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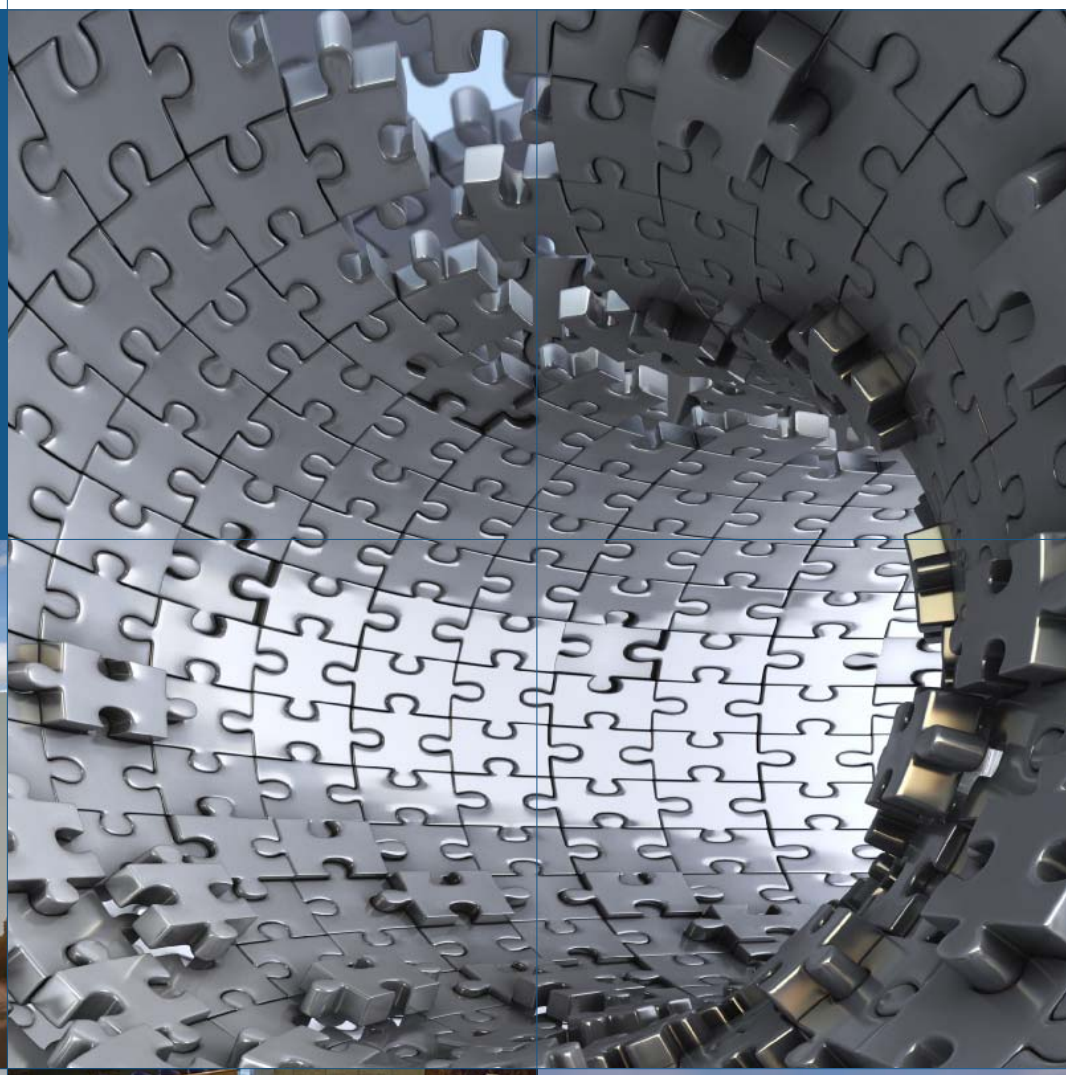
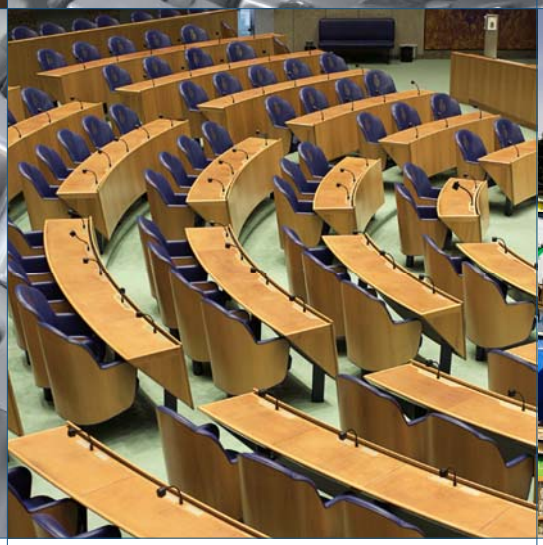
World Energy and Climate Policy: 2009 Assessment

