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For sustainable energy

Policies for the future

2011 Assessment of country energy and climate policies

Executive Summary

World Energy Council

Project Partner

OLIVER WYMAN



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Executive Summary

To provide energy systems that are simultaneously affordable, stable and environmentally sensitive is the universal aspiration. If the enabling policies are to gain acceptance, promote investment and secure our energy future, they should be built on transparent dialogue that is explicit about the trade-offs between multiple goals, time periods and participants, necessary to overcome this ‘energy trilemma’.

The earthquake and huge tsunami at the Fukushima Daiichi nuclear power plant, Japan, in March 2011, has re-invigorated the debate on how to meet the world’s growing demands for energy.

The challenges are numerous. Energy must be accessible and affordable, contribute to the well-being of people and the environment, and enhance economic growth now and for the future. Policymakers must accommodate these multiple requirements while reducing the carbon intensity of energy.

Three dimensions of energy sustainability

The World Energy Council (WEC) definition of energy sustainability is based on three core dimensions—energy security, social equity, and environmental impact mitigation. The development of stable, affordable, and environmentally sensitive energy systems defies simple solutions. These three goals constitute a ‘trilemma’, entailing complex interwoven links between public and private actors, governments and regulators, economic factors, national resources, environmental concerns, and the behaviours of individuals.

Energy Sustainability Dimensions

- ▶ *Energy security.* For both net energy importers and exporters this includes the effective management of primary energy supply from domestic and external sources; the reliability of energy infrastructure; and the ability of participating energy companies

to meet current and future demand. For countries that are net energy exporters, this also relates to an ability to maintain revenues from external sales markets.

- ▶ *Social equity.* This concerns the accessibility and affordability of energy supply across the population.
- ▶ *Environmental impact mitigation.* This encompasses the achievement of supply- and demand-side of energy efficiencies and the development of energy supply from renewable and other low-carbon sources.

The World Energy Council’s 2011 *Assessment of country energy and climate policies* report explores the energy challenges facing policymakers and energy-industry executives.

First, the report presents the Energy Sustainability Index. The Index ranks WEC member countries in terms of their likely ability to provide a stable, affordable, and environmentally sensitive energy system.

Second, this year’s report focuses on three themes related to the pursuit of energy sustainability and associated policies: addressing the demands of energy and mobility; pursuing energy efficiency; and implementing innovative financing mechanisms for the maintenance and replacement of existing infrastructure and the development of new energy infrastructure. The analysis was supplemented by the perspectives of energy-industry executives and WEC member committees, captured through surveys, direct interviews, and meetings.

Figure 1
Energy Sustainability Index leaders (by economic groupings)

Source: Multiple (IEA, EIA, World Bank, IMF, WEF etc. 2009-2010)

GDP/capita (USD)		> 33,500	14,300 – 33,500	6,000 – 14,300	< 6,000
Positioning	1	Switzerland	France	Colombia	Philippines
	2	Sweden	Japan	Latvia	Indonesia
	3	Germany	Spain	Brazil	Swaziland
	4	Canada	Finland	Mexico	Cameroon
	5	Norway	Italy	Albania	Sri Lanka

Black font = net energy importers. Blue font = net energy exporters

Energy Sustainability Index

The Index displays the aggregate effect of energy policies applied over time in the context of each country. It is based on an empirical analysis of a range of indicators that reflect the three goals of energy sustainability. These include energy performance indicators across the WEC energy-sustainability dimensions, and contextual indicators that reflect the broader political, social, and economic circumstances of the country. Figure 1 shows the strongest performers in the 2011 Index.

The Energy Sustainability Index (see Appendix) highlights that all countries face an imbalance amongst the three dimensions of energy sustainability. As countries develop and economies mature, they make choices that tend to strengthen or trade-off one or two dimensions against the third. Despite differences in resource endowment and market structure, leading countries, mostly mature economies, show low energy-demand growth and robust policy environments. These are supported by well-established energy-efficiency programmes, and a balance between affordable energy and pricing that enables investment.

Sustainability therefore involves a shifting balance of trade-offs between the three dimensions of energy sustainability with no single 'silver bullet' formula. Each country must determine its balance, taking into consideration its needs, public acceptance, and key externalities.

