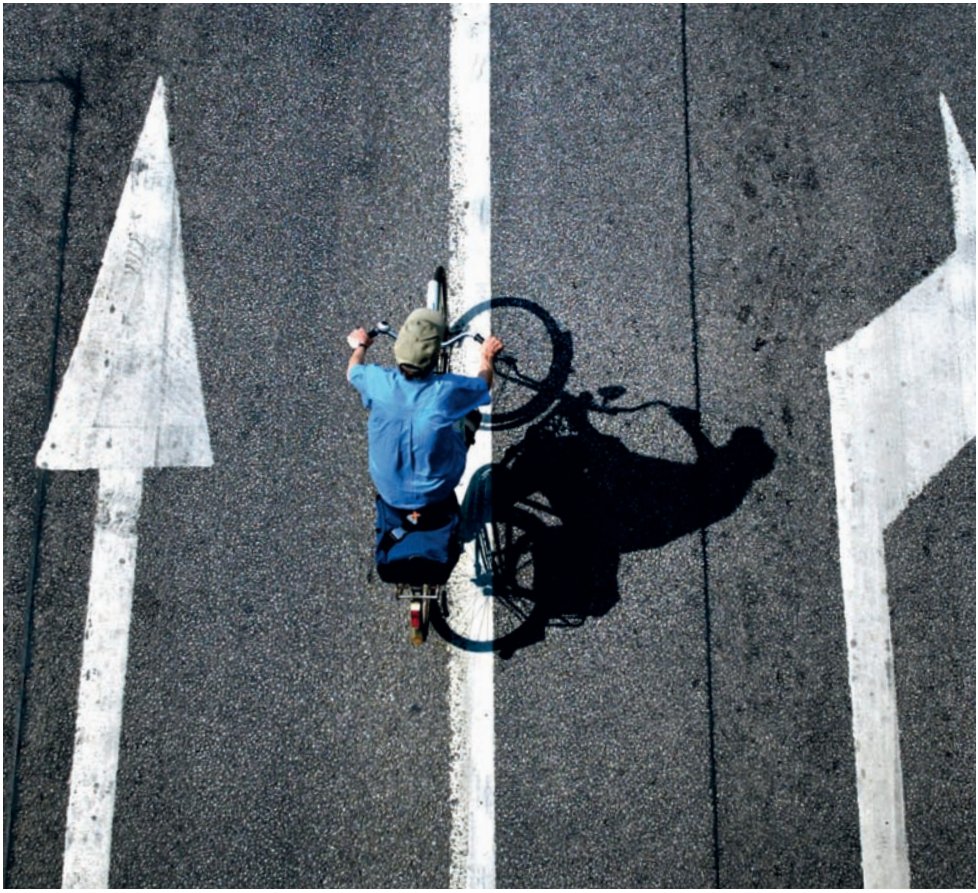

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Background report 10 to the Commission on the Future of Sweden

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Foreword

Over the past century, Sweden has transformed itself from one of Europe's poorest outskirts into a prosperous country. However, past accomplishments are no guarantee for future success. Sweden, as well of the rest of the world, faces challenges in many areas. Continued progress for Sweden depends on analyses of ongoing and future transformational processes, and what challenges these may bring.

Against that backdrop, the Government established the Commission on the Future of Sweden in November 2011. The aim of the Commission is to identify future challenges for Sweden in the short and long term. This expert report will contribute to the work of the Commission.

One of our greatest challenges is to ensure sustainable growth. However, since future conditions for a green transformation are so uncertain, shaping a coherent strategy for moving towards a green economy is a challenge. Technological development, the sensitivity of ecosystems to pressure, and how well we manage to cooperate internationally are all factors that can make it easier or more difficult to achieve our environmental and climate targets.

Diverging global scenarios, and how Sweden decides to act, will result in new, unknown challenges for other parts of society. This report illustrates what different future scenarios might look like, and how they may affect the prospects for a transition towards sustainable growth. The aim of the report is to broaden the discussion on how future uncertainty affects Sweden's potential to plan and implement long-term policies, and how that uncertainty can be managed.

The report has been authored by Karl Hallding and Måns Nilsson at the Stockholm Environment Institute, Henrik Carlsen, E. Anders Eriksson, Malin Mobjörk and Hannes Sonnsjö at the Swedish Defence Research Agency, Kristian Skånberg at the Swedish Confederation for Professional Employees, and Eva Alfredsson at the Swedish Agency for Growth Policy Analysis. This report would not have been possible without internal funding from SEI and FOI, in-kind contribution from Growth Analysis and TCO, as well as financial contributions from the Commission on the Future of Sweden and from Sida's Programme Support to SEI. Special adviser Petter Hojem has acted as the point of contact at the secretariat of the Commission on the Future of Sweden. The authors are responsible for the contents and conclusions of the report.

Stockholm, January 2013

Jesper Strömbäck
Principal Secretary, Commission on the Future of Sweden

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Appendices

Executive summary

This report lays out the basic rationale for a Swedish transformation into a 21st century green economy. The notion of 'green economy' has gained a significant foothold in the scientific and public debate, especially in the last few years. Most basically, it signifies new thinking designed to tackle an accumulated set of problems. It proceeds from the growing realisation that a damaged environment has direct economic and social consequences, and goes beyond the narrow ecological agenda of recent decades, or debates over sustainability. In policy terms, it involves the systematic incorporation of environmental considerations into the heart of economic decision-making – and, by extension, into the heart of modern society.

The implications of carrying out such a transformation are potentially major. A green economy can be a prime means of strengthening Sweden's economic, political and social fabric against a future likely to be defined by growing uncertainties, possibly punctuated by severe crises, and almost certainly shadowed by insecurity.

Sweden is in many respects well suited to the task. However, it will take years, even decades, to accomplish. It will require concerted effort, numerous policy trade-offs and some difficult choices. It is one thing to be forward-looking, and quite another to grasp the challenge and make the actual commitments – in time and effort as well as money – that will make a difference, and which some countries are already well in the process of making. This report uses a scenario-based approach to discuss the robustness of different policy options to deal with a future character-

ised by deep uncertainty. The work aims ultimately at responding to the following focal question:

> Considering critical global trends, rising uncertainties and the widely acknowledged need for innovative new strategies, what mix of green economic policy options provides the most promising opportunities for Sweden in the coming half-century?

The study is fundamentally a discussion document based on qualitative analysis. As such, it is meant to serve as a complement rather than an alternative to quantitative analysis. The focus lies on the wider ramifications of economic policy under conditions of growing uncertainty about the direction of global development.

The report is divided into four parts. Chapter 1 draws on research literature, high-profile reports from international institutions, and policy documents from various governments. It introduces the concept of a green economy and provides a brief *overview* of fundamental challenges facing the global and national economy in a world of scarce resources and pressured ecosystems.

Chapter 2 presents the methodological approach and elaborates a range of *scenarios* for global development up to the year 2050, along with the major assumptions and factors likely to shape their course. Scenarios are used to *understand possible developments in a longer-term perspective* in order to *inform today's decision-making.*

The crafting of scenarios is founded on well-established methodologies that have been applied widely in the security establishment as well as in business, involving primary input from a brainstorming workshop. The scenarios were generated with the aim of setting out four essentially different and contrasting global futures, each being plausible, relevant and challenging.

The scenarios spring from a common growing *problematique* during the onset period (up to 2020), which is broadly characterised by worsening imbalances in the global economy, frequent financial crises and further erosion of the international system's authority.

Scenario 1: Glocal Citizenship plots the advent of a mosaic of value-driven communities combining new measures of wellbeing and focus on local resource efficiencies.

Scenario 2: Global Governance sketches the emergence of a new state-based global system in the wake of an acute global crisis, charting a future of functioning global institutions but reduced economic growth.

Scenario 3: Return of Geopolitics depicts the gradual development of a multipolar world order, marked by growing tensions and securitisation of commodities and leading to global inefficiencies, low overall growth prospects and mounting inequalities.

Scenario 4: Big Business charts a dominant role for business, particularly transnational corporations, in setting a global agenda characterised by strong corporate social responsibility (CSR), sustainability-driven supply chains, and considerable productivity gains.

The scenarios were used as a framework for discussions during a second workshop, concerning threats and opportunities for Sweden and the robustness and potential effectiveness of Swedish green-economy strategies. The need for diversity among the scenarios was paramount, in order to fully address the robustness issue.

Chapters 3 and 4 are essentially based on input from and conversations during this second workshop. Chapter 3 discusses the prospects and consequences for Sweden that could arise from the uncertainties set out in the global scenarios. Finally, Chapter 4 examines alternative policy options in relation to the future scenarios, with the aim of stimulating debate on a robust Swedish green economy policy agenda.

The workshops are further described in Annex A.

Key findings

Building resilience in the face of uncertain world development

1. A substantial and growing body of evidence shows that the world's political, financial and ecological systems are coming under increasing pressure in a world of growing uncertainties, and are increasingly dominated – even dictated – by insecurity. As a small country in a world headed for far-reaching changes and primed for multiple, parallel crises, Sweden needs to carefully assess its range of strategies to cope with, and build resilience for, a future of growing uncertainty.
2. This report shows that green economic policy offer opportunities to bolster the resilience of Swedish society, enabling it to cope with, withstand and endure a challenging future and, potentially, even to prosper under the conditions of uncertainty. Investing in a transition towards a green economy could be a powerful and prudent insurance policy against fallout from future shocks.

Comparative advantages to reap long-term benefits

3. By adopting proactive policies and specifying priority areas for a green economic transition, Sweden could potentially reap long-term comparative advantages, even if doing so might increase short-term costs. There are many trade-offs involved in determining whether to assert itself as a prime mover, or indeed how far that is even possible. It can be tempting to save effort and resources by piggybacking on the efforts of others, riding the wave of developments and dealing with problems as they materialise. But a strategy of wait-and-see or 'muddling through', while ostensibly the cheaper option in the short term, might well turn out to be more expensive further down the road, forcing Sweden to adjust to external events, on a schedule and under conditions not of its own making.

4. A transition to a green economy would capitalise on Sweden's existing comparative advantages. The country has renewable natural resources along with high-grade ores, a valuable endowment. Its power-generation system is relatively efficient, has nationwide reach and is largely based on non-fossil energy. Sweden possesses ample social capital: an educated population, a knowledge-based economy and abundant technological expertise. All of this opens up possibilities for value-added production and systems to circulate these valuable resources widely. Successful elements of the 'Swedish' or 'Nordic' model also create a solid basis for transition, as could Sweden's emergence in recent decades as a wider point of reference. Efforts to market a new range of goods, services and even exportable technologies and services that carry the sustainability stamp would benefit from the international image of Sweden as a green role model.

5. Sweden currently has a very promising opening by virtue of its strong financial situation. Public debt levels compare favourably with most of the industrialised world, while having its own currency has insulated Sweden from the euro area debt crisis. This suggests particular advantage in acting now, rather than later, to bring about green economic reform. Investing in green economic development could facilitate two key economic objectives. It could provide a boost for a green and clean tech sector while strengthening the overall national balance sheet at a time of global stagnation and instability. And because the transition will require energy-centred investments, it will almost certainly be far more expensive to achieve in future years, when fuel prices are likely to be higher than today, and when there may be tighter restrictions on carbon use at regional or global level, such as price levies on carbon and other emissions. Compulsory green procurement policies would provide a strong demand-side boost for green technologies and services.

6. Striking a balance between forging ahead as a technological steam engine at whatever cost on the one hand, and capturing some area of middle ground by getting ahead of the curve on the other, the latter approach appears to hold the most promise. By following this course, Sweden could reap benefits from its own efforts and from developments further afield, in a way that keeps costs at reasonable levels.

Concerted national efforts to promote change at home and overseas

7. It will require concerted national efforts to realise a genuine transformation into a green economy. In terms of national economy and planning, this is an argument in favour of bringing the Ministry of Finance directly into the picture, making it accountable for ensuring that green economic targets are pursued as vigorously as any other headline economic indicator. Possible policy options would include incentives for entrepreneurs, public-private initiatives, green procurement policies, public investment in electricity and transport infrastructures, and stringent policies for resource-efficiency standards. Another effective option would be incentives for switching to renewable energy sources, which might encompass revenue instruments and include some form of green tax shift, although it is crucial that such a shift is fairly and judiciously introduced and is broadly revenue-neutral in effect.

8. Top-down initiatives by government are necessary but not sufficient on their own. They would need to be matched by efforts to encourage bottom-up involvement by broader society. This would require policies designed to co-opt and support, as well as induce and push, the business community, key social partners, interest groups and civil society. Innovative ideas and out-of-the-box thinking need to be worked into these wider efforts, while skillful communication of long-term targets is essential. There is a clear need to build solid democratic support for such a transition, and to foster broad understanding of its potential challenges and benefits.

9. Sweden has considerable opportunities to use green economic policy to promote development of a sustainable energy system primarily based on renewable energy. This would increase energy security and contribute to rural economic development, while at the same time offering considerable opportunities for energy exports in a potentially lucrative market of increasing energy prices. As an important part of an energy system transition, green economic policy instruments could be particularly helpful in unleashing the considerable untapped supply of 'negawatts' (energy savings), especially in buildings used for housing and services.

10. Despite Sweden's limited size and influence – or perhaps even because of it – an active green economic policy could enhance the national reputation as a well-informed and forward-looking country in a world already moving in this direction. Any such 'green foreign policy' options would not necessarily be limited to a calculation based on narrow self-interest; rather, they could slot into a broader, global transition toward greening the economy that draws on Swedish experiences and expertise. Sweden could build on its diplomatic repute to bring together coalitions of the willing on this policy area that, in turn, would reflect and enhance core Swedish interests. The country's good name in development policy and history as a neutral broker would also work to its advantage, given that emerging economies will play a crucial role. What Sweden invests it is likely to get back.

1

A green economy and the challenge of a new era

1 A green economy and the challenge of a new era

This chapter introduces some of the key elements of a 'green economy': what it is, what factors underpin its growing prominence, and why it is potentially of great importance for Sweden and for the global economy. It sets out the case for adopting an economic model that is suited to the great challenges facing the 21st century world. This background sets the stage for discussing the scenario-based methodology behind this study, which is then elaborated upon (Chapter 2) and applied to Sweden's situation (Chapter 3).

1.1 Arguments for a broader definition of the economy

The concept of a 'green economy' is frequently propounded as a remedy for market failures and institutional shortcomings associated with the conventional development model, and as a more effective pathway to advance economic, social, and environmental goals. There is a growing recognition that, in order to safeguard future wellbeing, the world economy needs to embrace environmentally friendly and resource-efficient production methods and consumption patterns. With awareness has come a willingness to act. The sense of urgency was underscored by the November 2012 report from the World Bank "Turn Down the Heat", in which researchers at the Potsdam Institute for Climate Impact

Research project a temperature increase up to 4°C by 2100, which would wreak human devastation due to extreme weather events such as widespread drought.[1]

Progressive corporate leaders have already come to similar conclusions, as indicated by recent initiatives from influential groups such as the World Business Council for Sustainable Development.[2] From the other direction, environmental activists increasingly realise that the path forward must include economic tools if they realistically hope to change the behaviour of producers and consumers. Mounting evidence of shortcomings in the conventional economic model, and the growing urgency of the need for new solutions, has brought about a new realism, new thinking and new scope for compromise.

A small but growing body of opinion – also within the business community – argues that the challenges facing the world are so dire that the growth model itself needs to be recast.[3] They reason that, facing a future of consolidation and retrenchment, the most important goal must be to salvage the gains that have been realised up to now. In this way of thinking, economic growth is by no means synonymous with development.

1.2 An economy designed to address today's challenges

Until the mid-20th century, economic development took place amid plentiful resources. The human population and scale of production were still limited in relation to natural capital. Under those conditions it did not seem to matter that development was based on a simplistic view of economic circular flows that did not account for depletion of natural resources, ecosystem services, or the negative effects of pollutants or waste.

[1] Potsdam Institute for Climate Impact Research, 2012.
[2] World Business Council for Sustainable Development, 2012.
[3] Santarius, 2012. For a perspective from business, see Borgeryd, 2012.

But since the Second World War the global population has tripled, while economic activity and utilisation of natural and finite resources has grown exponentially. This period, referred to by scientists as the 'Great Acceleration',[4] shows that the economic model we use to measure progress is far too limited to encompass the whole economy. It misses fundamental economic values and realities that lie outside of the traditional model's narrow view of economic flows, such as sourcing of natural resources and disposal of waste.[5]

There are signs that the world has reached a point where ever-growing demand for basic resources and ecosystem services can no longer be met by increasing supply. The changing demand-and-supply dynamics mark the end of the remarkable era of economic progress driven, in large measure, by resource affluence, particularly access to fossil fuels. Escalating interests in shale-gas exploration and deep-sea oil exploration, both requiring substantial capital commitments, are a strong indicator of this rapidly shifting situation.

As a consequence, humanity now faces fundamental challenges that are unfolding along two parallel but interlinking trajectories. Firstly, the ecosystem services that regulate the climate and ensure sufficient biodiversity are now so pressured that they can no longer function effectively.[6] Ailing ecosystems have a direct impact on livelihoods on local, regional and even global scales and deprive populations of basic resources like fresh water, food, clean air and a stable climate. With an expanding global population comes increased demand for food, particularly land- and water-intensive products such as meat and dairy as incomes rise. In the context of degrading ecosystems and water shortages, this creates food insecurity and volatile food prices, with consequences for human and political security.

Secondly, increasing pressures on physical resources – particularly fossil fuels – as well as renewable resources such as land and

[4] Steffen and Eliott, 2004.
[5] Eklund, 2011.
[6] Rockström et al., 2009.

water, are pushing commodity prices ever higher, causing instability in world markets. Volatile markets make for vulnerable economies. These developments impact global wealth and well-being, and the stability of the international financial system. The IMF has shown that stagnating oil extraction rates, combined with a rapidly growing energy demand from emerging economies, will lead to rising prices and volatility, with "non-linear" effects on the global economy.[7]

Many scientists argue that the world has entered a new geological epoch – the Anthropocene – shaped by human activity and defined by growing scarcities and mounting uncertainties.[8] These circumstances alter the global playing field, as nations and corporations adjust their strategies to meet future challenges.