World Energy Council 2009

Promoting sustainable energy for the greatest benefit of all





World Energy and Climate Policy: 2009 Assessment

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Foreword

The world has changed in recent years. Climate change is now at the forefront of the global agenda. But the economic crisis has tended to discourage efforts to tackle the climate threat. On the other hand, no-one is claiming any longer that the market can solve all our problems, and everyone recognises that public policies have a key role to play.

The crisis has had a major impact on energy issues.

Never has the world seen such a fast-moving crisis on such a global scale.

It has generated shocks across three levels for our sector:

- First, global demand. Declines of 2 percent for primary energy, 3 percent for oil and 3.5 percent for electricity are expected this year;
- Second, prices, with extremely volatile fuel and commodity costs;
- And third, investment capacity, primarily affecting smaller and medium-sized players.

Meanwhile, the three long-term energy challenges – climate, security of supply and inequality – are as urgent as ever, and even more daunting.

On the climate front: We have a limited CO_2 credit and we are on the verge of insolvency. As we pull out of the economic crisis we must ensure that we do not intensify the climate crisis.

The issue of security of supply is being further compounded by the downturn in investment. The economic recovery could cause fossil fuel prices to surge, and that in turn could potentially compromise long-term growth.

At the same time, the crisis is increasing inequality, widening the gap both within and between countries. Worse, climate change increases inequality since the poorest regions will be those hit the hardest.

Can we address the challenges that lie ahead without paying more attention to these inequalities? From an economic standpoint, the answer is no: inequality hinders development and depresses demand. Combating inequality is a way to foster economic recovery.

From an environmental standpoint the argument is no less valid: giving access to modern energy to the two billion people who live without it will reduce pollution locally. In addition, the faster and broader rollout of clean technologies via international support mechanisms will reduce CO_2 emissions.

The economic crisis underscores how the three challenges of climate change, security of supply and inequality are intertwined: we cannot resolve one without addressing all three. To my mind, and in the light of the crisis, tackling inequality is a central challenge.

We currently have the technologies to meet these challenges, and others are being developed. If they are to be rolled out as quickly and widely as possible to all countries; if we are to deploy them to

the poorest countries, and if the innovations are to be ready when they are needed, then we must have effective public policies.

Public policy will be essential in putting our energy systems on the path to clean growth.

In order to frame them, policymakers need outside advice more than ever before. It is in this light that WEC has produced its "World Energy and Climate: Policy: 2009 Assessment", outlining what we see as the four key priorities:

1. Long-term visibility

We need an agreement that is clear and long term, with specific commitments to either emissions reductions or effective public policies, depending on the country. Even if it means setting less ambitious targets, the priority will be to indicate clearly a far-reaching common path.

2. Effective design

National climate policies will need to be carefully designed to effectively minimise social and economic cost of CO_2 reductions, while retaining a sense of coherence at global level.

3. Better, more responsible governance

Across the globe, people will need to change their behaviour, not an easy thing to accomplish. There's a big difference between agreeing with a principle and making it part of our daily lives. In order for new policies to be successfully implemented, we must learn to listen, and in turn educate and explain, developing a sense of collective responsibility and fostering understanding and acceptance of new projects.

4. Controlling costs

Successfully putting our energy systems on a low-carbon pathway will be a challenging task, especially given the economic crisis. In the short term, we need to deploy mature low-emission technologies while also stepping up our R&D investments in tomorrow's technologies. We will need energy prices that reflect all investment, operating and environmental costs, including CO_2, while keeping firmly in mind the situation of the least well-off.

The crisis we face is an opportunity to make a genuine change in our mindsets and behaviour which will be key if we are to change the way we supply and use energy.

I am convinced that investing in a sustainable energy future will serve to re-energise the present.