Takeaways on the Energy Sustainability Index

- ▶ Policy choice is a key discriminating factor of energy performance.
- ▶ High-energy resource endowment does not necessarily result in long-term energy security. This is also dependent on economic, social, and environment choices.
- ▶ National resources, wealth, and contextual performance are not the dominating factors driving country energy-sustainability performance. When it comes to policy implementation to support energy sustainability, each country needs to determine its unique trade-offs.
- ▶ Energy security can change quickly in the short-term through minor policy adjustments, but long-term energy security can also be eroded by the implications of strategic decisions, such as over-reliance on energy commodities, lack of diversification of energy assets, and lack of energy autonomy.
- ▶ Social equity and efforts to mitigate environmental impacts, based on policy signals or energy-regime developments, often require several years to take effect.

Policy analysis

The energy system is the source of approximately 60 per cent of total current greenhouse gas (GHG) emissions. The report therefore focuses on policies relating to three critical issues where governments are able to take decisive steps to meet and dampen rising energy demand while working to limit the growth in CO₂ emissions. The policies studied this year are driving changes in mobility patterns and associated energy use, encouraging energy efficiency, and supporting innovative financing mechanisms for much needed energy infrastructure.

Mobility and energy

The mobility and transport of goods and people is critical for economic development and social cohesion. Passenger transportation represents the largest proportion of world transport fuel consumption, and by 2035 it is predicted to consume 90% of the world's total liquid fuel consumption. Transport is the fastest-growing source of global carbon emissions¹ and is responsible for a range of social and environmental problems, including local air pollution, noise, road congestion, and accidents. As the global population increasingly clusters in urban centres, sustainable urban mobility represents a key target of energy policy.

¹Transport accounted for 18% of global carbon emissions in 2009 and 13.5% of global GHG emissions. Transport emissions increased at an average of 1.6%/year between 1990 and 2008.

The reviewed policies highlight the importance of a long-term economic and social vision for sustainable transport. Private vehicle ownership is still the preferred mode of transport for many people—and in some situations the only option for effective mobility. Reducing CO₂ emissions from transportation will require important policy choices, significant investment, and changes in behaviour. The neglect of public transport can encourage the development of car-dependent infrastructures and adoption of lifestyles that can be very difficult to reverse. Government policies can positively influence oil consumption in road transportation by applying efficiency standards, promoting efficient technology, and giving incentives for desired consumer behaviours.

The policies reviewed demonstrate that it is possible to design transport and mobility policies that make a real contribution to environmental and social objectives. Above all, it is essential to supply integrated packages of mutually supportive measures focusing on user convenience, so as to increase the appeal of sustainable transport infrastructures. Similarly, consultation and collaborative dialogue with the public and private sectors are essential for building public support and facilitating behavioural change.

Energy efficiency to optimise resources

Energy efficiency is widely recognised as a key mechanism to achieve progress towards a lower-carbon economy. Energy efficiency can also contribute to social equity by reducing energy prices and increasing energy availability. Promoting energy efficiency is widely viewed as being the

largest, cheapest, and fastest option for tackling key energy problems, and many solutions are available already.

But challenges remain. Energy efficiency can be expensive and entail transaction costs that are hard to measure and reduce. Attracting financing for energy-efficiency initiatives and encouraging consumers (residential and industrial) and energy suppliers to adopt existing solutions is one of the biggest challenges facing energy policymakers—especially when the payback periods are long. An associated challenge is the evaluation of the effectiveness of expenditure on energy efficiency. Measurement and verification techniques are essential tools when complex and variable systems are involved.

Moreover, it is essential to assess and include the rebound effect on efficiency programs as part of the policy design. A recent study by the European Union highlighted that as much as 30% of the gains from energy efficiency are lost because the savings are put back into energy-consuming activities. For example, more efficient automobiles result in people driving longer distances, which means there will be very little improvement in the total amount of energy used and CO₂ produced.²

The energy-efficiency policies examined in this report underscore the need for policymakers to consider consumer (and corporate) behaviour as much as technologies. Successful policies apply a combination of information, awareness, and incentive programmes to overcome market and

non-market barriers to implementing energy-efficiency mechanisms. Energy-efficiency policies must evolve over time to ensure initial achievements can be sustained, reflecting the development of technology and markets. Finally, policymakers must be mindful of rebound effects, in order to ensure energy savings in one area (e.g., personal transport) are not undone by increased energy use elsewhere—either by direct (e.g., driving more and further) or indirect (e.g., increased consumption of goods) energy use.