At a time of systemic change that is affecting actor behaviour, tensions are growing as well. The complexity of multiple new challenges is ramping up risk levels throughout the world. Such tensions have potentially far-reaching consequences for economic and social stability, while also raising broader security concerns.[9] This theme – mounting global uncertainties and growing insecurities – is the main starting point and conceptual frame for this study.

This means that the case for a green economy goes far beyond environmentalism and is not primarily a matter of attending to a green agenda. More fundamentally, it implies a true understanding of a dramatically changed set of conditions – both already evident and foreseeable – for society as a whole as a vital first step toward forging workable solutions aimed at successfully adapting to them.

[7] International Monetary Fund, 2011.
[8] Economist, 2011.
[9] Hallding et al., 2012.

1.3 A green economy for Sweden?

Sweden is a small country with limited scope for affecting the global course or pulling global opinion its way. Sweden's best approach would appear to lie in anticipating future challenges, preparing for various eventualities and crises, and agreeing on flexible strategies that minimise any negative fallout while maximising emerging opportunities.

In an uncertain future, it is important that any set of policy options be able to pass a robustness test: they would need to be strong and flexible, and capable of retaining these qualities in the face of a broad range of possible developments. One virtue of the scenario format is that it offers a wide range of alternative future societies that are useful for testing how policies designed to forge a green economy might stand up to various situational pressures. This study lays out four different scenarios (expanded on in Chapter 2) as a means of assessing the robustness of green economy policy options.

While the concept of a 'green economy' is increasingly employed as a research and policy tool, it is important to note that there is not yet any universal agreement on what it entails. In the run-up to the Rio+20 Conference in 2012, a number of reports from international organisations and research institutes attempted to define the concept of a green economy. These reports emphasise different elements, and use disparate phrasing, although they ultimately agree on the basic need to safeguard livelihoods while limiting resource depletion and social exclusion.

Two examples of alternative formulations are those set out by the United Nations Environment Programme (UNEP) and the Organisation for Economic Cooperation and Development (OECD). UNEP defines a green economy as "one that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities. In its

simplest expression, a green economy can be thought of as one which is low-carbon, resource-efficient and socially inclusive".[10]

The OECD, by contrast, uses the term 'green growth', which refers to "fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our wellbeing relies. To do this it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities".[11] This latter definition prioritises (economic) efficiency, while the UNEP conception puts more emphasis on (social) efficacy. Both elements are necessarily a part of a broader package.

While the dual goals of being 'green' (environmental) and 'inclusive' (social) are both essential, seen in a policy perspective they are better regarded, this study argues, as separate though equally desirable and complementary goals. The starting point for this study has been to explore the viability of a green economy in meeting the challenges related to environmental constraints, changing ecosystems and growing resource competition. Consequently, the boundary conditions have been defined in terms of a Swedish economy that by 2050 is low-carbon (near-zero net emissions), resource-efficient (near-closed loops), and which maintains sustainable ecosystem productivity. Although social and 'inclusive' objectives have not been the main focus of this study, its consideration of a Swedish green economy strategy has identified social dimensions and requirements in relation to the various policy options discussed.

[10] United Nations Environment Programme, 2011, p. 16.
[11] Organisation for Economic Cooperation and Development, 2011, p. 9.

2

Using scenarios to plan for the future in an uncertain world

2 Using scenarios to plan for the future in an uncertain world

In general terms, scientific work is designed to tackle problems that are evident and observable. However, there is also a need for thinking applied to the future: to addressing long-term problems that did not arise yesterday and which will not be solved tomorrow. This is an important but sometimes delicate and tricky task. This chapter presents the approach that was utilised in this study, examining alternative futures by drawing up scenarios and testing possible policy responses against them. The following four scenarios were generated with the aim of representing different and contrasting global futures, while at the same time being plausible, relevant and challenging. The scenarios are expanded on in section 2.5 below.

1. *Glocal Citizenship* plots the advent of a mosaic of value-driven communities combining new measures of wellbeing and focus on local resource efficiencies.
2. *Global Governance* sketches the re-emergence of a new state-based global system in the wake of an acute global meltdown, charting a future of functioning global institutions but low economic growth.
3. *Return of Geopolitics* depicts the gradual development of a multi-polar world order with growing tensions and securitisation of commodities, leading to global inefficiencies, low overall growth prospects and mounting inequalities.

4. *Big Business* charts a growing role for business, particularly transnational corporations, in setting a global agenda characterised by strong corporate social responsibility (CSR), sustainability-driven supply chains, and considerable productivity gains.

2.1 What is a scenario?

The term 'scenario' is commonly used to depict possible future development, whether favourable or unfavourable. There is a range of different methodologies used in future studies, including a variety of scenario-based approaches that are commonly applied by analysts and government officials.[1] Future trajectories can be 'forecast' by applying assumptions for the development of key parameters to a mathematical model. Such work is typically carried out by economists, to assess possible macro-level outcomes of economic policy. Climate scientists use similar approaches to gauge the range of possible climatic impacts of human activity. Alternatively, the pathway to a certain desired future situation can be 'backcast' by reverse-testing the viability of different policy choices. This is usually the approach behind the development of 'roadmaps', such as the EU's "Roadmap for moving to a competitive low-carbon economy in 2050".[2]

The scenario-based approach used in this study takes a somewhat different starting point. The central task here is to explore the viability and robustness of a Swedish green economic policy, given a future characterised by growing uncertainties. The purpose of the scenario framework is to present a backdrop of alternative *global* narratives that can help formulate Swedish green economy policy choices. It lays out a set of futures, each of which is further shaped by a range of variables (drivers and meta-drivers); both of these elements are elaborated in subsequent sections below. It is important to understand the nature of

[1] Alm et al., 2012.
[2] European Commission, 2011.

the process – both its methodologies and its assumptions – in order to appreciate its applicability to the problem at hand, i.e. determining the most useful path toward a green economy.

This methodology draws on the well-known tradition that has the Royal Dutch/Shell group and, subsequently, the consultancy Global Business Network as its main centres of innovation.[3] An informative label sometimes attached to this school of thought is intuitive logics. This indicates the use of an intuitive but structured approach to devising a scenario framework for strategising, such that the scenarios represent alternative world logics, i.e. patterns for how society works.[4]

This study adapts intuitive logics by utilising a quantitative technique, scenario diversity analysis (SDA), to obtain a more intersubjectively measurable grasp on how well the scenario framework spans the range of feasible future developments. The basic thinking underlying SDA is that if actual future developments are a mixture of the scenarios, then policy strategies able to cope with the whole scenario set should also be effective in reality.[5]

The scenarios were drawn up to be plausible, relevant and challenging, as well as inherently different from one another. They should be challenging in the sense of being able to offer new perspectives. This means they should not be too close to the situation today, which implies striking a balance with plausibility (since sticking close to the current situation is the easiest way of maintaining plausibility).

The scenario development has not been guided by normative views, however any given scenario could be viewed as more or less positive, depending on the observer's perspective. Also, the positioning of each does not imply any sort of ranking or degree of importance. Nonetheless, there is a necessary element of realism involved, as well as a certain degree of trade-off. When done correctly, this allows valuable inferences to be drawn about

[3] See, for example, Schwartz, 1998; Global Business Network, 2012.
[4] Bradfield et al., 2005; van der Heijden, 2011; Wright & Cairns, 2011.
[5] Carlsen et al., 2012.

how effective green economic strategies might be across a range of futures.

The scenarios are not meant to portray the most probable future development trajectories: in fact, views on which trajectories are the most probable are often quite divergent. The point is rather that, taken as a set, the scenarios will span all likely futures, i.e. it will be possible to describe the actual future in terms of elements from several, or even all four scenarios. Designing policies to suit the four scenarios should then also provide scope to handle the 'intermediate' futures. To achieve this, scenarios should be somewhat 'extreme', yet they must also be plausible, in the sense of there being a credible path from here to there, and of the future states being internally consistent.

The scenarios were designed to be realistic enough to be plausible, wide enough to be inclusive, yet also holistic enough to be logically consistent. The boundaries between them, while distinct, are also somewhat porous: they are closer to fences than walls, not sealed off or iron-clad in a way that would turn them into mere artifices.

However, it is important to stress that the outcome of this exercise is not the elaboration of scenarios per se. The work aims ultimately at responding to the following focal question:

> Considering critical global trends, rising uncertainties and the widely acknowledged need for innovative new strategies, what mix of green economic policy options provides the most promising opportunities for Sweden in the coming half-century?

2.2 Overall process

The process applied in this project is based on a 'wind tunnel' approach. This is a way of testing the strength and flexibility of possible Swedish green economic policy options against a wide array of critical global trends, bundled into four scenarios. The study's overall work process was as follows.

1. **Identification of key drivers.** The first step was to identify a wide range of factors or global drivers that are likely to shape the world in the coming 40 years. At the Global Trends and Uncertainties workshop, a list of more than 150 such drivers was drawn up.[6] These were then analysed, prioritised and finally clustered into four meta-drivers. In addition, a separate, overarching meta-driver – a conceptual invariant – was also identified.
2. **Development of a scenario framework.** Next, the meta-drivers were scrutinised in order to generate a broad scenario framework. Each meta-driver was assigned a set of states. In order to develop a diverse set of scenario seeds, 'scaffolding' was created using scenario diversity analysis (SDA).[7] As SDA requires discrete states for the scenario variables, it was important that the essence of each meta-driver be clearly identifiable and explicit. The result from running the SDA model was then scrutinised anew, after which the scenario narratives were honed over several iterations through individual work and group workshops.
3. **Identifying policy options.** The next step in the process was the identification of policy options. To this end, the set of four scenarios was used in a workshop. One of the workshop's aims was to identify and develop policy options in order to achieve a green economy given a specific scenario. In this phase, the policies were developed from a single-scenario point of view.
4. **Testing policy choices for a green economy.** The viability of different policy choices for a green economy was discussed and analysed in relation to the futures portrayed in the scenarios. The robustness of various green economic policy options was tested across the scenarios by means of an

[6] The original brainstorming and clustering was done at the workshop on "Global Trends and Uncertainties", arranged by the Commission on the Future of Sweden on 4 June 2012. See Annex A.
[7] Carlsen et al., 2012.

iterative game. This approach generated a wide-ranging and objective picture of how various policy choices would play out under global development narratives. It also provided more specific suggestions for green economic policy design.

5. **Formulation of coherent policy choices**. This final step involved the evaluation of unique, or at least highly favourable, Swedish preconditions for implementing a 'no-regrets' green economic policy that is strong enough to withstand the buffeting and uncertainties of global development trajectories.

2.3 Development of meta-drivers

The overall set of approximately 150 drivers (listed in Annex B) was clustered, prioritised and re-clustered into a smaller set of four meta-drivers. Another element, which we labelled "Prevalence of discontinuities and tipping points", was assigned as a single, overarching thematic shaper of a common *problematique* and a starting point for all the scenarios. The specified meta-drivers – *Power structure, Modes of governance, Energy cost as a share of GDP* and *Ecosystem degradation* – were used to fill in the scenario framework and to guide the development of the four narratives at its heart. The basic characteristics of the meta-drivers are briefly described below.

Prevalence of discontinuities and tipping-points (overarching thematic invariant)

A single overall meta-driver, "Prevalence of discontinuities and tipping-points", was used as a common starting point for the scenario framework. The purpose was to signify the likelihood of ecological, financial and political discontinuities that together constitute a severe global crisis. Thus the onset period (up to 2020) is broadly characterised by worsening imbalances in the

global economy, frequent financial crises and further erosion of the UN-based global governance system's authority.

These imbalances are driven by a combination of the factors laid out in section 1.2 above. Rapidly growing populations and rapid development, particularly in the Third World, place further pressure on scarce resources and result in local and regional shortages. Escalating commodity prices generate huge global financial flows and transfers of economic wealth. In turn, economic and population pressures become so great that vital ecosystems cannot provide fundamental services such as climate regulation. Even some localised ecosystem failures ultimately have much wider, global repercussions.

Against this basic common pattern, the four scenarios differ considerably in the timing and speed with which these various crises and discontinuities play out. Likewise, the scale of decisive tipping-points anticipated by each one also varies. The meta-drivers, which are expanded on below, were used to shape the scenario framework and to guide the development of the four narratives.

Power structure

The first meta-driver, *power structure*, denotes how power is distributed within a societal framework: the degree to which it is concentrated or diffused among political units (i.e. branches of government) and social units, such as ethnic or interest groups. The power structure is a crucial determinant of how any society operates. It determines how societal goods are distributed, and the degree of inclusivity in making such determinations, and thus the extent of involvement of individuals and collective entities in decision-making processes.

In 'classical' international relations thinking, questions of power structure revolved solely around the role of central governments within a decentralised world environment based on the primacy of nation states, interacting mainly through trade or

bilateral diplomacy. Governments were traditionally the sole repositories of authority and coercive force in a world of autonomous and independent states. The creation of incipient world systems after 1918 (the League of Nations) and after 1945 (the United Nations) introduced new elements into the mix: interstate collaboration, institutionalised global diplomacy and collective security, which began chipping away at the primacy of the nation state without fundamentally challenging it, much less replacing it. Other post-war actors also began staking their claim to influence, from multinational corporations to regional bodies and transnational groupings.

The power structure meta-driver thus focuses on the global system of authority and influence. For the purpose of the SDA analysis it has been moulded into four descriptive states that are unique for each of the scenarios depicting global developments. Close networks of non-state actors define Scenario 1, Glocal Citizenship, with initiative flowing mainly from local and regional levels that have development, not necessarily growth, as the main political objectiveScenario 2, Global Governance, posits the re-emergence of a functioning interstate governance system, one of the main purposes being to address global commons dilemmas including global warming. Scenario 3, Return of Geopolitics, is defined by gradual compartmentalisation, whereby power is wielded within an asymmetric multi-polar structure and security is the prime political objective. Scenario 4, Big Business, envisions a power structure dictated primarily by the long-term interests of large corporations.

Modes of governance

The second meta-driver encompasses the *modes of governance* that help determine how societies adapt to change. It is a complex feature of the model that plays out quite differently across the four scenarios. For the purpose of running the SDA model, the driver was simplified into two explicit forms: a *bottom-up* approach

deriving primarily from individuals and values, and a *top-down* approach focusing on norms and institutions. Scenario 1, Glocal Citizenship, outlines a values-based, people-oriented world development that is guided by bottom-up initiatives.

The other three scenarios reflect strong normative influences. Different institutions play a central role in providing top-down governance: in Scenario 2 (Global Governance) it is elected and unelected politicians, in Scenario 3 (Return of Geopolitics) it is the security establishment, and in Scenario 4 (Big Business) it is transnational corporations. Given that the various factors that actually determine the mode of governance cannot be fully encompassed by this rather crude characterisation of top-down versus bottom-up, two other governance factors have been used to propel the scenario narratives: *key actors* and *mechanism of governance.*

The question of key actors is central to the debate[8] because the range of involvement in setting national agendas has broadened to include non-state actors (NGOs, local or regional bodies, interest groups, corporations and international organisations). This expanded gamut of involved parties has collectively shifted the political science usage from state-centric and public models based narrowly on 'government' to societal approaches bound up in the broader term 'governance', where other actors, including the private sector, assert their influence through networks.[9]

The level of governance relates to types of coordination and interaction, a complex interplay known as 'multi-level governance'.[10] While interaction between 'levels' of government can be a self-evident feature of policy-making processes, the extent to which meaningful impacts occur is far from clear. Even in the EU, the most developed and complex multi-level system, the impact of EU institutions on national governments is an open

[8] Eising & Kohler-Koch, 2004.
[9] Peters, 2005.
[10] Hooghe & Marks, 2003.

question.[11] Applied to the study scenarios, the first (Glocal Citizenship) puts the emphasis on local and regional levels, the second and fourth (Global Governance and Big Business) on the global level, and the third (Return of Geopolitics) on the national state.

Mechanisms of governance range between four types: regulatory, market, normative and cognitive.[12] Regulatory mechanisms work through coercion and hierarchical control, via prohibitions, regulations and the like. Market mechanisms, such as subsidies and tax incentives, are designed to modify economic behaviour. Cognitive mechanisms involve consensual interactions and knowledge, not just about solutions but about how problems are framed,[13] and involve policy mechanisms such as support for research and development and public-private partnerships. Finally, normative mechanisms relate to values and beliefs about what is good or right (preferences), and involve organisational processes alongside officially stated strategies or goals.

Debate persists over how far shifts have occurred, with some arguing that regulatory approaches have lost ground to those emphasising consensus or voluntary compliance,[14] especially in the past 20 years. Yet there is still plenty of evidence, both scholarly and anecdotal, that old-style elements of regulation, taxation and other forms of 'soft' coercion continue to dominate in many policy areas, with wider societal involvement limited mainly to the earlier stages of inputs and policy-shaping rather than policy-making.

In the four scenarios there is also some mixing and blending. Generally, though, Scenario 1 (Glocal Citizenship) emphasises cognitive and normative mechanisms, 2 and 3 (Global Governance, Return of Geopolitics) hierarchical mechanisms and 4 (Big Business) market-based mechanisms.

[11] Jordan & Schout, 2006; Knill & Lenschow, 2005.
[12] March & Olsen, 1989; Scott, 2000.
[13] Fischer & Forester, 1993.
[14] Treib et al., 2007.

Energy cost as a share of GDP

A fundamental condition for societal development is a readily accessible supply of energy. Energy prices are crucial determinants of economic strength and inflation levels. To put it another way, the potential for economic growth hinges largely on the energy resources available. As such, the total cost of providing energy for a society has a major impact on overall economic performance, making this third meta-driver, *energy cost as a share of GDP*, a powerful indicator. The bigger the share of economic activity that is spent on providing energy, the less that is available for other economic goods.

One well-known indicator, energy return on investment (EROI), is a ratio of overall energy used to keep energy supply up to the energy actually available for the final energy user.[15] The further away it is, the lower the quality of the energy carrier, and the more work it takes to exploit, process and bring the energy to the final user, the lower the EROI and thus energy prices – which, all in all, will make it increasingly difficult to keep up economic growth at previously high levels.