It is our hope that this multi-year WEC Assessment will prove a valuable contribution to this transformation.

Pierre Gadonneix, Chair World Energy Council

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Executive Summary

The modern industrial world exists by virtue of its command over energy production, supply, transport, and use. Consumers around the world expect energy supply to be affordable, secure, clean, and available for all. This is desired by most local and regional jurisdictions, and especially by national governments, which implement them through a range of supporting energy and energy-related policies dealing with energy security, energy equity, and environmental impacts.

Of equal importance is the evolution of a complex energy industry to meet the many and diverse needs of all energy consumers. The industry, which has supported the economic growth of the last two centuries, is facing a number of profound transitions:

- A major shift in demand toward Africa, Asia, Latin America, and the Middle East;
- A possible "peaking" of conventional oil in the coming 10–20 years and of conventional natural gas before 2050;
- An urgent need to restrict the production of greenhouse gases and handle regional air pollution;
- A need for the rapid development of a low-carbon and/or carbon-free energy supply.

These transitions, which need to be completed in one to two generations, will employ a wide array of technologies, some new, and will need enhanced policies.

These policies must not only be respectful of the demands for more security, equity and a cleaner environment, but also need to address trade-offs between those goals, which may conflict.

Energy policy must be integrated over time, and regionally and globally for some issues such as regional security and climate change.

WEC believes that relentless improvement of government energy policies and industry practices are needed, and that this can lead to a material advancement in their capabilities to effectively handle these energy transitions. To enable this rapid change, WEC has launched a comprehensive, multi-year Assessment of Energy and Climate Policy, facilitated by the WEC's unique structure of almost one hundred worldwide national committees.

This report encapsulates assessment results across 88 countries. Identified are top division country performers in energy policy effectiveness, overall and by major objectives, and many examples of country best practices. Countries are grouped into clusters dependent on whether they are energy importers or exporters and the level of income per capita.

Top division country performers overall by cluster are as follows:

- High-income importers: Austria, Finland, New Zealand, Sweden, Switzerland, UK, and USA
- High-income exporters: Canada and Denmark
- Fast-growth countries: Croatia, Jordan, Latvia, Lithuania, Poland, South Africa, Thailand, and Tunisia
- Low-income importers: India, Philippines, and Sri Lanka
- Low-income exporters: Indonesia and Paraguay

Broad lessons from this assessment include:

1. Strong and effective government and business institutions are critical; they provide the underpinning for successful energy policy.

2. Governments must pursue clear, consistent, long-term-oriented policy objectives.

3. Public acceptance of energy policy is essential; understanding energy issues is a pre-requisite to acceptance.

4. Business plays a crucial role and must be involved with government as a partner.

5. Global cooperation between higher and lower income countries is needed; technology transfer is a key priority and needs international policies.

6. Policy design matters, based on efficient energy pricing and cost-effectiveness.

7. RD&D efforts have to be augmented and with cooperation between governments and between governments and industry.

Recommendations

These lessons point to a number of difficult dilemmas and trade-offs that policymakers face. To break through these dilemmas and make effective policy, the following is recommended for government, business, and other stakeholders:

Government

Government as a whole needs to accept and incorporate the size, scale, and pace of needed development in the energy sector and in related sectors. Government must also ensure that energy strategy and policy are commensurate with the necessary tasks. Leadership at the highest level is required, ideally, through a dedicated ministry run by a senior minister, responsible for leading major new energy and climate initiatives, and advised by other ministries as needed.

Effective energy policy needs strong, open and effective institutions.

This is a challenging time for government, business, and other stakeholders. More than ever before, the interests of all stakeholders must be as aligned as possible, in the interests of all.

Such a ministry must ensure that it has a workable and agreed-to long-term energy strategy supported by a planning machinery to progress towards short- and medium-term goals. Open and participative dialogue with all stakeholders is essential to building strong public acceptance for the resulting energy policy and plans. In particular, government needs to be receptive to business.

Long-term vision and public acceptance are essential.

Given the pace and scale of likely energy developments, more effective approaches to gain local public acceptance for siting large projects and infrastructure are needed. For example, open, community-wide discussion and the lessons derived from such discussions should be applied to "zoning" to pre-approve energy projects.