Financing energy infrastructure

Approximately 1.4% of global GDP will need to be invested each year in energy-supply infrastructures to 2035 to meet growing demands and increased energy access in developing countries.³ Our report examines a range of financing instruments that address these challenges, as well as the issues involved in maintaining existing supply infrastructure, ensuring the reliability of supply, and promoting the development of new low-carbon energy infrastructure.

The analysis highlighted the fundamental importance for investors of well-defined and stable energy policies with reasonable predictability of financial outcomes over several decades. Governments and public bodies play an important role in designing and implementing rules and supporting the necessary range of market and financing arrangements to stimulate investment. Indeed, through policy stability, effective

² Addressing The Rebound Effect, April 2011, Global View Sustainability Services (GVSS)

³ World Energy Outlook, 2010, International Energy Agency (IEA)

communication, and well-defined roles and responsibilities, governments can reduce the risks of regulatory change and other policy-driven investment uncertainties which otherwise may inhibit investments. This, in turn, will optimise the private sector's ability to bring forth capital in public/ private partnerships.

Finally, both industry and government must engage in dialogue with citizens to ensure that the public funding of energy infrastructures, energy efficiency, and the transition to low-carbon energy systems is sustainable, equitable, and credible.

The key messages for policymakers from the *2011 Assessment of country energy and climate policies*, which cut across all policy areas, are set out below.

Key messages for policymakers

Assess, communicate and manage policy trade-offs

- ▶ Energy policymaking is complex, with multiple objectives that cannot always be pursued simultaneously.
- ▶ Policymakers must be transparent and explicit about the trade-offs involved in a policy and about the rationales for the choices they make.
- ▶ The introduction of new policy instruments on top of existing policy instruments must be analysed in advance to avoid potential conflicts, redundancies, and policy failures.

- ▶ Policies must be continuously monitored to identify and address unintended consequences.

Address complexity and co-ordination across multiple jurisdictions and energy-policy domains

- ▶ Multiple levels of government are involved in aspects of energy policy, each with its own responsibilities, competences, and opportunities to contribute to sustainable energy policy.
- ▶ To achieve policy objectives co-ordination is needed across at least three dimensions: policy instruments, jurisdictions, and local, regional and national government levels.

Adapt 'best practice' policy instruments:

- ▶ Dialogue with international energy-policy experts, policymakers, industry, and stakeholders can provide reliable evidence on what works and possible pitfalls.
- ▶ Countries must translate global findings about successful policy instruments into local arrangements and settings.

Conclusion

It is estimated that energy demand will rise by 40% over the next 20 years, primarily in developing countries. The drivers include population growth, the enormous, on-going industrialisation process, the continuing relocation of industrial production to Asian countries, the expansion of transportation infrastructure, and the advancing affluence of a currently small, but fast-growing middle class in those countries. At the same time, an estimated 1.4 billion people currently lack access to electricity and 3 billion people rely on traditional biomass fuels for cooking, heating, and other basic household needs.⁴

Progress is being made towards a lower-carbon energy supply. For example, global investment in renewable energy in 2010 was a record \$211 billion, up 32% over 2009.⁵

However, much needs to be done in order to deal with the trilemma of energy sustainability. In developing stable, affordable, efficient, and environmentally sensitive energy systems, policymakers and the energy industry must address three critical tensions:

- Ensuring a stable regulatory regime that supports a large volume of capital, investments while allowing policy updates and revisions as necessary

- Driving changes in energy systems at a pace that may be faster than markets alone will support
- Stimulating an urgency to reduce carbon emissions and the policies to drive those changes, while building and maintaining support from consumers and citizens

The *2011 Assessment of country energy and climate policies* highlights the tremendous value of international dialogue about the pursuit of sustainable energy solutions. This is especially the case at this critical juncture in global policymaking, when hard choices have to be made and multiple benefits secured. Policymakers and industry must work together to design and implement broadly supported mechanisms to address energy sustainability in the near and long term. As its policy assessment work continues, WEC will look to facilitate such interactions among policymakers and the energy industry, aiming to deepen the current extensive exchange of ideas on the national, regional, and international levels.