Most experts concur that global society has benefited hugely from the availability of cheap fossil energy. Leading industrial powers typically spend less than 10 per cent of their GDP on providing energy. In the United States, the largest consumer, figures drawn up by the Energy Information Administration calculated the overall percentage for 2006 at 8.8 per cent and historically it stands at about 8 per cent, although it hit nearly 14 per cent after the 1973 oil crisis.[16] In Sweden, total energy consumption increased from 1800 to 1980 in line with growth, after which energy consumption lagged behind growth[17] – a sign of a maturing economy.

It is likely, however, that the total cost of providing energy in the future will rise, because of either tighter regulation or scarcity and

[15] Gupta & Hall, 2011.
[16] U.S. Energy Information Administration, 2011.
[17] Kander, 2002.

insecurity, thereby reducing economic growth potential. For the SDA model, two contingent states were established, high and low, with scenarios 1 and 4 (Glocal Citizenship and Big Business) having low energy cost share of GDP, and scenarios 2 and 3 (Global Governance and Return of Geopolitics) having relatively higher ratios due to tighter regulation and a race for resources respectively.

Ecosystem degradation

The fourth and final meta-driver, denoted as *ecosystem degradation*, describes key interlinkages between social and ecological systems.[18] It encompasses both the impact of human activity on the environment and the resulting feedback dynamic, in which damage to natural resources (e.g. food, fuel, fibre and biodiversity) and to services (climate, soil, air and water regulation) can have direct impact on economic growth and development.[19] Other processes also clearly link to ecosystem functioning, such as land-use change and global freshwater use. Based on the concept of 'planetary boundaries', three bio-geophysical elements – climate change, excessive nutrient loading and biodiversity loss – play an especially crucial role in this meta-driver, and already exceed sustainable levels.[20] All of these factors impede development: in the extreme, ecosystem degradation places an absolute limit on human activity.

For the purpose of SDA, ecosystem degradation has been characterised in terms of three qualitative states: low, intermediate and high levels of degradation. These levels or states refer both to progressively worse conditions in nature and to progressively greater impacts (via feedbacks) on the planet's ability to provide ecosystem products and services. However, these changing conditions and feedbacks can be more or less

[18] Berkes et al., 2003.
[19] Millennium Ecosystem Assessment, 2005.
[20] Rockström et al., 2009.

mediated, and thus have a greater or lesser impact (social, economic, political) on our societies.

In low-level ecosystem degradation, the impacts and feedbacks are mainly local, e.g. land-use change leads to degradation of previously productive agricultural land, or locally worsening climate impacts negatively on farmers or fishermen.[21] Overall, conditions are actually stable, balanced by mitigating factors such as better resource management or successful efforts to curb emissions. Intermediate degradation involves whole regions or sub-continents being affected. Factors such as lower fresh water availability due to greater withdrawal rates or climate change, or regional crop failures, can affect hundreds of millions of people.[22] Large regions of land and water become degraded by grazing, overfishing, erosion and oceanic acidification. The results are unevenly distributed such that, despite extensive damage generally, some regions may actually emerge better off than before.

At high levels of ecosystem degradation, the effects are both global and severe. Key thresholds are exceeded and ecosystems lose their capacity to generate products and services. Human impacts are widespread, yet overall impacts are unknown or impossible to measure. Coastal zones are threatened, fisheries collapse, mass extinctions of species may occur and entire populations are forced to move, resulting in overall declines in global quality of life. Even so, ecosystem degradation has highly variable spatial impact, with some societies much better able to adapt than others. Still other factors, such as chemical pollution and atmospheric aerosol loading, can cause unexpected breaches in thresholds regionally.[23]

The three states of ecosystem degradation relate to three different scales of degradation: global, transboundary and local. Global ecosystems include the climate system and oceans. Transboundary effects include regional air pollution, desertification, widespread habitat destruction or biodiversity collapse, whereas

[21] IPCC, 2007a.
[22] IPCC, 2007a.
[23] Rockström et al., 2009.

local degradation encompasses water scarcity, local pollution and environmental impacts that affect food security and biodiversity. All scales are vulnerable to feedbacks and tipping points at which irreversible change occurs.

As with the complex meta-drivers, ecosystem degradation takes different forms across the four scenarios. In Scenario 1 (Glocal Citizenship) ecosystem degradation is intermediate, with high levels of productivity counterbalanced by a society that internalises values other than economic growth. Scenario 2, Global Governance, envisions low ecosystem degradation. This is an aggregate effect of a very limited growth of global economic activity on the one hand, and ambitious climate and environmental policies that evolve world-wide through a new global governance system on the other.

Scenario 3 (Return of Geopolitics) outlines a future of modest economic activity coupled with generally low productivity gains, again producing intermediate degradation, reaching high degradation in the last decades, and then hampering growth. Scenario 4, Big Business, describes a high-growth future defined by very high productivity gains, true sustainability-oriented CSR systems, and a partial agreement aimed at limiting global greenhouse gas emissions. This combination is seen to maintain an intermediate level of ecosystem degradation, at least through the first decades of the scenario. Toward the latter end of the period, however, aggregate pressure from economic activity pushes ecosystem degradation towards high levels.

Climate change is a particularly important element of ecosystem degradation. Given the timescales of the scenarios, which extend until 2050, and due to inertia within the global climate system, historical emissions dictate the range of climate change expected up until around 2040.[24] This means that climate change projections are more or less the same in each scenario, although uncertainty implies that there is a potentially wide

[24] It takes over 30 years for greenhouse gas emissions to affect global temperature. See also IPCC 2007b.

range of possible outcomes. Within this range there is a roughly equal chance of severe impacts right across the scenario set. Hence, Scenario 2 (Global Governance) is partially triggered by a series of extreme weather events and prolonged drought before 2020, although the same climate phenomena are equally likely to occur in other scenarios.

Some developments, for example the widespread usage of renewable energy or the continued exploitation of fossil fuels and new shale gas developments, would significantly influence emissions trajectories *within the scenario* and therefore have profound effects on the *future* climate pathway *beyond 2050* (and to some extent on the climate conditions during the final decade or so of the scenarios, which are likely to diverge significantly). Degradation of the global climate system therefore remains a crucially important differentiating factor within the scenario analysis. Overall, negative ecological feedbacks are expected to dampen economic growth rates in most of the scenarios.

2.4 The 'Kaya identity' and economic growth assumptions

The 'Kaya identity' is an equation relating factors that determine the level of human impact on climate, in the form of carbon dioxide emissions. It states that total emission level can be expressed as the product of four factors: population, GDP per capita, energy use per unit of GDP and carbon emissions per unit of energy consumed.[25] A Kaya-based set of headline indicators was developed to define and delineate the scenarios, illustrate how the narratives unfold over time, and to ensure consistency of the scenario set. The headline indicators for each scenario are presented in the scenario descriptions below.

[25] The Kaya identity express the level of CO_2 emissions as a product of four factors: $CO_2 = P * GDP/P * E/GDP * CO_2/E$ (population, GDP per capita, energy use per unit of GDP, carbon emissions per unit of energy consumed). See Kaya, 1990.

As GDP growth is a key Kaya parameter, it is important to discuss why the GDP growth assumptions used in this study are generally lower than those presented by leading international institutions.[26]

Table 1: Real annual GDP growth in percentage terms per decade in the four scenarios

Decade	Scenario 1 Glocal Citizenship	Scenario 2 Global Governance	Scenario 3 Return of Geopolitics	Scenario 4 Big Business
Trend	Shrinking	Low but steady	Shrinking	Shrinking
2010–2020	1.5	-0.5	2.0	1.5
2020–2030	1.8	1.3	2.0	3.0
2030–2040	1.5	1.1	1.3	2.5
2040–2050	0.8	1.1	0.5	1.0
Comment	GDP no longer the primary goal for people/politics	Financial collapse in the decade 2010–20	Population growth key element	Harmed by environmental feedbacks

Many other economic projections floating around (for instance from the IMF, OECD and IEA) have higher global economic growth figures. There are several reasons why the figures presented above are somewhat lower.

Firstly, the starting points for the projections in this study are different from the ones developed by most other institutions. The four scenarios in this report are constructed around future challenges which all herald negative economic growth impacts. As these challenges play a role in the scenario narratives, this will naturally affect future growth prospects.

Secondly, the energy prices (energy cost share of GDP) are higher in this study's scenarios – especially in scenarios 2 and 3, Global Governance and Return of Geopolitics – than is assumed by most other extant studies. Model simulations by the IMF to

[26] See for example Johansson et al., 2006; International Energy Agency, 2012, p. 37.

explore the effects of a greater economic role for oil than its current cost share nonetheless show a considerable deterioration of growth potential in all regions.[27]

Thirdly, this study assumes that the main actors who shape societal development prioritise political objectives other than economic growth in all scenarios except for Scenario 4 (Big Business). In Scenario 1 (Glocal Citizenship) this means local development and cooperative solutions rather than market-bought goods, in Scenario 2 (Global Governance) it means combating climate change, and in Scenario 3 (Return of Geopolitics) it means geopolitical power and security. These differences in political priorities, and how they affect resource use, show up in the economic growth figures.

Fourthly, ecosystem degradation, as was recently highlighted by the World Bank in its report "Turn Down the Heat", cited earlier, is assumed to cause negative feedback mechanisms to kick in at different times and with different strengths, depending on how successfully greenhouse gas emissions are curbed and ecosystems and global commons managed. Outlook reports from institutions such as the IMF, OECD and IEA do not normally factor in possible effects of ecosystem degradation.

Finally, one reason why accumulated growth up to 2050 is projected to be higher in other studies is that the present study starts off with 2012, and assumes global economic turbulence that, in the four scenarios, will make the period up to 2020 more or less a lost decade from an economic growth perspective, especially in Scenario 2 (Global Governance).

The modest *overall* growth rates combined with considerable global inequities imply that large parts of the world are, effectively, set for a close to zero-growth outlook during all or parts of the scenario period. An educated guess is that less developed regions, if managed well, will have above-average 'catch-up' growth figures while rich industrial countries will have lower than average growth. This assumption factors in a tendency for

[27] International Monetary Fund, 2011.

production to move to low-cost regions and regions with the highest population and per capita growth, which recently have been in developing countries.

2.5 Scenario descriptions

The scenario narratives are written as reflections on global developments seen from a 2050 vantage point. Table 2 below summarises the triggers of the scenarios during the onset period up to 2020, and the states assigned for each of the meta-drivers that were used in the SDA analysis and to guide the development of the narratives.

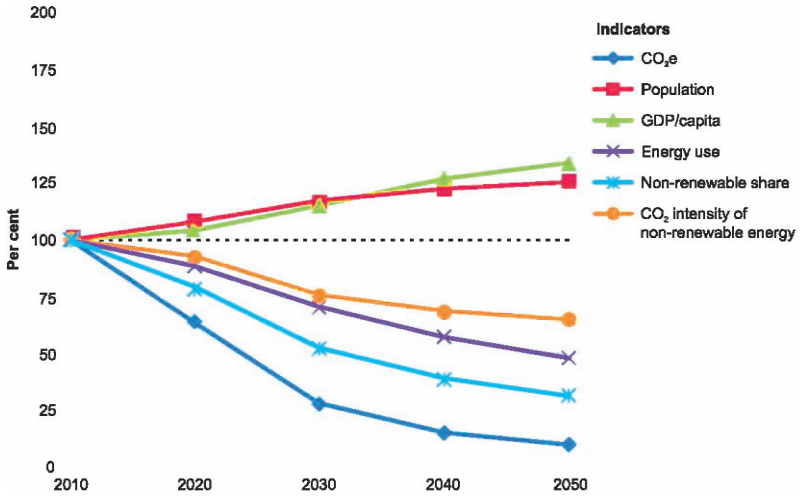
Table 2: Summary of states assigned to meta-drivers to drive the scenarios

Meta-driver	Scenario 1 Glocal Citizenship	Scenario 2 Global Governance	Scenario 3 Return of Geopolitics	Scenario 4 Big Business
Onset period up to 2020	Mounting imbalances and economic crisis. Local ecosystem collapses	Total financial breakdown and deep recession. Large-scale climate-triggered food crisis	Growing global financial imbalances. Sharpening competition for resources	Economic volatility and the debt crisis. Erosion of nation state-based global system
Power structure	Networks of non-state actors focusing on wellbeing	Re-emergence of functioning global governance to protect global common goods	Compartmentalisation into security-driven asymmetric multi-polar structure	Hierarchical networks of transnational, second-tier and smaller-scale business
Modes of governance	Bottom-up: Values-based, people-oriented	Top-down: Politicians (elected and unelected)	Top-down: Security establishment	Top-down: Trans-national corporations
Energy cost share of GDP	Low, driven by efficiency	High, driven by regulation	High, driven by race for resources	Low, driven by productivity
Ecosystem degradation	Intermediate: High productivity in a society that internalises values other than economic growth	Low: Slow growth in economic activity in combination with successful management of global commons	Intermediate moving to high: Sluggish economic activity but inefficient energy systems and low productivity	Intermediate moving to high: GDP growth mediated by high productivity and 'green' CSR

Scenario 1: Glocal Citizenship

This first scenario, Glocal Citizenship, posits a value-based development driven by networks of non-state actors. The scenario charts a low-growth trajectory of traditional wealth measurements, a crucial assumption being that new 'beyond- GDP' metrics have taken hold and are increasingly preferred as indicators of progress and wellbeing.

Figure 1 **Change in percentage terms for six indicators under Scenario 1 from 2010 to 2050**



Mounting global financial imbalances during the 2010s manifested in a rolling economic crisis and a series of deep and damaging recessions afflicting much of the world economy. Gradually but inexorably, the dominant global and national governance structures, particularly the nation state and the world market, lost legitimacy as did the UN-centred international system. Concern over the increasing precariousness of ecosystems spread rapidly. The actual collapse of some eco-

systems caused severe damage that spilled over into many local economies.

Popular concern and anger over this multi-systemic breakdown spawned a mosaic of new value-driven communities. The emerging mega-cities became natural hubs for these new expressions, but regions with less dense populations also came to play an important role in providing alternatives. These networks worked in close interaction with locally based social and business entrepreneurs, while also fully exploiting the potential for global networking provided by modern information and communication technologies (ICTs). Vibrant expressions of these new forms of socio-economic connectivity emerged all over the world, but the main wave of change came from emerging economy communities – not least from their growing and increasingly influential mega-cities. Being more reliant on commodities and harder hit by price gyrations, these communities were forced to think anew about their development strategies. Rising energy costs everywhere kept growth subdued.

Many private sector elements saw value-driven change as an opportunity. Consequently, new models of economic life such as cooperatives, non-profits and sustainability-minded businesses emerged in force. A substantial body of opinion became dedicated to notions of 'happy degrowth' and advocated the abandonment of GDP indicators. Notions of brand loyalty took on fresh meaning as companies began to reflect the values of consumers. Ethical forms of investment and new types of consumer-led ownership took hold. These supported the development of sustainable businesses and innovations, aimed at providing creative solutions to seemingly intractable energy and environmental problems. Ambitions for these new community-based approaches even extended to highly valuable systems solutions to tie networks together, including ICT, smart power grids and high-speed rail systems.

Traditional top-down public policy – both globally and within Europe – was eroded in the face of a resurgence of value-driven communities, their networks and *ad hoc* coalitions. Severe

crisis and mountainous public debt shook faith in active government, leading to tentative approaches and reactive policies. Governments were forced to concentrate on catching up through legislation and regulation as well as positive incentives. As an example, stricter regulations on CO_2 emissions were introduced in response to public demand to reward those leading the transitional charge and were not viewed as punitive policies.

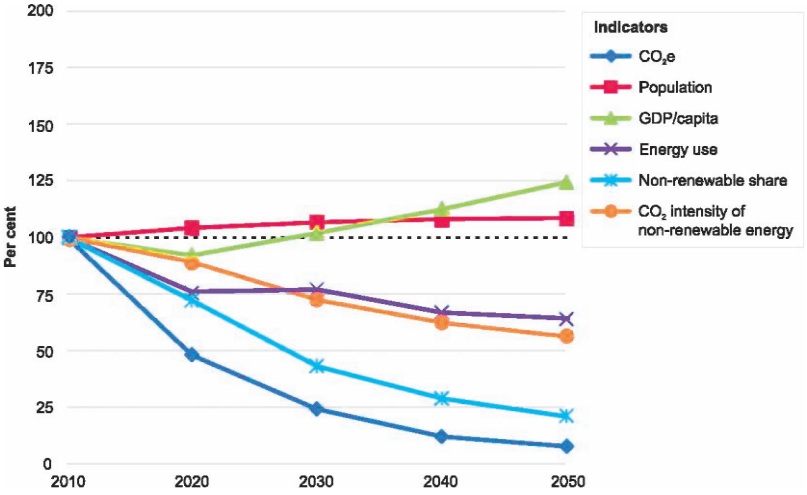
Energy emerged as a vital area of socio-economic innovation, largely driven by efficiency improvements in utilising local and renewable energy sources, while material consumption lost appeal in favour of value-oriented personal services. One consequence was a considerable downshift of the energy-per-GDP curve. This shift enabled significant improvements in wellbeing, which was given a new 'beyond-GDP' definition refined to better encompass elements of economic performance beyond gross output. As a consequence a new, more quality-oriented measure of wellbeing was decoupled from the old notion of GDP growth.

And yet, a world dominated by value-driven communities and coalitions proved less than effective at crisis management, or as an engine for achieving an equitable distribution of wealth. Nor were governments able to address continued ecosystem degradation that, while less obvious to non-experts than the headline subject of climate change, was still deeply damaging, particularly at local and regional levels.

Scenario 2: Global Governance

The second scenario, Global Governance, describes the re-emergence of a functioning nation state-based global governance system following a major financial crash before 2020. Protection of global common goods becomes a central focal point for development, partly at the cost of economic activity as compared with present levels.

Figure 2 Change in percentage terms for six indicators under Scenario 2 from 2010 to 2050



The fiscal imbalances and debt crises during the early 2010s spiralled into a bona fide global financial meltdown. The crash was accentuated by a series of extreme weather events that resulted in lost harvests, bringing skyrocketing agricultural commodity prices and food shortages. Global and regional trade collapsed and caused wider breakdowns in social cohesion. A global recovery effort, initiated by a group of influential leaders from both South and North, marked the first steps towards a new global governance arrangement in which the North Atlantic region – after a tense and uncertain period of adjustment – no longer dominated. The new global governance system managed to stabilise developments and enabled better management of global commons under principles of fairness and equitable burden-sharing among states.