Business

Business has a very valuable contribution to addressing global energy issues, given that many large energy companies operate in a wide range of jurisdictions. There is a special role to be played in collectively advising and shaping global energy policy that reflects the realities of experience gained in a wide range of countries.

Business must be involved with government as a partner.

Business needs to engage openly and constructively with all stakeholders, without special pleading. In particular, business has to actively play its part in securing public acceptance of new projects.

Other Stakeholders

Other stakeholders – a diverse group including civil society, various associations, political parties, the media, and the public – should recognise the critical importance of making intelligent and timely policy, because energy is essential to our collective future.

Cost effectiveness and efficient markets are important to an effective energy policy.

A veto from any group should be avoided. However, the fractious nature of collective energy and environment policy can make this difficult. Thus, appropriate mediation may be needed to strengthen cooperation.

Comments on this report are welcome and should be directed to assessmentstudy@worldenergy.org.

1. Introduction

There is an urgent need to explore, understand, and communicate the components of successful energy policy. A large portion of the world's population still lacks reliable and affordable access to modern energy. Despite a considerable effort to address this, there is still much to do. Emerging energy transitions are creating a turbulent environment for the energy industry that is testing governments and business from the local to the international level. Shifts in energy demand are taking place faster than expected, challenging existing infrastructure and suppliers, and driving energy price volatility. This is exacerbated by concerns over possible longer-term supply constraints to conventional oil and gas supplies, and the geographical distribution of these resources. To add more urgency, the financial crisis and its uncertainties makes the situation even more volatile. Looming over everything is the increased urgency attached to tackling greenhouse gas emissions, the major driver of climate change.

The cumulative effect of these challenges underscores a number of phenomena:

- Energy prices. In the last year, crude oil has more than doubled in price and subsequently declined in price to less than half its peak.
- Deep concern among energy consumers. In many countries, the high cost of energy has caused deep concern by consumers.
- Possible economic dislocation in countries. Higher oil and gas prices have severely affected the budgets of the poorer oil-importing countries, in some cases leading to political difficulties. High energy prices are a major contributor to inflation, putting particular pressure on the poor.
- Greater emphasis on energy security. The uncertainties around future energy supply in a world of higher energy prices have raised concerns about security in many energy-importing countries.
- The increased role that governments have in relation to energy. The global nature and magnitude of these transitions, with increased annual investments estimated as high as one trillion US$, has highlighted the essential role of governments in providing adequate frameworks for energy decision making and action. For example, governments need to enable and even fast-track new investments in energy infrastructure and facilities in the face of public local and regional groups who do not want these facilities on, or to pass across, their lands.

We know some of the features of effective energy policy. For example, open, well-designed, competitive, and regionally integrated energy markets are important for supplying energy at efficient prices. We also know that the role of markets, particularly in network-based industries such as electricity generation, transmission and distribution, is intricately enmeshed with legislative and regulatory actions. In addressing climate change and energy security externalities, a mix of market-based instruments, for example, taxation or allowances trading, are needed

The goal of this assessment is to accelerate the global achievement of energy equity, security, and environmental sustainability by sharing good policy and its practices.

alongside government-based instruments, such as regulation and standards.

Why an Assessment is needed

Energy policy is strongly shaped and influenced by particular national and even regional situations. Thus, lessons from a country's energy policy and practices are less useful by themselves in formulating policy for other countries, and indeed the entire globe. At the same time, as WEC's recent energy scenarios[1] concluded, there is no one ideal policy or suite of policies. Not attempting to learn from the practices of others, bearing in mind the scale and speed of the needed energy transitions, is irresponsible. This is consistent with the call in WEC's energy scenarios for unprecedented levels of cooperation and integration.

The list of critical questions is daunting. How should policymakers best balance their responses to today's energy challenges with those of tomorrow's? How can the private, public, and citizen sectors work together more effectively to respond to these challenges – and keep driving forward the necessary changes? What are the best examples of public policy, regulation, market mechanisms, business strategies, and financial instruments needed to create energy supply and demand patterns that that can best eliminate energy poverty, ensure energy security, and achieve energy sustainability?