The full report is available for download at: <http://www.worldenergy.org/publications>.

⁴ World Energy Outlook, 2011, International Energy Agency (IEA)

⁵ Global Trends in Renewable Energy Investment 2011, United Nations Environment Programme

Appendix: Energy Sustainability Index

Country data was brought together in an Energy Sustainability Index. This provided a snapshot profile of WEC member countries in terms of both the three dimensions of energy sustainability and the broader political, social, and economic context. Indicators were selected that had a high degree of relevance to the research goals, exhibited low correlation, and could be derived from reputable sources to cover a high proportion of member countries. These sources included the International Energy Agency, the US Energy Information Administration, the World Bank, the International Monetary Fund, and the World Economic Forum.

The structure of the Index and the coverage of its 22 indicators are set out in Figure 2. The index is

weighted in favour of the energy performance axis by a factor of 3:1, with the scores for each dimension carrying equal weight within their axis.

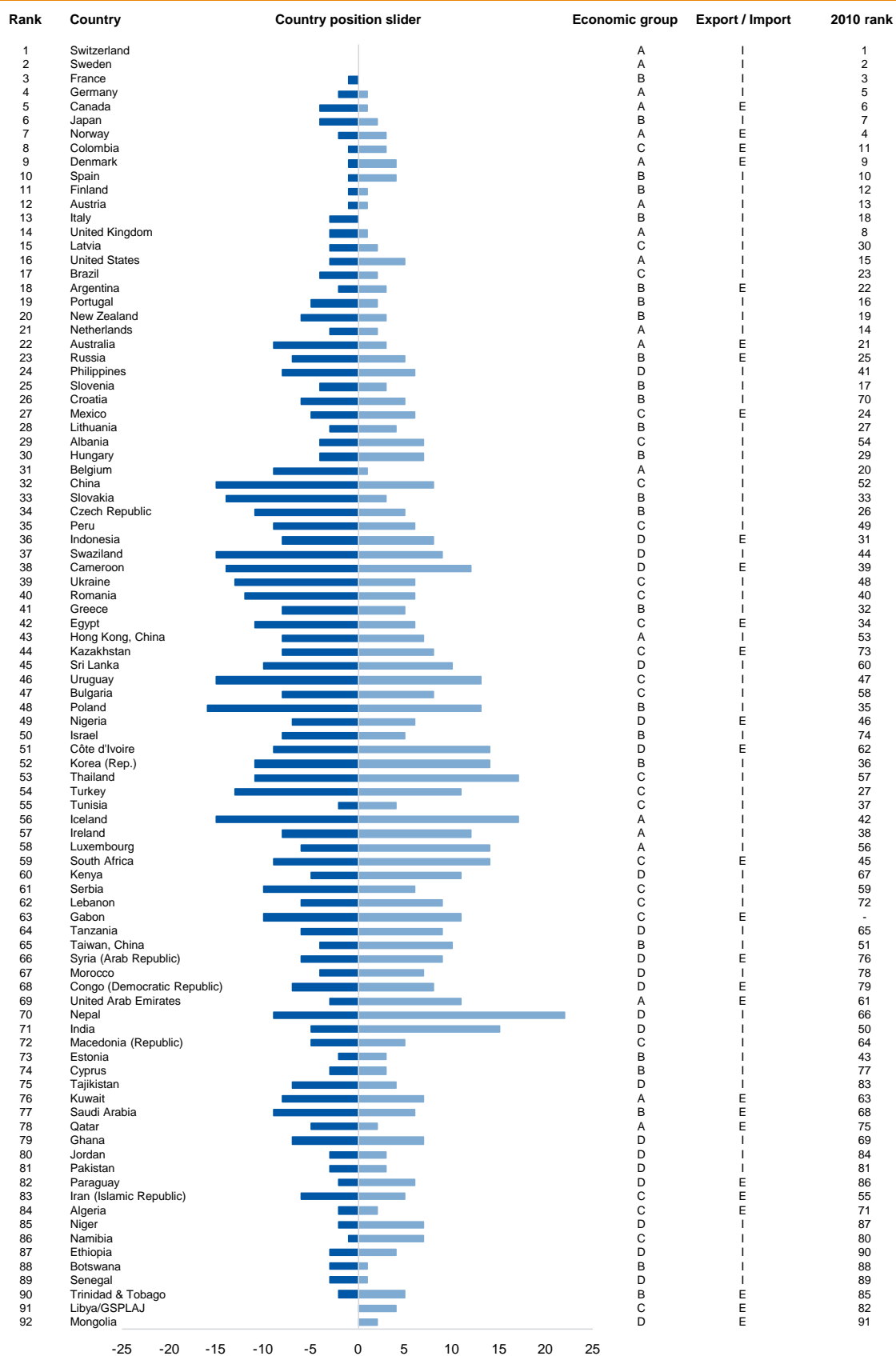
The 2011 Index is a continuation of the 2010 Index, with the methodology and approach unchanged. Where possible, all data has been updated to reflect the release of updated datasets and the datasets used are unchanged. However, the indicators ‘macro-economic stability’ and ‘education’, which were provided by the World Economic Forum, have undergone a minor change due to an alteration in one of the underlying component datasets. This will introduce a measurable artificial modification in country positioning for year-on-year comparisons.