Global businesses were markedly weakened by the crisis, and the re-establishment of an effective state-based governance system provided governments with the upper hand in relation to transnational corporations. Nonetheless, business interests generally

supported the new global governance system, since it recreated the conditions necessary for managed trade, bringing about stability while reducing uncertainty.

The world order that emerged proved pragmatic, less hierarchical, and equally open to democratic and undemocratic states, as long as they accepted the rules of the game. The striking successes of some authoritarian regimes, measured in terms of wealth and influence, weakened the attractiveness and influence of democracy to many states and peoples in transition.

The strengthened position of several of the former emerging economies had a levelling effect on the global economy, as the most interconnected and previously prosperous countries were also those hardest hit by the prolonged financial slowdown. This 'reset' of global governance brought new institutions that worked, via greater interstate cooperation, to reduce global inequalities. While these bodies helped prevent an abrupt widening of the gap between 'have' and 'have-not' countries, intra-state inequality remained high in many places. International conflict became less frequent, less intense, and susceptible to effective management by a new constellation of collective power arrangements. While economically and politically weakened, EU integration deepened and the union managed to continue pushing for democracy and civil rights.

Successful regulation to protect global commons promoted advances in technology and improvements in energy use, and kept transboundary and global ecosystems reasonably well protected. However, post-crisis growth remained sluggish, with trade flourishing mainly on a regional basis, amid falling living standards in the Global North. Intra-state inequality remained high in many places, and some states acted with force to suppress internal discontent and stifle political protest – at the direct expense of democratic expression.

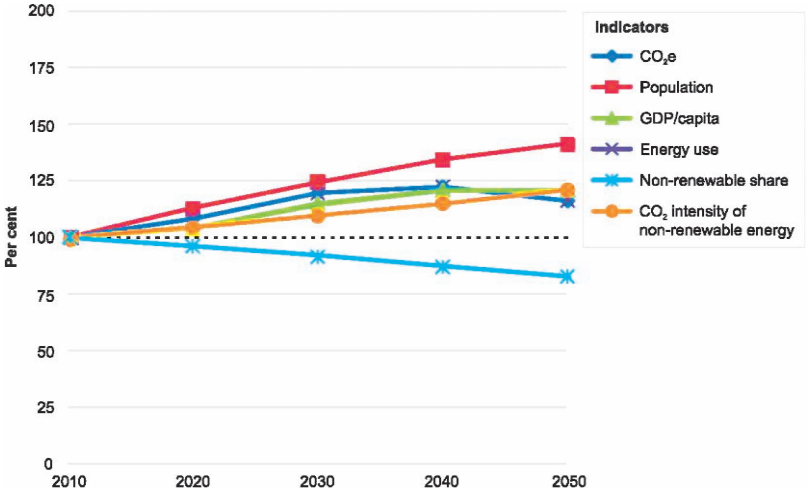
After a promising early start, the new global institutions proved slow to change, being hampered by the need to proceed carefully on the basis of uneasy consensus, and by structural weaknesses stemming from the rushed negotiations to restore

stability during the crisis. Unexpected events, such as sudden scarcities of badly needed resources, led to occasional flash points that the rearranged but still state-dominated system remained ill equipped to handle.

Scenario 3: Return of Geopolitics

The third scenario, Return of Geopolitics, envisions a world breaking up into a security-driven, asymmetric multi-polar structure. The inefficiencies that stem from compartmentalisation and securitisation imply low productivity gains and sluggish overall levels of growth in a markedly inequitable world, with some areas suffering drops in output and others flourishing.

Figure 3 **Change in percentage terms for six indicators under Scenario 3 from 2010 to 2050**



The persistent global financial imbalances of the 2010s were aggravated by intensifying competition for remaining resource stocks, turning resource-rich hot spots, mainly in Africa, the

Arctic and Central Asia, into flashpoints of acute geopolitical tensions. With its Cold War heritage, the UN-based system proved unable to negotiate solutions that could ease tensions, and a new bloc pattern of old and new nation-state powers emerged, precipitating a world driven largely by *Realpolitik*.[28]

In contrast to the Cold War, however, the situation did not cement a bipolar bloc structure but led to a multi-polar world order, dominated by a handful of powerful nation states. Smaller states competed for advantages by seeking alliances with the pre-eminent powers.

As globalisation gave way to a compartmentalised and heavily securitised situation, the world economy lost the force of global comparative advantages as a driver of productivity, ideas and innovation. Consequently the global economy developed in a skewed fashion, with living standards varying widely between different groups of countries – as well as within most national settings. Large swathes of the world became incapable of sustaining a reasonable quality of life.

National regulations and policies became the prime determinant of technology markets. Countries invested heavily in strategic technologies (particularly energy, including nuclear power, nanotechnology and ICT), often motivated by military and security considerations. The severe impacts of climate change turned geo-engineering – that is, technologies aiming at changing the Earth's climate – into a vital technology field.

The role of the EU as an international player weakened continuously, driven by an inability to deepen cooperation on either external relations or financial policy. Indeed, the rift between northern and southern Europe widened after some members were forced to leave the euro zone. While the traditional Franco-German duopoly remained intact, many European countries acted opportunistically on the international scene, eager to join forces with other global players at the expense of

[28] Politics or diplomacy based primarily on power and on practical and material factors and considerations, rather than ideological notions or moralistic or ethical premises.

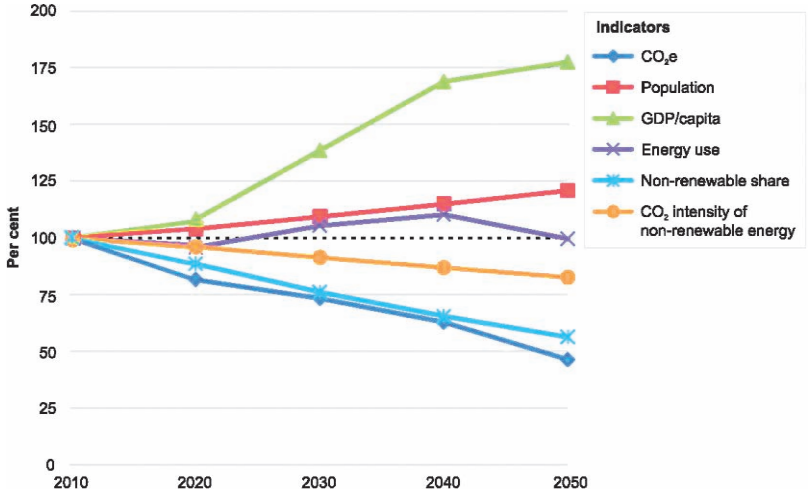
regional unity. Sustainability agendas everywhere took a back seat to bread-and-butter survival issues.

The sluggish overall level of economic activity had the positive side effect of easing some of the worst pressures on ecosystems. Even so, the lack of productivity gains and a continued use of out-dated and excessively polluting systems of production caused further damage to many local and regional environments. Fossil fuels continued to dominate the global energy mix (including growing attention to exploiting shale-gas and other non-conventional fossil energy deposits), setting the world on a path of unchecked global warming towards the end of the scenario period.

Scenario 4: Big Business

The fourth scenario, Big Business, plots a future in which the nation state-based global system is gradually replaced by corporate networks. Strong productivity gains generate considerably higher and more stable economic growth up to 2040 than the other scenarios. Businesses' successful promotion of sustainable production and consumption practices and thorough application of CSR mediates ecosystem destruction, but toward the end of the scenario period the overall volume increase in economic activity takes its toll in terms of ailing ecosystem services causing slowing growth.

Figure 4 Change in percentage terms for six indicators under Scenario 4 from 2010 to 2050



As economic volatility and the debt crisis deepened through the 2010s, the global system eroded as nation states failed to find agreement on practical ways to tackle the multitude of pressing economic and environmental challenges. This trend was emphasised by growing American scepticism towards international collaboration, particularly within the UN context, and underpinned by North America having become self-sufficient in energy supply, mainly due to the shale gas revolution and shrewdly targeted investment in renewables and 'clean tech'.

The heavily indebted US federal government came to rely increasingly on outsourcing essential services and a hands-off approach that enabled widespread business self-regulation. The growing inertia of the nation state-based global system helped to turn the new American ultra-slim government model into a *de facto* standard across the world. This was particularly the case in international contexts where business had a strong interest in

connecting the world in order to unlock growth potentials, and in circumstances where states had been unable to act.

Global developments were increasingly dominated by business alliances led by forceful and influential business leaders who were able to impose their corporate-driven values and norms on society at large. These were not, however, the narrow, coldly calculated profit motives of old, or new-fangled versions of 19th century robber barons. Instead, the most successful global corporations became those that saw sustainability and CSR not as hindrances to future profits, but as part of their core business strategies. Along with shifts in attitude came greater willingness to act collectively and through supply chains, in order to address pressing social questions. These methods included new transboundary trading schemes for carbon, biodiversity offsetting mechanisms and habitat banking.

In many developing and (once) emerging economies, the state was organised around powerful government-owned corporations. These developed a *modus operandi* akin to private-sector multinationals. Giant corporations, both private and government-owned, became increasingly key players on the global scene. But behind these corporate monoliths lay a phalanx of smaller, more nimble companies. These provided essential services, competing for auxiliary business and developing niche operations while also being better positioned to run a tight ship.

In the Global North, prevailing neoliberal policies underscored a strong collective belief in the market. Private enterprises increasingly operated even core societal services, such as hospitals, education and policing, which were long operated by welfare state organs. European integration deepened further, reinvigorating the EU's market liberalisation policies and tightening its single internal market. EU competition authorities gave considerable leeway to major cross-European businesses, which took advantage of economies of scale to secure a dominant position in various markets and services, including welfare, infrastructure, banking and manufacturing.

On the whole, development was driven by business logic and by what made sense in terms of the marketplace. This mind-set generated strong efficiency and productivity gains, and allowed the energy cost share of GDP to remain relatively low. At the same time, the world was increasingly divided, not just along old North-South lines but also within states, due to growing inequalities. Weaker states and marginal regions had to fight for a share of business.

Although CSR and corporate sustainability goals had become core strategies for most companies, growing aggregate pressures on ecosystems and limited resources, coupled with rising social tensions, made it increasingly difficult to sustain growth rates in the long term. By the early 2040s, the growing pressures from high levels of trade and economic activity had led to the transgression of critical ecological thresholds, causing feedbacks that began to severely impede economic development. This in turn magnified regional and local inequalities and spawned conflicts that became more intense and influential during the 2040s.

3

Opportunities and threats for Sweden in an uncertain future

3 Opportunities and threats for Sweden in an uncertain future

This chapter discusses key challenges that each of the four global scenarios poses for Sweden's case in particular. For while the need to adapt to far-reaching global change is immense, Sweden also has clear strengths to build on in terms of domestic policy, international standing and capacity for adopting technologies to serve societal interests. A key concern here, elaborated further in Chapter 4, is the extent to which Sweden would best benefit from jumping to the forefront of green economic development, or by being a nimble responder.

The analysis of opportunities and threats for Sweden is based on specific issues and concerns that were brought up and debated during the second workshop focusing on Swedish options, which was held by the Commission on the Future of Sweden on 9–10 September 2012. The chapter begins with four sections that reflect deliberations relating to each of the scenarios, with items stemming directly from the workshop italicised in the text for emphasis. The final section draws up a synthesis of common features across the scenario challenges, as well as highlighting differences that arise.

3.1 Scenario 1: Glocal Citizenship

A marginal role for government

The first scenario (Glocal Citizenship) describes a world in which coercive measures are less effective than today. Citizens increasingly demand the right to choose their green path, either individually or with the help of values-based and like-minded communities. Such a world would pose a number of special challenges. First and foremost is the task of *setting coherent policy*. A one-size-fits-all strategy is increasingly hard to come by, given that various societal sub-groups express differing needs. A second problem is the continuing *need for a tax-based welfare system.* Even societies that are ostensibly built on community values would not necessarily attend to the needs of marginal or socially excluded groups without specific laws and policies designed to do so, which is at odds with the bottom-up nature of governance in this scenario.

A related challenge is the risk of *greater illegal immigration* to Sweden, as job-seekers offer their services in a new and lucrative service-based economy, but may be unable to enjoy the benefits of living in a rich country. A final issue relating to the newly truncated role of government concerns the system's *political feasibility*; that is, whether societies based heavily on community networks could still reach voters and sustain a genuine element of collective citizenship. When good governance relies on the initiative or active support of issue-oriented coalitions, the *risk of corruption*, or at least of legislatures that are susceptible to open-ended and aggressive lobbying, is likely to increase.

The mosaic global arena

Sweden, while a clearly defined nation state, is also heavily involved in processes of regionalisation, a trend that picked up speed following its entry into the European Union in 1995. At

the sub-national level, the regions of Öresund and Västra Götaland have seen their profiles grow, as have other such areas elsewhere in Europe. A shift towards value-based communities and a mosaic-like international society could open opportunities for Sweden to help guide this shifting constellation, building on recent developments.

Sweden's position and status in the international system, and its ability to act as a *magnet or role model*, also depends greatly on the *development of the EU*. Should a strong core of Germany and France persist, the possibilities for Sweden to stand out are limited. However, were the EU to weaken or fragment politically, this could open new opportunities for cooperation, for instance at Nordic level. Sweden is well placed to build bridges and consolidate networks, especially if the community-based system turns out to mask a widespread reality of *isolated enclaves*, xenophobia and images of 'outsiders' as more enemy than friend.

Shifting economic preconditions

Sweden has an *export-based economy*, which is reliant on world trade and free flows of goods, services and ideas. Still, it is not easy to determine the country's comparative advantage in this scenario. The important iron and steel industry might see its role diminish in a dematerialised world, raising the question of *what to actually export* in the future. An opportunity might lie in promoting Sweden as an *exporter of large-scale system solutions* rather than small 'green tech' enterprises. This presents a challenge, namely putting in place the necessary infrastructure in order to position Sweden in this new market situation. Investments in big-ticket items such as smart grids and transport systems are not possible unless they accompany efforts to coordinate and prioritise. These two facilitating functions are still best fulfilled by the government. In this scenario, however, government will have limited coercive or punitive means at its disposal.

3.2 Scenario 2: Global Governance

Sovereign but globally connected states

Within a climate-conscious global community emerging in Scenario 2 (Global Governance) Sweden would have a prime opportunity to *convert to 100 per cent renewable energy* without imposing intolerable burdens on society. The country already has some prior, inbuilt advantages over other, less fortunate countries that would need to conduct an expensive shift away from fossil fuels in the energy sector. This head start could give Sweden leeway to use its revenue system to steer towards sustainability. This could include a *tax on carbon emissions*, but it could also encompass other means of encouragement or regulatory incentives designed to phase out inappropriate technology or outdated systems.

As state sovereignty is a basic premise for this scenario, a key challenge would be to find effective ways to *promote democracy*, human rights and transparency. The realities of global governance require give-and-take with societies that adhere to or proclaim other values. Such a system requires trade-offs and compromises. Trade in *sensitive commodities* such as the arms trade, an important component of Sweden's export profile, needs extra consideration in this context.

Problems of trade also arise with respect to *high costs in the transport sector,* which reflect high energy prices. This affects not only interstate export trade but also distribution patterns within Sweden itself. High energy costs have knock-on effects. They have a direct impact on energy-intensive steel and iron manufacturing, which could potentially price these goods out of some markets. As with Scenario 1 (Glocal Citizenship), this in turn would force Sweden to *find new commodities to export.* Sweden would also have to address the question of fostering *greater self-sufficiency* in a wide range of sectors in order to minimise its dependence on expensive imports.

Preserving the welfare state

In conditions of sluggish or uneven economic growth, the political climate is likely to become harsher. Public economic priorities are likely to become a battleground for two ideologically definable groups: a neo-liberal faction arguing for low taxes in order to re-establish a climate for *investments and capital flow,* and opponents pushing for *increased tax-funded welfare programmes*. A challenge for Sweden in this world would be to strike a balance between clearly differing means to achieve a mutually desirable end. On the one hand it would need to maintain solid education systems, pension arrangements and social security networks in order to *create a base for future generations.* Equally, however, there will be an acknowledged need to *get the economy rolling* and keep unemployment levels as low as possible.

Climate change as a trigger

This scenario starts off with a global crisis partly driven by severe climate change impacts on global food-producing systems. The new climatic patterns could have direct impact also on Sweden, in the form of *landslides, heat waves and severe floods*. Such developments would put pressure on Sweden's *freshwater resources,* which have long been taken for granted. Climate change will require *new forms of crisis management*, not just in Sweden but in the world's more sensitive regions, on which Sweden relies for supply chains of resources and as markets for its exports. Under a global governance framework, Sweden may also have onerous obligations to assist other countries in their adaptation efforts, given its history of benefitting economically from emissions, and its relative wealth and high capacity.

Sweden, however, would be less affected than other countries – and likely to display strong community and overall national resilience and adaptive capacity (at least in some communities).

Demand for Swedish products and services in the global adaptation market could well increase, creating opportunities.

If adjusted to wisely, climate change could also generate significant new opportunities for northern climes, e.g. through increased yields in agriculture, fisheries and forestry. This would be especially true during the early decades of the scenario, before climate change becomes more extreme (after which initial benefits in terms of yield may be cancelled out by seasonal variability and increasingly harsh growing conditions). Sweden could conceivably achieve self-sufficiency in food production by the year 2050.

3.3 Scenario 3: Return of Geopolitics

Lack of willingness to pay in society

As the third scenario (Return of Geopolitics) unfolds against a dramatic drop in per capita GDP, the *notion of a tax-based, widespread welfare system*, long the European norm, would face strong resistance from the better-off segment of society. Maintaining an *open, inclusive society* based on principles of trust while not falling into the trap of controlling society by force and pervasive surveillance is a challenging task that relies on retaining a *high level of social capital* in Swedish society.