Energy businesses are increasingly global in nature, requiring a global perspective in investment decisions and technology choices, but energy policies are predominantly made at the national level. Thus, a gap has to be bridged at a time when significant investments are needed to ensure security of supply and to meet global environmental challenges. This Assessment can help bridge this gap by contributing to more consistent and coherent energy policies across nations, and by ensuring that energy businesses receive timely, clear, and stable policy signals from governments to invest in new technologies, infrastructure, and products. Governments and their constituents need assurances from business and financial markets that security and sustainability challenges can be realistically met, while maintaining healthy regional and global economies.

WEC believes that a new approach to the assessment of national energy policy and practices, built around an appropriately designed methodology, provides a valuable catalyst for finding answers to such questions and for accelerating solutions to emerging energy transitions.

Why WEC is uniquely qualified

WEC is the world's foremost multi-energy organisation. Established in 1923, it covers all types of energy – coal, oil, natural gas, nuclear, hydro, and renewables, as well as energy carriers such as electricity, and end-uses, such as transportation. WEC has member committees in nearly 100 countries, including the largest energy-producing and energy-consuming countries. These

[1] http://www.worldenergy.org/documents/scenarios_study_online_1.pdf

countries cover the widest variety in terms of natural resources, constraints, energy systems, level of industrialisation, and institutional and governance forms. Many of the member committees have a longstanding practice of collaboration at regional and continental levels. Collectively, WEC member committees have a unique understanding of energy policy and practices and a tradition of sharing their results. WEC's member committees reflect the thinking of people working in policymaking and implementation worldwide, drawn from industry, government, academic, and non-governmental organisations (NGOs). In line with WEC practice, this Assessment is a Bottom-Up exercise, drawing on WEC's country committees and their members, ensuring an on-the-ground foundation for the Assessment. WEC members are at the forefront of formulating and implementing energy policy and practices in their countries, and have major responsibilities in finding new pathways for the energy industry.

Scope of the Assessment

Many examples of national assessments focus on the relative effectiveness, attractiveness, or competitiveness of a nation's policy and practices in specific areas. For successful assessments, a number of requirements must be met:

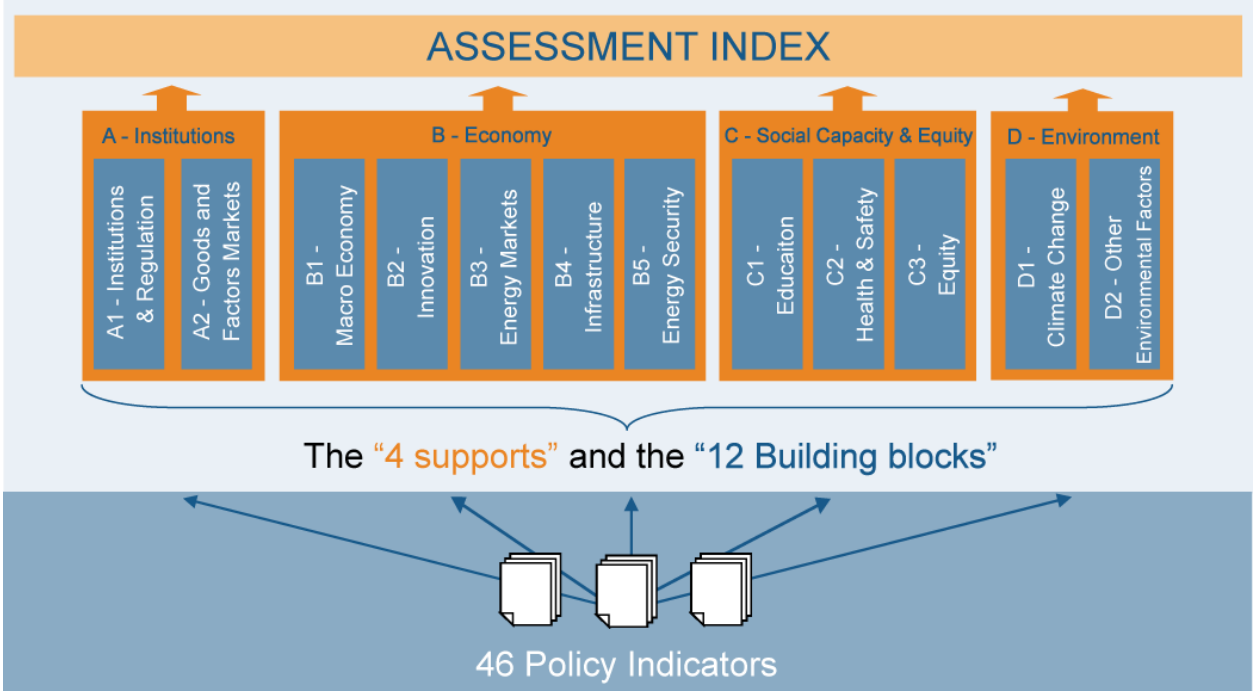
- A compelling and thoughtful structure to the analysis and assessment.
- A recognition that factors indirectly shaping performance (foundational or enabling factors) are as important to outcomes as those factors that directly shape performance.
- Adequate identification and collection of new primary and available secondary data.
- Sufficient quality assurance of the analysis and assessment.
- Transparency and wide communication of results, and engagement with all those interested in the assessment.