Figure 2
Index structure and weighting

Axes		Dimensions	Indicators
Overall country result	1 Energy performance 75%	1 Energy security 25%	1. Consumption growth 2. Ratio of energy production to consumption 3. Wholesale margin on gasoline 4. Diversity of electricity production 5a Exporters - Dependence on and diversity of energy exports 5b Importers – Oil reserve stocks
		2 Social equity 25%	1. Affordability of retail gasoline 2. Affordability of electricity relative to access
		3 Environmental impact mitigation 25%	1. Energy intensity 2. Emissions intensity 3. Effects on air and water 4. Efficiency of electricity production
	2 Contextual performance 25%	1 Political strength 8.3%	1. Political stability 2. Regulatory quality 3. Effectiveness of government
		2 Societal strength 8.3%	1. Control of corruption 2. Rule of law 3. Quality of education 4. Quality of health
		3 Economic strength 8.3%	1. Macro-economic stability 2. Cost of living expenditure 3. Availability of credit to the private sector

Figure 3
2011 Energy Sustainability Index ranking

Source: Multiple (IEA, EIA, World Bank, WEF etc. 2009-2010)



Member committees of the World Energy Council

Albania	Iceland	Peru
Algeria	India	Philippines
Argentina	Indonesia	Poland
Austria	Iran (Islamic Republic)	Portugal
Belgium	Ireland	Qatar
Bolivia	Israel	Romania
Botswana	Italy	Russian Federation
Brazil	Japan	Saudi Arabia
Bulgaria	Jordan	Senegal
Cameroon	Kazakhstan	Serbia
Canada	Kenya	Slovakia
Chad	Korea (Republic)	Slovenia
China	Kuwait	South Africa
Colombia	Latvia	Spain
Congo (Democratic Republic)	Lebanon	Sri Lanka
Côte d'Ivoire	Libya/GSPLAJ	Swaziland
Croatia	Lithuania	Sweden
Cyprus	Luxembourg	Switzerland
Czech Republic	Macedonia (Republic)	Syria (Arab Republic)
Denmark	Mexico	Taiwan, China
Egypt (Arab Republic)	Monaco	Tajikistan
Estonia	Mongolia	Tanzania
Ethiopia	Morocco	Thailand
Finland	Namibia	Trinidad & Tobago
France	Nepal	Tunisia
Gabon	Netherlands	Turkey
Germany	New Zealand	Ukraine
Ghana	Niger	United Arab Emirates
Greece	Nigeria	United Kingdom
Hong Kong, China	Pakistan	United States
Hungary	Paraguay	Uruguay

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