Ensuring that burdens are shared among all citizens is difficult, but arguably less so if the country faces an *existential threat* from outside. The appeal of a genuine security state, in which crucial issues are placed above politics and prioritised as top-level, can be strong in times of extreme crisis. Even then, however, such moves need careful consideration, as removing entire policy areas from political give-and-take can leave citizens susceptible to *politicians' propaganda* and scare-mongering. At an extreme level it would represent an effective suspension of democratic life.

Adaptation rather than mitigation

In a zero-sum world, societal focus is on achieving *relative gains*, not enhancing human wealth or happiness. As a result, the main impetus driving innovation and technology in this scenario would be *self-preservation* rather than collectively tackling a common crisis. Meanwhile, it is not likely that *global taxes on carbon emissions* or universally accepted carbon-trading schemes, would be put in place. This would mean that even a genuine breakthrough in technology, such as a major new source of renewable energy, would tend to have limited impact. The focus shifts to securitising Sweden's critical supply chains and ensuring the resilience of its territory and assets to climate change, possibly in ways that negatively affect other countries.

Market logic not always applicable

The question of self-sufficiency is unavoidable in this world, particularly if its dynamics involve substantial *increases in commodity prices.* Such a development would strike hardest at import-dependent countries. Sweden too would feel the effect, but this would probably not grow into an imminent threat, since Sweden could also benefit from *increased domestic food and energy production.* These new conditions would, however, radically *change the focus of Swedish politics and political economy*, from being an open and export-dependent country to a more closed one (possibly within a tight Nordic regional bloc). The underlying rationale is the problem of the *global supply chain* and the fact that *survival is the number-one priority.*

When considerations of Realpolitik take precedence and commodities are seen more as strategic resources than as mere economic assets, states will be forced to adapt in order to avoid being left behind. On its own, this stark reality might suggest less focus on the relative luxury of green policies. However, investment in efficiency measures, especially in the energy

sector, could have a significant positive impact, as it would reduce dependence on imports and vulnerability to supply disruptions. As a result, this scenario by no means shuts the door on a greener environment and economy, even if the underlying logic for it may change.

3.4 Scenario 4: Big Business

The problem of competition and free riders

Within the fourth scenario (Big Business) the idea of carving out distinct areas of comparative advantage through investments in, for example, energy efficiency is tempting. When the exploitation of multiple natural resources rises sharply, businesses that have already undergone a *strategic shift in favour of sustainability* are likely to enjoy distinct advantages.

The biggest risk in this scenario, however, relates to the continuing problem of *free riders:* parties and actors that are not compelled to internalise the environmental costs of their behaviour. The task of government in such a scenario is therefore to *create a framework* that enhances equity. It would need policies aimed at minimising the free rider problem so that these actors are, at least, required to be 'fast followers' and dissuaded from continuing their brown business practices.

Another risk with a milieu dominated by big business is *lack of sufficient competition.* A case of *market dominance of a few extremely large companies* – either in collusion via cartels or in fierce competition with each other – would disrupt natural competition in terms of price and quality, which is a fundamental characteristic of any market economy. For Sweden, a small actor in a globalised world dominated by transnational corporations, it would be *hard to implement punitive political measures*, given the risk of companies simply moving their operations to other, less restrictive national settings.

The diminished role of the government

A decentralised world system poses a clear risk of a *small country squeeze*, in which Sweden's room to manoeuvre could be restricted and its role limited to becoming a *fast follower*. Furthermore, it would be a tricky task to convince the electorate of the *need for expensive new investments*, and that Sweden should step up and be a prime mover if organised elements of the international system, such as *the United Nations or EU, should see their influence ebbing*. With states and inter-governmental organisations playing a smaller role in the international system, conflicts could erupt suddenly, causing severe problems and carrying potential for spillover. *Maintaining the rule of law* requires the coordination of national security organs, a clampdown on organised crime, control of migration flows and rigorous border controls.

3.5 Cross-cutting and contrasting – finding differences and similarities

Evidently, the four scenarios span a wide range of issues and each has a distinct focus. And as the discussion above indicates, each poses a variety of challenges for future Swedish development. Still, there are important overlaps in terms of, for example, nations' role in a global system or the domestic conditions for prosperity and inclusiveness. This section provides a short discussion of the obvious differences and similarities.

An export-based economy under threat?

Sweden's export-based economy is a challenge in all of the scenarios. Scenario 1 (Glocal Citizenship) implies that a more dematerialised world could reduce the demand for Swedish steel and iron products, thus lowering export potential in a crucial industry.

Scenario 2, Global Governance, poses the problem of high energy costs and their knock-on effects in related industries and services, such as the transport sector, which would negatively impact long-distance trade. This scenario also raises the issue of sensitive commodities and ethical considerations connected to trade, especially the sale of arms to authoritarian regimes.

In Scenario 3 (Return of Geopolitics) the logic of the market is abandoned in the sense that security of supply does not necessarily relate to price mechanisms for strategic commodities such as fuel. Instead, energy commodities are seen as strategic resources where steady and secure flows, rather than steady price levels, are prioritised.

Scenario 4 (Big Business) foresees a world of powerful business entities that see sustainability and CSR as core strategies for long-term profitability. Given the potential for producing clean energy in Sweden, it is likely that energy-intensive industries will gravitate toward the source. In this case Sweden could become a greater production centre than in the past. It could also become a magnet for innovative firms, and thus be able to continue exporting a wide range of products.

In conclusion, Sweden has ample opportunity to develop sources of renewable energy, and can draw on a well-educated population and a tradition of innovation in systems solutions. The potential benefits of successfully exporting technologies and solutions hinge on strong demand from importing countries, which is far from guaranteed in any scenario. All of these factors could work to its advantage, in terms of both competitiveness and robustness to cope with change.

Prime mover or a small actor on the periphery?

All of the scenarios beg the question of whether Sweden would be better off attempting to forge a role as prime mover, as opposed to being a fast follower.

The first scenario, Glocal Citizenship, is especially conducive to Sweden as a magnet or a model, based on the progressive profile that Sweden and Scandinavia enjoy.

Scenario 2 (Global Governance) posits Sweden as a promoter of democracy worldwide, since the global community is becoming more interconnected, even as trade ties lag. One downside of this scenario is the tendency towards protectionism. Efforts to enhance self-sufficiency would lead to initiatives to reduce expensive imports of basic goods and commodities such as food and energy.

A state-governed but less cooperative world emerges in Scenario 3, Return of Geopolitics. If survival does become the government's number one priority then considerations of high security will be paramount across a wide range of policy areas. Sweden's capacity to become a prime mover is weakened, and attention instead gravitates toward forging small 'coalitions of the willing' that can act collectively and within which Sweden could be an influential player. Energy-efficiency measures are likely to be developed and shared within these groupings, which would probably encompass neighbouring countries or the north European area. Such coalitions would aim to boost cooperation within a smaller setting or narrower context. But it is unlikely that these technologies would be spread worldwide or turn Sweden into a 'green Silicon Valley'.

Scenario 4 (Big Business) provides few opportunities for Sweden to become a prime mover, even if some of its corporate entities continue to thrive. A national 'green push' would be unlikely to succeed, given that a globalised world dominated by corporate interests would diminish the effect of top-down, state-sponsored green policies. Instead, the small country squeeze suggests that fast follower status would not only be the best option, it may be the only realistic one in such a world.

The viability of the Swedish welfare state model

The challenge of maintaining a tax-based welfare state figures throughout the scenarios. The community-based, network-oriented society of Scenario 1 (Glocal Citizenship) could be challenging to the Swedish welfare state model. Top-down efforts to generate ideas may meet with a lack of willingness to cooperate, or to accept governmental initiatives. The relative absence of a strong central government would instead give rise to feeble attempts to create policy solutions, and policies built on muddling through. All this could increase the risk of lobbyism running rampant and even of corruption gaining a foothold.

Scenario 2 (Global Governance) points to potentially sharp political divisions within societies with low economic growth – in other words, to significant levels of intra-state inequality. This would probably increase tensions between those arguing for tax relief in order to boost the economy and those pushing to maintain public health care and other tax-based welfare programmes.

In Scenario 3 (Return of Geopolitics), external threats and a generally turbulent world place national security as an overarching priority. Such conditions might also issue a rallying call to citizens and create a temporary force for cohesion. However, public authorities would need to be vigilant, so as to avoid going too far down the road of surveillance and controls of citizens' actions and movements. It would be crucial, therefore, to maintain social trust among citizens, in order to ensure their basic willingness to pay for collective goods, even in times of dramatic drops in economic output.

In the globalised world of Scenario 4 (Big Business), it is possible that a shared identity in spatial terms would give way to genuine global communities. Citizens would, however, still require law and order in their everyday lives and may continue to show a willingness to pay as a collective – even if private actors increasingly perform societal functions in lieu of the traditional state apparatus.

Threats and opportunities from climate change

Global warming up to about 2040 is largely a result of emissions already produced, and is expected to be roughly equal right across the four global scenarios. Thus any policies would have to be both adaptive and resilient. Differences mainly concern how far Sweden determines its own need for self-sufficiency. The actual effects of a 2°C or more increase in temperature, while hard to predict, are likely to be widespread and possibly vast. Catastrophic events such as landslides, droughts and typhoons would be increasingly frequent and would therefore require more efficient crisis management and collective efforts.

Sweden is quite well insulated from the worst of the problems looming as a result of long-term climate change. It has an abundant fresh water supply and ample precipitation levels. The prospect of a longer growing season could be expected to raise agricultural yields, and thus could actually be a net benefit. An additional factor concerns geological conditions specific to the region. For example, ongoing processes of post-glacial rebound or land-lift would help insulate it, particularly its low-lying coastal areas and cities, by counteracting the worst effects of a rising sea level. Thus while massive climate change would have worldwide repercussions, there is reason to believe that Sweden might avoid the worst of them.

Even so, it is important to recognise that Sweden is not an isolated entity. Should global warming reach serious levels, a small, export-dependent country would be positioned in a totally different world compared with today. Thus the main consideration is not impacts in Sweden, but the impacts of climate change on the global context that Sweden must navigate.

4

A green economy for robust Swedish development

4 A green economy for robust Swedish development

This final chapter addresses the combination of policy options that could provide the most promising opportunities for Sweden in the coming half-century, considering critical global trends, rising uncertainties and the need for innovative new strategies. Starting from the different preconditions set by the four scenarios, the first section discusses trade-offs in the broader areas of strategic policy choice. The second section focuses on the relative strengths of different options within key areas of public policy. The third section broadens the scope and debates special Swedish preconditions for moving towards a green economy. The final section discusses the effectiveness of different policy options in providing responses that are robust across the four scenarios – in essence, responding to the question whether 'no-regrets' policy options exist in line with a green economic changeover.

The list of policy options discussed here was essentially generated during the workshop on Policy Choices for a Green Economy that was held by the Commission on the Future of Sweden on 10–11 September 2012.[1] It is therefore not the result of empirical research, nor of systematic reviews of the rapidly growing literature on the topic of green economy and growth.

The approach used to assess the possible merits and shortcomings of these policy options against the backdrop of the four scenarios is purely qualitative. The assessment was initiated during the workshop and finalised by the project team. It is

[1] The workshops carried out in the course of this study are detailed in Annex A.

meant to serve as a scoping exercise rather than an alternative to quantitative economic analysis. The focus lies on the wider ramifications of economic policy under conditions of growing uncertainty about the direction of global developments, rather than on the economic efficiency of policies under given future conditions.

4.1 Key Swedish policy choices, priorities and strategies

There are potentially many different ways to achieve a low-carbon, resource-efficient economy in which biodiversity and ecosystem productivity are protected and society is made more resilient in the face of uncertainty. This section considers trade-offs that relate to four strategic aspects of policy choice: *degree of self-sufficiency*, *energy mix*, *economic structure*, and *priorities and timing of action*.

Self-sufficiency versus international integration

The degree of self-sufficiency is a strategic factor in a globalised world marked by pervasive uncertainties over the fate of the 'global metabolism'. It is important, however, not to regard the aim of achieving self-sufficiency as merely a protective or defensive option. It could also be a potential source of strength in the face of unstable global or regional markets, persistent commodity price increases and growing pressures on land and water resources.

The case for policies based on self-sufficiency is weaker in the two scenarios in which global factors still play a central role in generating wellbeing and development. This is the case in scenarios 1 (Glocal Citizenship) and 4 (Big Business).

The first scenario, Glocal Citizenship (a title combining local and worldwide elements), depicts an open, community-based society composed of a mosaic of value-oriented entrepreneurs. It is likely to be heavily interconnected and interdependent, with

some isolated and protectionist enclaves still persisting. Various communities would have their own set of comparative advantages, with relatively open borders, flexible mind-sets and non-conflictual patterns of interaction generally prevailing. Relationships would be determined by closed loops within a dematerialised world. These loops would have a degree of self-sufficiency because material components will be costly. Technologies would be shared rather than owned, with companies sharing key components and using them temporarily before they are replaced by new technology. This would generally require lower imports of raw materials.

In Scenario 4, Big Business, trade is the crucial factor. It would be costly, unproductive and inefficient to work towards a high degree of self-sufficiency, particularly in the food sector. However, attention could be focused on notions of 'ecological self-sufficiency' – a strategy to ensure that Sweden leaves a shallow global environmental footprint and utilises no more than its fair share of valuable, non-renewable resources.

The two scenarios in which the international machinery is interrupted – Scenario 2 (Global Governance) and Scenario 3 (Return of Geopolitics) – provide a stronger case for self-sufficiency policies. In the Global Governance scenario, which starts off with a severe set of crises that effectively reverse globalisation trends, Sweden could not only be self-sufficient but could actually become a net exporter of clean energy. Self-sufficiency would be valuable mainly as part of states' security supply-chain. Similarly, domestic production of bio-fuels could be expanded greatly. Relative self-sufficiency would help ensure the provision of basic resources. It would also create opportunities to gain comparative advantage in the post-crisis development of a new global governance order.

In Scenario 3 (Return of Geopolitics), arguments for self-sufficiency go beyond market logic. They would instead be seen as important components of a broader security-driven framework. For example, energy-efficiency measures could be important not just for reasons of environmental sustainability but for reasons of supply-chain security, as they would lessen national

vulnerability to turbulent world markets. As in Scenario 2 (Global Governance), self-sufficiency policies in this context would give Sweden opportunities to export resources onto high-priced commodity markets. It could also conceivably provide resources to alliance partners in potential 'coalitions of the willing'.

Demand-side versus supply-side energy strategies

The choice of energy mix gives little room for manoeuvre in terms of developing non-renewables, since the boundary condition for a green economy is 'close-to-zero emissions'. Sweden's rich endowment of hydro-, bio- and wind energy sources nonetheless offers considerable scope for policies that further promote and expand use of renewable energies.

The decentralised world envisioned in Scenario 1 (Glocal Citizenship) encapsulates a community-based future with strong incentives for efficient use of domestic resources. Efficiency-focused energy service companies (ESCOs) could play a strong role here, with surplus electricity traded among communities both inside and outside Sweden. Smart grids are central focal points, and offer means for different parties to cooperate and pool resources at national level. This provides strong motives for policies that promote energy efficiency. It could also give a boost to local renewable resources while providing incentives and opportunities to trade the surplus.

In Scenario 2 (Global Governance), energy is costly and there is a global deal in place to limit carbon dioxide emissions. The resulting opportunities for Sweden to export fossil-free energy warrant a push for policies designed to promote renewables.

The security-centred and protectionist world of Scenario 3 (Return of Geopolitics) implies strong rationale for proactive policies aimed at protecting the domestic energy supply. In addition to renewables, this may also raise the important question of whether to start mining Sweden's remaining uranium deposits.

Sweden may have ample opportunity to sell surplus energy in this scenario, too.

The arguments in Scenario 4 (Big Business) relating to a strategy for supporting renewables are built on the assumption that it might well open up new business opportunities. With a strong near-zero carbon energy base, Sweden would enjoy a comparative advantage in a future in which sustainability and 'environmental CSR' are highly valued by transnational corporations. By investing heavily in a renewables-based energy system, Swedish businesses could become prime movers in technology and systems solutions. Since the nation state has ceded its leading role to multinational corporations in this scenario, a renewables strategy should naturally be cultivated in close cooperation with the business community.

It should be noted, however, that in all scenarios, despite Sweden's natural endowment of water and biomass, a successful near-zero-emissions renewable energy system relies on global supply chains for key materials, including rare earth and metal supplies for wind turbines, solar technology and smart grids.

Incremental versus transformational change in economic structure

The economic and industrial structure of any society determines its 'metabolism'; how it functions as a whole. To bring about a situation of near-zero carbon use, involving closed loops and sustainable usage of ecosystems and other resources, a true metamorphosis of the broader economic and industrial structure would be needed. One top-level strategic question thus concerns the relative merits of incremental, step-by-step changes driven by stock renewal and gains in productivity and efficiencies, versus a more fundamental transformative change. The latter would be characterised by 'creative destruction',[2] in which substantial investments and reduced costs have to be committed up front in

[2] Schumpeter, 1942.

order to replace lost or outmoded systems. In terms employed by Sir Nicholas Stern, the fundamental trade-off is between the costs of action today and the costs of inaction in the future.[3]

Scenario 3 (Return of Geopolitics) suggests the clearest and most challenging case for transformative change, in which upfront investments, notably in energy and transportation infrastructure, would be warranted on the grounds of overarching security needs. This scenario also depicts a future with strong central government powers to direct, implement and, if necessary, force through change.

The other three scenarios indicate a need to do both: to let the market drive incremental change wherever possible, while also directing public resources or public-private partnership initiatives toward major structural investments for incremental change.

The community-based world set out in Scenario 1 (Glocal Citizenship) has ample capacities to push development in the direction of both efficiency and values: to drive incremental change while simultaneously embracing value-driven transformation. In the latter case, however, critical infrastructure would require extensive coordination and integration, for example via SuperSmart grid structures. The current Swedish governance model, based on regionalisation and strong municipal government, could be useful in this context.

Scenario 2 (Global Governance) relies on a strong state and global governance system to bring about the transformative change needed to rebuild the global community. There is a need for large state intervention programmes, particularly in research and development, food production and energy. A major issue here, however, is how to include the business world in this transformation and how best to apply the logic of running a business to implementing these endeavours.

In Scenario 4 (Big Business) the government has far less power to push through far-reaching changes to the economic

[3] Stern, 2007.

structure. Policy-making would require close dialogue with corporate entities, which would be empowered to shape, and possibly even dictate, conditions for production or research and development activities. Strategies here would ideally aim to facilitate change in a tight compact with business. This could include both economic policy incentives and joint public-private investment schemes aimed at transformative change.

Timing of action: early adopter versus 'wait and see'

All four scenarios have one key element in common: They are driven by a 'prevalence of discontinuities and tipping-points'. As such, they represent alternative futures in which the baseline narrative is driven by fundamental global uncertainties and increasingly severe pressures. As a strategic starting point for a future green economy, therefore, a crucial question arises: should Sweden aim to take a leading position, to be an aggressive early adopter of new technology in an effort to get ahead of others, or should it be guided by a strategy of 'wait and see'? That is, should it be primarily proactive or basically reactive? In the face of imminent and possibly radical change, and in a world already moving rapidly in this direction, a prudent strategy in all four scenarios would be to act sooner rather than later.

The timing of specific action, of course, depends heavily on the issue and on developments further afield. In some cases Sweden could very well benefit from being an early mover, shaping standards while implementing energy-efficiency initiatives and measures to decrease dependency on imported goods. In other cases, such as developing low-carbon technologies that are still at an early stage, it may make more sense to get on board the train once it starts moving, in order to avoid bearing the full cost of development from which others will benefit. Either way, the growing urgency of developments highlights the need to be vigilant.

The bottom-up perspective set out in Scenario 1 (Glocal Citizenship) suggests that societal development would reflect

progressive values, with actions taken on a more or less voluntary basis and by free choice. As resources become more costly, entrepreneurs would turn to recycling and waste management. This also assumes that coordinated and integrative cross-sectorial policies would be best pursued right away, since this would lead to greater efficiency and, at the same time, improved prospects of tackling future challenges. The government, albeit in a diminished capacity, could still play the role of facilitator, for example through taxation policy, technology-replacement schemes or research and development initiatives.

Research and development strategy is even more crucial for Scenario 2 (Global Governance), where sustainable forestry and agriculture need a boost in the aftermath of a severe environmental crisis. A more inclusive global system, based on active dialogue and participation of most states, may benefit from conflict management. That said, consensus-based decision-making is by nature a slow process, and may not be up to the task of ensuring timely action to meet unforeseen challenges.

For Sweden it thus seems wise to look inward and consider those issues that can be dealt with reasonably quickly. Public planning, e.g. in urban development and public transport, often requires long-term thinking. But the viability of, for example, future public transport systems depends on workable emission reduction schemes that take time to implement. Given such long time lags and the need for continuity for planners, many of the initial policies associated with a transformative society should be put in place as soon as possible.

The strategic importance of Swedish policies is especially highlighted in Scenario 3 (Return of Geopolitics). Here, decisive action to reduce dependency on imported goods would be needed quickly, especially in energy production and raw materials. However, the timing of key investments hinges on how quickly others act, since relative rather than absolute gains predominate in this zero-sum game. Swedish efforts must be benchmarked against other actors' strategies. One important and even urgent task would be to create a widely inclusive international coalition

of the willing, as a platform for formulating Swedish norms and values in this world dominated by a few powerful national actors.

Scenario 4 (Big Business) requires a balance to be struck between two different yet related needs. Proactive policies could gain Sweden comparative advantage in some areas, yet in other respects it would pay to be a fast follower, allowing the country to reap economies of scale by aligning with wider forces and adopting technology first developed elsewhere. This type of trade-off is crucial in a green economy, a concept that is still evolving, which is a process that will depend on technological breakthroughs, not just on applied existing policies. Investment in critical infrastructure is one such area where Sweden, a well-organised society, can be a prime mover. Another example lies in developing renewable technologies, which can be ramped up quickly in order to create wider standards that others would want, and perhaps even need, to follow.

4.2 Relative strength of different policy options for a green economy

This section explores the applicability and fundamental strength of explicit policy alternatives across the four scenarios. This can mainly be useful insofar as it recalls the exercise on which the study was based: the method used to identify policies, the wind-tunnelling approach used subsequently, and the grouping of policy options. A policy that is robust or resilient is one that would be fully applicable and manageable in all of these scenarios.

As such, the 'robustness test' assesses the strength and flexibility of a given policy approach in each individual scenario – but does not attempt to evaluate the efficiency of its implementation. The test shows that a majority of the policy options set out are robust across the four scenarios. This gives a strong indication that a green economic policy can feasibly be applied as part of a wide policy package that can serve multiple policy goals. The policy alternatives discussed here (italicised) were originally

generated during the policy workshop. The full list of policies evaluated is found in Annex C.

Planning and policy process

A truly green economy will not proceed from environmental policies and ecological agendas alone. It is worth reiterating that a 'green economy' is not merely a green sectoral approach. It is, rather, an overarching, economy-wide set of policies designed to overcome fundamental challenges for future security and well-being in a fundamentally uncertain world. These policies would require extensive coordination and high-level initiative, and would naturally involve the Ministry of Finance as a central player, along with other key government departments involved in industry, energy and transport.

Along with ministry involvement, this evolution would entail reform of the planning and policy process itself, to ensure that the Ministry of Finance becomes *accountable for the green economy and sustainable development.* This role would include *setting up new, improved and broadened national accounts, both concerning production and consumption* (those where the effects generated abroad by what Sweden imports are registered), and social welfare measures that go beyond GDP measurements.[4] Making the Ministry of Finance responsible for the transition to a green economy would also *promote policy coherence across ministries on what sustainable development would entail.*[5]

The effort to achieve this transition presupposes better coordination of national, regional and municipal planning processes. It would also require the *development of stronger interfaces between government bodies at different levels, and key elements in civil society, including the scientific community, the business world and trade unions.*

[4] Hamilton, 2000.
[5] Nilsson & Eckerberg, 2007.

Sweden has a longstanding tradition of tripartite negotiations between government, employers and trade unions in setting national economic policy. These could be expanded, in the case of sustainability issues, into *five-way talks* that also include the scientific community and civil society. Within the labour market, the key negotiating partners, namely employers and trade unions, could build on the demonstrated strengths of the collective bargaining model to make the workplace more resilient and sustainable. Government investments and economic policies (described in the next section) should be designed to ensure that all economic actors act sustainably in their own spheres of activity. This aim can be pursued by putting in place a functional and sustainable infrastructure.

A market-based economy needs economic incentives. These incentives could support sustainable production and consumption decisions that are affordable; clearly, it would be counterproductive to make it far cheaper for entities and individuals to continue acting unsustainably. A research-based, civil society-backed, sustainability-strengthening, policy-rich platform of governmental support would give the key social partners, employers' organisations and unions – which actually represent the vast bulk of the Swedish economy, including most producers and consumers – the instruments to pursue sustainable patterns of production and consumption.

One useful way of streamlining the planning process and creating momentum for the transition period would be to *set national and/or municipal targets for CO_2-neutrality in different sectors. Greater leeway could also be granted to municipalities to pursue green urban development and develop a more local circular resource metabolism.* This could help ensure that prime sustainability movers set a positive example for others. The task of rebuilding the northern Swedish city of Kiruna could include transforming it into a sustainable model of urban development. That would require support from the reforms mentioned in this (planning) category and others concerning investments and economic instruments.

The policy options under the heading of planning and policy process are broadly robust across the four scenarios. They are particularly viable in Scenarios 2 and 3 (Global Governance and Return of Geopolitics), which envision a stronger role for government. Even so, all planning and policy process improvements appear more achievable if bottom-up support for sustainability ideas can be maintained. This would be most likely in Scenario 1 (Glocal Citizenship) and Scenario 4 (Big Business).

Economic policy

The economic policy cluster consists of three major components: *a green tax switch, targeted (specific) green economic policy and a 'circular economy regulatory reform'.* The three policies complement each other in driving cost-efficient solutions to reach green economic targets. However, their effectiveness depends on the setting of strict limits such as caps, standards or tax levels.

The economic policy options are largely robust across the four scenarios. The drawbacks or risks primarily involve potential negative impacts on the short-term competitiveness of energy- and resource-intensive industries. These risks can be substantially mediated if tax levels are increased gradually and follow a reliable, open and predetermined trajectory.

Economic policy instruments are, however, not sufficient on their own. They need to be complemented by standards and regulations (command and control instruments) including norms, standards and prohibitions (see subsection on innovation policy below). The *cap* part of a cap-and-trade system, for example, is a regulatory tool that combines with market instruments to constitute an overall policy package.

The *green tax switch* could provide a technology-neutral and efficient policy foundation for adjusting incorrect pricing of goods and services by internalising negative (and positive) external

effects.[6] Carefully crafted and fairly applied green taxes would target energy (in order to increase energy efficiency), greenhouse gases and other pollutants in line with the polluter-pays principle. The dual aim would be to encourage good usage while penalising wastage. Such taxes would also target non-renewable resources and renewable virgin resources, in order to incentivise increased resource efficiency and promote a 'circular economy'.[7] The 'switch' element makes it clear that the aim is *not* to increase the overall tax burden. Rather, taxation instruments can correct for market failures while keeping the total level of taxation unchanged.

Over time, the introduction of a green taxation element would reduce both the production and consumption of the taxed products and services. This could, in itself, erode the tax base. The loss, however, may be adjusted for by gradually raising taxes on those products that cause negative external effects until either the product has reached a (sustainable) target level or else has been phased out in favour of lower-taxed alternatives. The composition of the tax switch would accordingly change over time. A key consideration in designing the economic policy package is that, in order to be effective and fair to all involved parties, environmental policy must be predictable and credible. This in turn requires the setting of long-term targets and forging a high degree of political consensus.

However, the tax switch does not merely have 'green' benefits. In a global future that includes high energy prices, as in Scenarios 2 and 3 (Global Governance and Return of Geopolitics), a green tax switch would help to prime industry, and society as a whole, for a reality of higher energy costs. This would generate comparative advantages through better energy efficiency and greater usage of renewables. As Sweden does not have the luxury of fossil fuel deposits like neighbouring Norway, an effort to reduce dependence on imported fossil fuels via a tax switch would

[6] SOU 1997:11, p. 17; Brännlund, 2006; Rutqvist et al., 2012.
[7] See e.g. Ministry of Environment, 2003. Also pursued as a national strategy in China; see Yuan et al., 2006.

increase the economy's resilience. This would particularly be the case in a world of rampant protectionism such as Scenario 3, Return of Geopolitics. A concerted effort to become self-sufficient in terms of energy in a high-energy-cost future would constitute a 'no-regrets' policy. It could also potentially enable Sweden to become a net energy exporter.

In Scenario 4 (Big Business), which is dominated by transnational corporations and characterised by weak government, it would clearly be advantageous to maximise the efficiency of the national economy as well as its key industries. A tax switch offers scope for lower costs for labour and services. Lower costs, in turn, would improve Swedish competitiveness in all the scenarios in which trade forms an important component of the world economy.

Taxing the use of non-renewables and virgin resources in order to improve resource efficiency is also a robust and no-regrets policy in a globalised world in which strong governments are able to impose policy in order to maximise efficiency, such as Scenario 2 (Global Governance).[8] On the other hand, efforts to tax non-renewables or virgin resources would be harder to implement in a developmental context, where local resources are crucial for the local community's livelihood. The government would also find it hard to impose new taxes in a global milieu dominated by Big Business (Scenario 4).

While technology-neutral policies have many virtues, they also have drawbacks. They tend to produce sequential implementation of new technology. The cheapest technology (usually that which is old or well-known) tends to be utilised first, thus slowing development of new replacements. The pace of eco-innovation would therefore have to quicken so that efficient and effective technologies are developed and implemented in parallel. The role of targeted (*technology-specific*) *green economic policy* is meant to address the market failures and system weaknesses associated with a slow pace of eco-innovation, which increases societal costs in the long term. One aim is to overcome bottle-

[8] SOU 2001:2, p. 2.

necks and other weaknesses in the development of eco-effective technology.

A *circular economy reform* consists of a set of regulations aimed at achieving a high degree of (energy and environmental resource) efficiency. Examples of regulations include recycling rules, landfill prohibitions, bans on burning certain products and regulations concerning the composting of biodegradable waste. An effort to ensure efficient use of resources within a circular economy reform, aimed at encouraging innovation and developing technology and systems solutions, would constitute a no-regrets policy in all scenarios, regardless of global developments.

Innovation policy

The innovation policy cluster consists of three major components: *support of system-level innovation and research, public procurement,* and *stronger environmental standards and regulations.* These three components complement each other. However, they also have different roles in different contexts, especially in relation to global development. With a single exception, namely the usefulness of *environmental standards and regulations* in Scenario 3 (Return of Geopolitics), all policy options are robust across the four scenarios. Even so, the strength of government and the value base in society are important qualifiers for determining innovation policy options.

System-level innovation concerns a process designed to foster future-oriented strategic technologies and systems. The aim is to identify comparative advantages and strategic areas, but without pointing out preferences or picking 'winners'. The policy process needs to be adaptive with respect to the area in question. Reorganisation of the transport system, for instance, demands large-scale solutions and top-down approaches. Other needs, such as boosting energy efficiency, can also be facilitated through bottom-up small-scale innovation processes.

In general, a balance needs to be struck between competition and coordination. Only this will create the conditions for long-term commitment and predictability for researchers and investors. Policies should be coordinated and integrated to avoid the problem of fixed or segregated sectors. System-level innovation can be encouraged by some specific policy tools. These could include *smart research and development programmes* of applied research in strategic areas; encouragement of '*skunk works*'[9], and *supporting the transition from small-scale projects to market-oriented products*, for example through pilot and demo projects, eco-venture capital and incubators.[10]

Support for system-level innovation is most easily adapted to Scenario 2 (Global Governance), which is characterised by strong government and functional intergovernmental cooperation. It is less compatible with those characterised by bottom-up tendencies, as in Scenarios 1 and 4 (Glocal Citizenship and Big Business). Encouraging 'skunk-works', however, fits rather well with a world partly insulated from global developments, but for different reasons. This is also the case when it comes to facilitating a transition from projects to products.

The role of *public procurement* is to guarantee the presence of an early market for new technologies, services and products. It is important in creating a domestic market and securing demand for green services and products. As such, it can support a transition from small-scale projects to market-oriented products, for instance through demo projects on electric cars for municipal purposes, which might be developed later as vital consumer-market products. Public procurement is usually a feasible policy approach irrespective of global developments.

Stronger standards and regulations are crucial mechanisms for driving technology performance forward and for phasing out

[9] 'Skunk works' refers to the establishment of dedicated research and development teams that are given considerable freedom to think outside of the box and explore unconventional solutions.
[10] Henderson & Newell, 2011.

obsolete or harmful products and solutions.[11] Long-term commitments and predictability are important in this area, for it allows researchers and investors to feel reasonably secure about the path ahead. Setting such standards would require a combination of good governance and actor acceptance. This implies that the feasibility of such measures is dependent on global developments in the field of regulation. Nevertheless, since policy based on transparency and long-term goals is vital, government has a clear opening to set the agenda. However, in Scenario 3 (Return of Geopolitics), which is characterised by national self-interest and a strong need for self-sufficiency, the scope for tough environmental standards or regulations is more limited.

Infrastructure and energy policy

The infrastructure and energy policy cluster consists of measures and strategies targeting specific infrastructures of critical importance for a transition to a green economy. This includes *transport infrastructure, energy infrastructure* and *buildings.* Technology-neutrality is generally difficult to achieve, since actual investments in given technologies need to be financed – partly or fully by the state. Political decisions are an inevitable part of the process.

The policy options in this cluster constitute the most robust and no-regret set of recommendations in this report. There are good reasons to believe that a push to electrify domestic transport systems would be attractive in all four scenarios. The energy infrastructure policy pays off very well in the two high-energy cost scenarios, 2 and 3 (Global Governance and Return of Geopolitics), but are also beneficial in the bottom-up Scenario 1 (Glocal Citizenship) and Scenario 4 (Big Business), which is dominated by transnational corporations. Likewise, investments in energy- and resource-efficient infrastructure are nearly always

[11] Clerides & Zachariadis, 2008.

a sound idea. Finally, safeguarding governmental financing capacity is a useful option. This is true both for scenarios where the government is a strong actor, and for those dominated by the private sector. In both it can help attract business investment and public-private partnerships.

On *energy infrastructure*, the policy strategy centres on renewable power production. Market pull policies (emissions trading systems and green certificates) are needed at the start, to promote the most cost-effective renewable production capacity. Complementary policies are then needed to address the innovation chain, especially for non-mature technologies such as offshore wind, solar and wave power. Policies would need to boost renewable energy from biomass and hydropower, in a way that minimises trade-offs with other social, economic and environmental objectives.

Secondly, such initiatives would lead to a massively expanded capacity for generating renewable electricity in the Nordic area. Efficiency improvements are likely to follow. Demand should likewise increase, especially from an expanded and wholly electrified domestic infrastructure system, but not nearly enough to cover the excess capacity. This would, in turn, require major new investments in transmission infrastructure, in order to export to continental Europe.

In this light, Sweden could become a net exporter of green electricity and excess capacity from its hydropower production. Electricity transmission infrastructure is admittedly very costly and slow. Although planning is now managed by the European Network of Transmission System Operators for Electricity (ENTSO-E), it requires firm commitment and resources from the state. A policy package would need to include fast-tracking of market design and systems harmonisation to ensure balancing capacity.

In terms of *transport infrastructure*, technology choices, both implicit and explicit, cannot be avoided. Recent evidence on pathways to low-carbon transport systems suggests that such choices will be difficult. This would be true even in a transform-

ative or breakthrough scenario, such as scaling up the production of electric and hybrid electric vehicles to (necessarily) much higher levels.[12] Likewise, biogas, ethanol and other biofuels face production and sustainability issues, which may prevent them from becoming a major part of the solution.

While battery-powered electric vehicles and biofuels in various forms will remain on the agenda, complementary approaches must also be considered. A promising strategy could include grid-based electrification of transport – not just the railways but also electrified highways and even city networks for buses, trucks and personal vehicles. Demos and pilot projects along these lines are well under way in Germany. Prevailing estimates suggest that 6 000 km of electrified highway infrastructure for trucks will cost approximately EUR 15 billion[13] (meaning that each kilometre would cost roughly SEK 20 million) at today's prices.

In terms of *buildings*, the main concern is energy conservation and resource efficiency. A strategy to improve efficiency resonates with all aspects of the green economy agenda. It would reduce energy demand, lower costs, create new jobs and minimise damaging CO_2 emissions. Such a strategy is, in fact, critical for sustainable development worldwide. For example, energy-efficiency savings alone are expected to account for more than half of the total reductions in energy-related CO_2 emissions by 2030, according to one of the World Energy Outlook stabilisation scenarios.[14]

The diversity of energy end-users is great, which naturally makes it difficult to devise simple policy solutions aiming broadly at energy efficiency. While energy taxes and consumer information may help people and organisations make informed decisions about investments in buildings and equipment, actually implementing these decisions is another matter. Policies must often be designed for, or adapted to, specific sectors and technologies, taking into account incentive structures and the rela-

[12] Åkerman, 2012; van Essen & Kampman, 2011.
[13] Köhn, 2012.
[14] International Energy Agency, 2010.

tions between various agents. Regulations, especially standards for building codes and equipment, are critically important policy elements. One clear need would be building codes that mandate very low energy use levels for new constructions and retrofits alike. Policies that encourage the running of buildings on renewable energy could also be important.

Efficiency also plays well with business development. Efforts to improve it can create market opportunities for suppliers of building materials, windows, lighting, and ventilation equipment. It also creates a variety of jobs in the construction industry. Energy Service Companies (ESCOs) are part of a rapidly growing business sector, thanks in part to ICT-enabled cost reduction. Some of the major players originally manufactured building controls and automation systems, notably TAC by Schneider Electric, Siemens, ABB and Honeywell, as well as power companies. Small and medium-sized enterprises (SMEs) are also capturing a significant share of this new market, which requires specialist or niche knowledge. The private sector can generally stimulate significant technological innovation if given the opportunity.

Bolstering *governmental capacity to finance rural green infrastructure* is widely seen as a policy priority that cuts across energy, communications, and transport sectors. Even so, rural Sweden, with its smaller population base compared to urban areas, has rarely been able to muster the required purchasing power to pay for infrastructure on a commercial basis.

Social policy

The social policy cluster consists of key social policy conditions that would facilitate the transformation towards a green economy. Without such policies, other policy changes may be difficult or even impossible to push through because of social resistance. Key areas include *active labour policies to enable innovation and transition, policies to stimulate greater creative diversity in the social fabric,* and *policies to increase the pace of green reform within*

the education system. The options in the social policy cluster are clearly robust across the four scenarios. The only partial exceptions concern somewhat lower utility of active labour market policies in Scenarios 1 and 4 (Glocal Citizenship and Big Business) – the two scenarios that depict a future with a weaker role for national governments.

Active labour policies to stimulate innovation and transition have served Nordic modernisation and development well. They enabled a rapid and successful shift from the relatively poor 19th century to the socially inclusive, highly developed present. The Nordic countries now top world rankings in nearly all benchmark social and economic categories. Active labour market policies also appear to have given them the necessary flexibility to cope successfully with the current crisis. In a report presented at the 2012 World Economic Forum in Davos, the Nordic model, with its inclusive labour markets, was propounded as a formula for other countries, and a guidepost in implementing the changes needed to meet present and future challenges.[15]

When a country combines generous unemployment benefits with ample opportunities to retrain those whose jobs have been phased out, it not only preserves human and social capital, but also redirects that capital to more productive areas. This is a valuable service in turbulent times. By easing the task of extensive re-industrialisation, it would help renew, and indeed structurally transform, the economy. In this way, crises could be converted into opportunities, for businesses as well as individuals.

A wholesale switch to a green economy heralds major changes in economic structures and supply chains, and would include overhauling the basic description of many individual jobs and job sectors. Extensive 'creative destruction' would mean that the number and quality of jobs lost would be more than compensated for by new employment opportunities gained. In this light, efforts to pave the way for a transition to a green Swedish economy

[15] Midtun & Witoszek, 2011.

and society can only be reinforced by further developing and strengthening the flexibility and resilience of the Nordic model.

Another key component of this transition would lie in the education system, by introducing enhanced green content – not just in higher education and research but at all school levels. It seems vital that understanding of global sustainability challenges be strengthened and broadened as much as possible. Instilling that knowledge would require efforts to enhance the types of skills that would be needed in this new economy. Such an effort would foster wide societal acceptance of the transitional challenge. It would also stimulate efforts to find the best solutions to practical problems standing in the way of such a transition.

The effectiveness of the above options in the social policy cluster would largely hinge on the government's role in the transition. Such a role might include a strong budgetary commitment and a willingness to collaborate with social partners (employers and employees/trade unions). It would also need determined efforts to coordinate policy steps with other, like-minded governments committed to travelling down the same road. In fact, the policy options in the social cluster would be helpful to the process whatever the surrounding circumstances, since building social capital (resilience) and human capital are key elements of any knowledge-based and cooperative societal transition process.

A third area of social policies might aim to enhance resilience and thrift by stimulating diversity of creative forces in the social fabric. This notion builds on research by Richard Florida,[16] who posits that society must be able to attract and retain a diverse spectrum of high-quality creative talent (such as technology workers, artists, musicians, and what he refers to as "bohemians"), if it hopes to cope with, and thrive in, a world of rapid change. Policies to build such a diverse creative base may comprise a mesh of economic incentives and education initiatives. Those that aim at balancing diversity with inclusiveness and social cohesion could help greatly. As such, this aspect of social

[16] Florida, 2010.

policy would complement the labour market and education initiatives mentioned above. It would have a particularly valuable role to play in the decentralised and network-oriented Scenario 1, Glocal Citizenship.

Alliance-building policy

The alliance-building policy cluster represents potentially useful options for Sweden in the realm of foreign policy. They revolve around the need for a wider Swedish role in pursuing a robust path towards a global green economy by 2050. These policy options differ somewhat from the other policy clusters in that they do not necessarily start from a political calculation based on narrow national economic self-interest. They take into account the role Sweden could play beyond its borders, where coercion is not an option and patient but determined diplomacy is a must.

Policies to *pursue opportunities for building 'green coalitions'* imply active Swedish efforts to explore how different actors' interests across a range of policy areas could align most effectively. Such efforts could pave the way to alliances of willing and like-minded partner countries involving 'green economic diplomacy', related sectoral policy areas and actors in the Swedish and international research communities. An active Swedish policy to bring together coalitions of the willing is robust across the four scenarios, but the strength of the policies depends on the focal mix between nation states and multi-actor networks.

A continued *focus on the EU as the main avenue for alliance-building* is also fairly robust across the four scenarios. It may be of less utility in Scenario 3 (Return of Geopolitics) due to the partial fragmentation of the EU implied by the scenario narrative. In this scenario, the more narrowly Nordic or northern European context would be more feasible in terms of exploring joint opportunities.

Although strong support for alliance-building policies is evident across the four scenarios, Scenario 4 (Big Business) offers the

least foreign policy leeway, given the dominant role envisioned for corporate interests in this future.

4.3 Conditions for developing a green economy in Sweden

When facing change or imminent threats, every country has its own set of preconditions that largely determine the options available. Countries may be more or less vulnerable to changing circumstances, for example due to geographical conditions, infrastructure design or social features. But it is also possible to strengthen national resilience to cope with, manage and endure shocks or rapidly changing conditions. The section discusses the particular preconditions that exist in Sweden, enabling it to build resilience in the face of uncertainty through green economic policy. It also looks at the opportunities for, and obstacles to, such action.

Unique Swedish preconditions for a transition to a green economy

Sweden occupies one of the larger and better-endowed territories on the European continent. The country is rich in non-fossil fuel, land, fresh water and other natural resources, all of them subject to relatively little population pressure. The populace is well educated and enjoys a high standard of living. A long tradition of active welfare policies has created a social security framework that leaves fewer people behind than in most other industrial countries. Another intangible asset is a forward-looking and conservation-minded society. Most Swedes have a positive relationship with nature, yet also believe technology can be a force for good. Social trust is high, and the Nordic/Swedish model has proven its worth as a stabiliser, as well as a transformer, of society. In short, Sweden exhibits many of the necessary

preconditions to successfully tackle a green economic transition, and, as such, can be a role model for change.

The Swedish power sector has already reduced its reliance on fossil fuels, with nuclear power accounting for about 40 per cent. Energy-efficiency measures, together with base load and balancing power from hydroelectric production and ongoing investment in wind power and biomass-based combined heat and power generation, have strong potential to make the Swedish electrical system both fossil- and nuclear-free. This would be rare for a highly developed industrial country.

The Swedish transport sector, however, is still heavily oil-dependent, a trait shared with most other countries. Reducing fossil dependency in the transport sector will require bolder investments along with some tough choices about type of infrastructure. But while the needs are great, so are the possibilities, given Sweden's high level of know-how and the pressing need to find energy and environmental solutions for this ever-expanding sector.

In a world facing multiple interconnected crises, Sweden holds two key pieces of the green economy jigsaw puzzle. One is an industrial base characterised by a highly skilled labour force and a distinct technological edge. The other is a set of active labour market policies that support retraining and facilitate transformation of worker skills. Both assets promise to be useful in an era of turbulence, when creative destruction is a certainty.

The future narratives above can play a crucial role in determining priorities and making choices concerning how to meet future challenges, both expected and otherwise. These choices cannot be idle ones. They would require transformative investments of money and effort if they are to maximise Sweden's resilience and retain confidence in its ability to deal constructively with a world caught up in mounting uncertainties. The preconditions for transforming Swedish society into a green economy are decidedly – and in some respects uniquely – favourable compared with other countries. And the notion of becoming a part of the solution, as opposed to being part of the problem, is

inherently appealing. Making solid investments and encouraging widespread, active involvement can help bring this about.

Opportunities for, and obstacles to, achieving a green economy

The transition to a green economy thus offers several clear opportunities for Sweden that closely resemble economic notions of comparative advantage:

- Sweden has a sizable total volume and diverse range of renewable natural resources, amounting to a very high per capita endowment.
- Sweden is rich in high-grade ores. It possesses technology and capacity for CO_2-efficient, value-added production,[17] and systems for efficient recirculation.
- Sweden has developed a societal model that makes economic transformation, while never easy, a less painful process than it would be in many other countries.
- Sweden has a history of being a much-studied model. It could reinforce this reputation by, for example, bringing sustainable-labelled goods, services, and even exportable technology early onto a market that may ask for precisely that in the near future. In this way, it would have less to prove from the standpoint of general excellence.

The major hindrances to achieving a green economy are associated less with Sweden as a country than with factors beyond its control. These could include a lack of demand-pull for green economy goods, services, technology and solutions, or insufficient resources (as broadly construed) to drive the transition process forward.

[17] Kander, 2012a; Kander, 2012b.

- Energy prices could drop and remain low. This could happen as a result of a stagnant world economy or an actual drop in overall demand. It could also stem from a successful technological breakthrough that brings new energy supplies to market in quantities large enough to keep prices down. Positive supply shocks figure in Scenario 4 (Big Business) and Scenario 1 (Glocal Citizenship). In economic theory, a positive low-energy-price injection boosts economic growth and thereby energy demand, eventually pushing energy prices upward again. But should energy prices remain consistently low for whatever reason, green or thrifty energy solutions would have less purely economic appeal than in other relative-price situations.
- Climate policy, whether globally coordinated or not, could come to play only a marginal role, making the 'polluter pays' principle even more marginal than it is today. Such a future is likely to prevail in Scenario 3 (Return of Geopolitics). Investments in energy efficiency and/or climate-neutrality are usually more fruitful if carbon is priced fully (i.e. higher), and as long as the global energy sector is dominated by fossil fuel use.
- Economic growth and world trade could be severely curtailed by rapid climate change, wider armed conflict or other disruptions sketched out briefly in the different scenarios. Any or all of these would siphon demand away from the world market for industrial products in general.

Even so, under the above circumstances, the alternative of *not* having transformed the Swedish economy, and using the comparative advantages listed above, would be of little help. If better energy efficiency becomes the national lodestar, modest energy prices would be lower still for the user – even if the country has paid a little too much in the process of getting there. However, if world energy prices subsequently rise anew, or carbon pricing becomes fairer, such a transformation would really begin to pay off.

Put another way, energy-efficiency measures are like paying for insurance. If climate policy fails globally, Sweden will suffer the consequences of global warming much as everyone else. But having a grid-based, efficient energy system in place nationally seems certain to make it easier, or far less painful, to cope with all of the global, regional and local upheaval that would accompany rapid climate change. And given the positive knock-on effects of encouraging economic activity in the environmental sector, a green economy focus would help insulate Sweden from the shock of wider recession.

The most favourable timing and speed of the transition to a green economy would depend largely on what others do, as that will affect relative costs, the size of the market for green technology and the competitiveness element of using national resources to help the transition along. The optimal position, it would seem, is to keep a step or two ahead, but not three. Of course, it is difficult to know how to position in such a way; indeed this is the green-economy-game-theory-multi-billion-dollar question. The downside solution – a situation in which nobody wants to end up – emerges if everybody moves too late, and is thus another consideration. In a situation of climatic and ecological deterioration that disrupts the economic playing field and harms general wellbeing, everyone would be worse off.

4.4 Are there 'no-regrets' policy options for steering towards a green economy?

Societies that neglect to invest in the future invariably become eroded. Such investments, measured in time and effort as well as money, should ideally have both present and future consequences: they should strengthen existing societal capacities while building a solid bridge to the future. Their role becomes especially critical in rapidly changing or turbulent times, when existing approaches and standard procedures seem unable to meet the challenges at hand, yet people and institutions tend to shy away

from bold new commitments. And in good times, when everything seems to be going well, 'more of the same' is an easy answer. In either case, if old structures and ways of operating appear inadequate, a different kind of investment and policy approach are needed: an approach in which transition, not continuation, is the rule. Global circumstances indicate that such a time is rapidly approaching.

Stiff global challenges such as financial instability, unequal development opportunities and stressed ecosystems are well known. The ever-increasing pressures on finite resources may prove to be a wild card with genuinely unknown consequences. Policies to meet these challenges – both the imminent, discernible ones and those that may unfold in the capricious chain of future events – must be robust and "no-regrets," as seen from the current vantage point.

Green economic policy needs to be robust in order to survive a future that is likely to be deeply uncertain. Other elements, such as the need to be efficient, while important, are less crucial in this regard. There are no silver bullets to cut through complex issues and provide ready-made solutions. Even so, this report shows that most of the policy options evaluated and tested make solid sense, from a political and economic viewpoint, across the four uncertainty-driven scenarios that were explored.

The analysis above has generated a set of indicators that collectively argue for priority action. It should be emphasised that this is not a list of formal policy recommendations. Rather, it is a compilation of *policy areas* that were identified as crucial through the workshop-based, bottom-up process used in this study. They would need close attention in any concerted push toward a green economy. These can be summarised as follows.

- The green economy would need to be placed at the heart of national economic policy and planning. It follows logically that the Ministry of Finance would be accountable for progress, to ensure that green economic targets are pursued with the same rigour and frequency as with any other headline

economic indicators. Additionally, the government would need to establish stronger interfaces with the scientific community, key social partners (employers and trade unions) and other elements of civil society to solicit input and ensure accountability.

- Vigilance would be needed to ensure steady progress toward resource-productivity and maximise the energy efficiencies of real capital, along with the goods and services it produces. This would keep costs down, improve competitiveness, strengthen the Swedish 'green trademark' and secure future job opportunities. Adjustment of relative prices would aid this process, not least by motivating businesses to make productivity-related decisions. Judicious use of a green tax strategy and public-private investment programmes would promote efficient socio-economic solutions, that are profitable from both business and household perspectives.
- Progress toward environmental targets would need to be aligned with long-term objectives that are communicated and understood clearly throughout society. This would strengthen the government's leverage through public procurement and support via system-level innovative research efforts.
- Sustainability-enhancing investments, particularly in transport infrastructure, would need to be stepped up. Electrification in particular could vastly improve efficiency, while biomass-based solutions could be a valuable complement. A sustainable energy infrastructure, based on both renewable and locally supplied energy, could produce a double bonus in the form of increased energy security and enhanced local or rural economic development. Energy-efficiency measures, especially applied to buildings for housing and services, constitute another crucial part of an energy system transition – keeping in mind that the cheapest and most sustainable energy supply is the 'negawatt', energy that does *not* have to be supplied.

- To ensure a just, knowledge-based, democratically smooth transition to a green, secure and resilient economy, sustainable social policies would also be needed, especially through the education system and labour policy. Without participation by knowledgeable people and support from the rest, all of whom will ultimately benefit, no major societal transition will ever be effectively and efficiently undertaken.
- It would be prudent to take advantage of Sweden's currently strong financial situation to invest in green economic reform now, rather than sometime down the road. Many countries are in the unhappy situation of having to borrow expensively just to cover consumption needs and budget shortfalls. Sweden is comparatively well positioned to finance sustainable productive investments that will ultimately strengthen the national balance sheet. To solve the interlinked crises (environmental/climate and economic/social), sustainable productive investments seem to offer the best (robust and no-regrets) medicine.
- Notwithstanding solid arguments for acting soon, rather than waiting for a time of much higher energy prices and/or carbon-use restrictions, it is important to acknowledge the real trade-offs between being a prime mover and being an early adopter. One could argue that Sweden's comparatively efficient, flexible, domestically based and low-carbon energy system would favour an early-adopter strategy, allowing others to take the risk of driving new technologies down the cost curve. If, on the other hand, a 'prime-mover' strategy created new opportunities for Swedish-based industries while reinforcing Sweden's role as a technology innovator, Sweden would be competitively well placed to deliver to world markets. Doing so would also enhance its overall international standing.

Annex A: Acknowledgements

This report is the product of collective research efforts extending over a half-year period. The study project was initiated and directed by the Stockholm Environment Institute (SEI) in partnership with the Swedish Defence Research Agency (FOI). The work has been implemented in cooperation with the Swedish Agency for Growth Policy Analysis (Tillväxtanalys) and the Swedish Confederation for Professional Employees (TCO), and in collaboration with the Commission on the Future of Sweden.

The main part of the work was carried out from May to November 2012 out by a core research team consisting of Karl Hallding (SEI, project leader), E. Anders Eriksson (FOI), Malin Mobjörk (FOI), Måns Nilsson (SEI), Eva Alfredsson (Growth Analysis), Kristian Skånberg (TCO), Hannes Sonnsjö (FOI), Magnus Benzie (SEI), Henrik Carlsen (FOI), Eric Kemp-Benedict (SEI), and Phillipe Vandenbroeck (Shift'n).

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John Ross played a central role providing coordination and copy-editing during the finalisation of the report. The team owes

a debt of gratitude for John's dedicated work to turn the research into this final report.

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Two workshops, arranged by the Commission on the Future of Sweden, provided fundamental input to the research process. Philippe Vandenbroeck skilfully moderated both workshops.

A first brainstorming workshop took place on 4 June 2012, focusing on global trends and uncertainties. During the day a total of more than 150 drivers of global uncertainty were generated in a bottom-up process. The drivers were discussed and clustered, after which the most important drivers, as presented in Annex B, were selected by a vote. Finally, the cluster groups were combined into four meta-drivers which provided input for the generation of the four scenarios.

The following group of people took part in the 4 June workshop: Elisa Abascal Reyes, Eva Alfredsson, Anna Borgeryd, Alexander Crawford, Dominique Croteau, E. Anders Eriksson, Karl Hallding, Petter Hojem, Kristofer Jakobsson, Bernice Lee, Christer Ljungvall, Sara Lönberg, Malin Mobjörk, Åsa Nevestveit, Måns Nilsson, Björn Nykvist, Andrea Ricci, Kristian Skånberg, Hannes Sonnsjö, Philippe Vandenbroeck and Erik Westholm.

A second workshop was held on 9–10 September 2012, with the aim of assessing Sweden's range of policy options and strategic choices for a transition to a green economy, given the global development narratives that had been elaborated in the four scenarios. The workshop was organised around two breakout sessions of syndicate work moderated by researchers from the core team.

In the first session the workshop was divided into four groups, each assigned the task of discussing threats and opportunities for Sweden in its given scenario, and presenting ideas for green economic policy that would be viable under the conditions

of that scenario. The groups were in particular asked to consider trade-offs in terms of *self-sufficiency versus international integration*, *demand-side versus supply-side energy strategies*, *incremental versus transformational change in economic structure*, and *timing of action (early adopter versus 'wait and see')*.

The syndicate work generated a list of over 30 suggestions for green economy policies that had been judged viable options in at least one of the scenarios. The core team clustered the list of policy suggestions into policy areas. During the second breakout session the workshop was divided into four new groups, with each of the groups asked to assess the robustness and effectiveness of a subset of policy options across the four scenarios. The outcome of this exercise was further refined by the core team and is presented in Annex C.

The following group of people participated in the 9–10 September workshop: Martin Ådahl, Eva Alfredsson, Sofia Alroth, Anna Borgeryd, Henrik Carlsen, Alexander Crawford, Enrico Deiaco, Anders Ekbom, Klas Eklund, Hans Enocson, E. Anders Eriksson, Carl Hall, Karl Hallding, Petter Hojem, Benny Jansson, Mats Landén, Sara Lönberg, Susanne Lundberg, Malin Mobjörk, Åsa Nevestveit, Lars J Nilsson, Måns Nilsson, Kristian Skånberg, Hannes Sonnsjö, Göran Tillberg, Philippe Vandenbroeck, Oskar Wallgren, Urban Wästljung and Erik Westholm.

All of the participants in both workshops contributed in a personal capacity, and have therefore not been listed with their affiliations. The core research team would like to extend its warmest appreciation for the invaluable input provided from the two workshops, without which this study would not have been possible. However, the workshop participants and other contributors to this report are in no way liable for the outcomes of the study.

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The authors have worked collectively on this research and share responsibility for the final analysis, conclusions and views expressed in this report.

Stockholm, December 2012

On behalf of the team of authors,

Karl Hallding

Annex B: List of drivers

Score	Cluster Name	Driving Forces
14	Degree of trust/social contract	Degree of identification with nation state
		Degree to which have societies globally developed in cooperation or in conflict
		Extent of corruption
		To what extent will social media develop and contribute to new governance models?
		Perception of the Nordic social model
		How far trust in democratic institutions affects options for political intervention
		Social cohesion: ability to maintain trust?
		Level of trust in the political system (working towards public good)?
14	Distribution of wealth & economic power	Development of global power structure / concentration
		Extent to which income differences are allowed to keep increasing
12	Resource efficiency industrial metabolism	Extent to which production can be decoupled from consumption (extend the utility per production unit [circular economy])
		Degree to which economy is bio-based
		Extent to which nanotech radically reduces resource-consumption and transport demand
		Degree of reuse/recycling and prevalence of 'circular economy'
		Cost of non-fossil transport technology
		Prevalence of circular-economy thinking

Score	Cluster Name	Driving Forces
12	Availability of & access to fossil fuel	Role/level of subsidies in fossil vs renewable energy (degree of policy coherence)
		Degree of accelerated extraction of fossil deposits
		Political stability in major oil exporting countries
		Development of unconventional fossil fuels (shale gas, etc.)
		Hydrocarbon depletion
		Price of natural gas
		Whether peak-oil becomes plateau-oil (or not...)
12	Energy productivity	Access to energy services (high-quality, cheap, abundant) (amount and quality)
		Per capita access to energy
		Price of energy
		Rate at which energy efficiency is achieved
12	Balance of state vs. markets	Degree of neo-liberal politics in the world
		To what extent is economic model (market-based capitalism) questioned? Alternatives?
		Role of nation state in relation to multinationals
		To what extent will representative democracy remain the prevailing governance model?
		Degree to which MNCs (or states) are providers of public goods
		Level of state involvement in governance of societal functions
11	Ecosystem stability	Extent to which crumbling ecosystem services reduce global productive capacity
		To what extent do concentrations of 'substances' affect productivity (+/-) in ecosystems and their services? Will good/bad chemical cocktails (e.g. pollution) or a second green revolution win the race?
		Ecosystem stability

Score	Cluster Name	Driving Forces
11	Investment in robustness of technological progress	Degree to which US and BRICS pursue low-carbon investment Investment, subsidies and technological development Extent to which businesses have incentives to contribute to sustainable development Level of geo-engineering deployment Degree to which fossil fuels can be cleaned by CCS How many governments and businesses can finance green R&D Extent of focus on development through technological change (R&D -> innovation)
11	Prevailing norms & values	Political role of religion Culture 'storytelling' -> norms (what stories will prevail?) The level of new 'tribal loyalty' Extent to which OECD citizens accept the idea of 'happy de-growth' How do people value prosperity? Importance of virtual experiences vs real life (playing WoW instead of in the woods) Degree to which the consumerist model of the West spreads: to what extent can we help non-OECD countries not to replicate mistakes?

Score	Cluster Name	Driving Forces
		Shifting values towards nature and religion; how will we make people care?
		Reactions to change (policy vs grassroots)
		Human-nature relationships in the Anthropocene age
		The degree to which people react to 'Churchillian cooperativeness' and bear the burdens of change. Will change will be perceived as negative by most?
11	Impact of climate change	The visibility of climate change-related impacts
		Level of concrete GDP impact from climate change
		Weather patterns
		Degree of Arctic melt
		What level of climate change are societies facing in 2050?
		What level of climate change has occurred?
		To what extent is society managing the increasing variability of weather patterns?
10	Shifts in global power structures	Vulnerability of resource-rich but poor countries/regions
		Extent of democratisation in China
		Degree of new dependencies linked to trade in renewables
		Development of BRICS, especially Russia (energy) & China (consumption)
		Penetration of Confucian values into the West
		Geopolitics: Asian power use?

Score	Cluster Name	Driving Forces
		The degree of RMB (Chinese currency) internationalisation
10	Degree of coordination of global climate policy	Extent/scope of climate negotiations
		Is a global carbon tax introduced? (Yes? No? At what price?)
		Degree of global climate policy coordination (e.g. UNFCCC success)
		Development of US attitudes to the environment (e.g. climate change)
		Level at which climate change is seen as beneficial/detrimental by countries
		Number of countries that adopt CO_2 taxes of any type
		The degree of participation in, and compliance with, international environmental codes/treaties, etc. on a global level
		Global average of CO_2 price
9	Prevalence of overt conflict	Global land scarcity affecting world conflicts
		(Growing) number of resources-related overt conflicts
		Extent of conflict in MENA
		Extent of conflict in East Asia

Score	Cluster Name	Driving Forces
9	Prevalence of discontinuities & tipping points	What tipping points are societies facing?
		Frequency and intensity of terrorist acts
		Interval between globally disruptive events (e.g. financial, debt)
		What tipping points have occurred?
9	Food security	Degree to which waterless agriculture is developed and deployed
		Blue water productivity in agriculture
		Food productivity and logistics (how far can we transport food?)
		Alternatives to current fertilisers (phosphorus, nitrogen)
		To what extent will overexploitation of land increase?
		Degree to which people can grow their own food if they wish to do so
9	Fate of globalisation	Fate of globalisation
		Free trade vs trading blocks
		Economic growth
		World currencies and monetary policy (consensus? Currency wars?)
		Level of re-regionalisation of the global economy
8	Liveability of Cities	Extent to which urbanisation affects need for energy and depletion of natural resources
		Willingness to live in polluted areas (in exchange for economic prosperity)
		To what extent will the current prevailing urbanisation model persist?
		Liveability of cities
8	Extent of decentralised resilience	Extent of decentralised resilience
		Emergence of local energy entrepreneurs
		Efficiency and value-added of small-scale production systems
		To what extent will RES-based local production of electricity achieve grid parity?

Score	Cluster Name	Driving Forces
7	Ability to manage complexity	To what extent is decision-making long-term and holistic?
		Perception of Western 'linear' thinking vs Eastern 'circular' thinking
		Ability to manage democracy as complexity increases
		Systems complexity affecting possibilities to govern global affairs
6	Access to freshwater	Degree to which people have access to drinking water
		Cost of desalination
6	Viability & stability of global financial system	Levels of debt/capital created by central banks
		Ability to safely 'disarm' financial expectations of a much larger future
		Whether the financial system is reformed if we manage to control the total amount of money/debt
		To what extent the financial system will provide secure payments, credits, pensions to everyone or only to 'safe customers'
		Extent of major disruptions to public finances (especially pensions and benefits)
5	Cohesiveness of the EU	Degree to which European political and economic integration deepens
		Cohesiveness of the EU
		EU as a cherry or a melon? (Decentralised or centralised)
5	Level of global governance	Development and stability of global governance (i.e. UN, WTO, World Bank and institutions)
		Whether we create global democratic institutions (the development of voice)

Score	Cluster Name	Driving Forces
4	Cost of alternatives to fossil fuels	Degree of penetration of low-carbon technology in energy systems
		Successful development of fusion energy (or not)
		Power distribution technology breakthroughs (smartgrids, cables, etc.) and storage
		Energy technology breakthroughs in (non-fossil) power generation (new nuclear, large-scale solar, small-scale solar, etc.)
		Disruptions to nuclear power (accident, storage, etc.)
4	Knowledge Base for a Green Economy	To what extent can we return to 'affordable' ratios of energy return on energy investment, or how will EROIs evolve?
		Level of total supply-chain analysis and production costs included
		Ability to assess profitability of fairly long-term investments (industry, government, infrastructure, etc.)
		The development of the formal economy versus the informal economy
		Degree of access to information on environmental impact
		Extent to which action is taken on the knowledge of global scarcities and inequalities
		Degree of 'off-the-grid' internet movement/engagement/development of information flow
3	Availability of cheap buffers of labour & materials	Development of Africa (availability of cheap resources and labour)
		Breakthrough in non-terrestrial resources extraction
		Availability of low-cost labour and resulting capital-labour balance

Score	Cluster Name	Driving Forces
2	Impact of migratory patterns	Extent of conflict between 'indigenous' and 'new' populations in Europe
		Extent of migratory flows globally
		Migration patterns
2	Changing consumption patterns	Volatility in market prices of commodities
		Cybercultures leading to dematerialisation?
		Role in economy for non-material growth
		View on cars and use of public transport (what is freedom?)
		Relative prices of lowest level of Maslovian pyramid
		Changing age structure and its impact on consumption and production patterns
2	Role of women	Degree of women's liberation affecting the development of a green economy
		Development of gender equality
1	Population pressure	Number of children per capita (birth rate)
		Degree of growing population pressure
		Impact of demographic shift globally and in different regions/countries
1	Development of health & disease	Health and infectious diseases (e.g. impact of, preparedness for)
		Diseases and viruses at global scale
		The development of antibiotics affecting world health and life expectancies
0	Changing work / employment models	The extent to which young people believe they will have a job, or can create their own
		To what extent will the prevalent form of employment models change?
0	Availability of access to social services	To what extent will healthy ageing be ensured?
0	Securitisation of resource & technologies	Role of specialty raw materials (e.g. ree, coltan)
		Extent of securitisation by nation states of strategic resources and technologies

Annex C: Wind-tunnelling of green economy policy options

Policy area / policy	S1 Glocal Citizenship	S2 Global Governance	S3 Return to Geopolitics	S4 Big Business
Planning and policy process				
Make the finance department accountable for green economy (sustainable development) incl Develop green national accounts including conumption based accounts	+	++	++	+
Ensure policy coherence from a green economy perspective	+	++	++	+
Set targets for e.g. CO2 neutrality in national and municipal planning instrument	+	+++	+	0
Develop stronger interface btw gov't and science (incl. natural science), business, civil society	++	++	+	++
Implement integrated sustainable urban and regional planning	++	++	+++	+
Provide more leway for municipalities to pursue green urban development and local metabolism	+++	++	++	++
Economic policy				
GREEN ECONOMY REFORM	++	+++	+++	+
- Public finance for green investment	+	++	++	+
- Tax shift (technology neutral): Set long term predicable (legally binding?) path towards internalisation of externalities	+	++	++	+
-- energy tax	0	+	++	0
-- CO2 tax	+	++	++	+
-- Environmental tax	+	++	++	+
-- Resources tax	0	+	++	0
-- Reduce taxes on labour and services	+++	++	++	++
- Targeted (technology specific) green economic policy	+	++	++	+
- Border tax adjustments	--	--	++	--
CIRCULAR ECONOMY REFORM (Recycling waste to value, producer responsibility, regulations on wasting resources)	++	++	+++	+

Policy area / policy	S1 Glocal Citizenship	S2 Global Governance	S3 Return to Geopolitics	S4 Big Business
Innovation Policy				
Support system level innovation and research: Coordination and integration of policies to avoid fixed areas and limited sectors	0	+++	+	0
- Encourage "skunk-works". i.e. Focused subsidies to research areas we know little of	++	+	+	++
- Support transition from small-scale projects to market oriented products	++	+	++	0
Public procurement: Government as the 'first costumer'	+	+	+	+
Set stronger environmental standards and regulations (set pathways for phasing out)	+	++	-	++
- Development of de facto industry standards	++	++	--	+++
Infrastructure and energy policy				
Expand and valorise share of renewables in Sweden's energy mix	+	++	++	+
Expand grid-based electrification of transport infrastructure	++	++	++	++
Expand energy and resource efficient built infrastructure	++	+++	+++	+
Safeguard capacity to finance countryside critical green infrastructure	++	+	+	+
Social policies				
Active labour policies as enabler of innovation and transition "Green flexicurity" and/or "Green Nordic model"	+	++	++	+
Stimulate diversity of creative forces in the social fabric ("Green" Richard Florida)	+++	++	++	++
Increase "green" reform pace of education system, incl both elite and general levels	++	++	++	++
Alliance building policies				
Pursue opportunities for different coalitions of the willing (nation states)	+	+++	+++	+
Pursue opportunities for different coalitions of the willing (multi actor networks)	+++	++	++	++
Focus on EU as main avenue for alliance building	++	++	0	+

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Presentation of the Commission on the Future of Sweden

The Commission on the Future of Sweden was appointed by the Government in November 2011. The aim of the Commission is to identify the important social challenges that Sweden will face in the longer term and to contribute to a more future-oriented debate. The Commission's conclusions will be presented in a report to be published in spring 2013.

As part of the Commission's work, four future-oriented inquiries are being conducted, focusing on the following areas: (1) demographic trends; (2) integration, gender equality, democracy and participation; (3) sustainable growth in the age of globalisation; and (4) justice and cohesion.

A number of reports have also been commissioned to highlight various issues of relevance to Sweden's future social challenges. This is one of these reports.

Prime Minister *Fredrik Reinfeldt* chairs the Commission on the Future of Sweden, and the principal secretary and administrative director is Professor *Jesper Strömbäck*. The other members of the Commission are:

- *Jan Björklund*, Minister for Education
- *Göran Hägglund*, Minister for Health and Social Affairs
- *Annie Lööf*, Minister for Enterprise and Energy
- *Viveca Ax:son Johnson*, Chair of the Board of Directors, Nordstjernan
- *Klas Eklund*, Senior Economist at SEB and Adjunct Professor

- *Helena Jonsson*, President of the Federation of Swedish Farmers (LRF)
- *Eva Nordmark*, Chair of the Confederation of Professional Employees (TCO)
- *Mernosh Saatchi*, CEO, Humblestorm
- *Johan Rockström*, Professor of Natural Resource Management
- *Lars Trägårdh*, Professor of History
- *Pekka Mellergård*, Vice-Chancellor and Associate Professor
- *Stina Westerberg*, Director-General, Music Development and Heritage Sweden

Sweden in a World of Growing Uncertainties

Over the past few years, the notion of a 'green economy' has gained a significant foothold in the scientific and public debate. In policy terms, it involves the systematic incorporation of environmental considerations into the heart of economic decision-making – and, by extension, into the heart of modern society.

How can Sweden transform into a green economy? The answer depends on what form the future takes. In a globalised world, policy-makers are influenced by what happens beyond Sweden's borders. Will the future prove more or less favourable to a green transformation? The aim of this report is to explore how global uncertainties affect the possibility to move towards a green economy. The report draws up four different scenarios in order to test policy options and strategies and tries to answer the following question: considering critical global trends, rising uncertainties and the widely acknowledged need for innovative new strategies, what mix of green economic policy options provides the most promising opportunities for Sweden in the coming half-century?

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