In WEC's Assessment, each country's policy effectiveness is analysed according to four areas, or Supports: institutions, economy, social capacity and equity, and environment.

Data collection is facilitated by WEC member committees, through alliances with international institutions, such as the International Energy Agency and national energy institutes. Quality assurance is strengthened by a Committee of Experts and WEC member committees working with study teams. The goal is a fully transparent assessment, ensuring widespread engagement with all relevant stakeholders, including the public.

This Assessment focuses predominantly, but not exclusively, on the present and interprets historical developments. Future work will likely take trends and changes more into consideration.

Figure 1-1
Structure of the Assessment showing the relationship between the 46 Policy Indicators, 12 Building Blocks, and the 4 Major Supports.



Methodology and Implementation

The methodology consists of two parts:

- An evaluation of existing national policies, regulations, and standards, in general as well as for energy in particular, and their effectiveness in energy practices. This is related to the overall capability of a country to develop and implement energy policy and practices, based on a broad range of indicators (currently 46) from publicly available data. These are shown in Table A1-1 in Annex 1.

- An analysis, based on feedback from WEC members, of specific energy policies within a country, and how they have worked or are working in practice. Included in the analysis is a compilation of key lessons from the country responses.

Evaluative Indicators

Central to the process are indicators measuring the extent to which a country has the broad attributes in place to achieve the goals of energy sustainability, especially in terms of energy equity, energy security, and environmental compatibility. These indicators are important, not necessarily in identifying best energy practices themselves, but in that they indicate which countries and policies should be examined as to their effects. Combined, these indicators produce an Assessment Index built around building blocks and four major supports as shown in Figure 1-1.

The four supports measure the capacity of a country to design and implement high-quality policy and practices, the strength and flexibility of the economy, the performance in addressing energy security (of both demand or supply), and the condition of the environment.

The four supports are composed of at least two building blocks each for a total of twelve. For example, the Economy Support is composed of five building blocks, which measure the health of the economy, strength of innovation, robustness and efficiency of energy markets, capital formation for investment, quality of underlying infrastructure, and overall energy security. All told, some 20 separate indicators provide the basis for this building block. Explanations and sources of data are given in Table A1-1 in Annex 1.

Each building block is defined by a set of relevant indicators (see Annexes 1 and 2 for details on both building blocks and indicators). All of the data are sourced to international institutions, national statistical organisations, and national energy institutes. All data have been validated by the relevant WEC member committee. The question of relative weighting of indicators arises. The results obtained using Principal Components Analysis (PCA)[2] and experts to determine the weights using the Analytic Hierarchy Process (AHP), compared with equal weighting, were very much the same. For this first Assessment equal weighting was used. This will be examined in ongoing Assessments.

Analysis

A detailed review of leading country energy policy instruments was then carried out based on feedback from WEC member committees. This was aimed at identifying those policies which contribute most to the indicated effectiveness of a country's energy policies, thus informing the debate over whether certain types of policies allow countries to achieve their energy goals.

The analysis of policy instruments also highlights the 'trade-offs' between the different objectives and elements of energy policy. In fact, effective energy policies have to simultaneously reconcile economic, social, environmental, and institutional objectives, as well as deal with regional considerations. These various dimensions might not always be compatible. As an example, addressing climate change may have cost implications leading to higher energy prices with consequences on economic growth and social cohesion.

Differing economic development and resources make comparing countries difficult, because countries require different efforts to reach their specific objectives in relation to their current status and needs. However, many countries are broadly similar and countries within such a "cluster" can be reasonably compared. Five broad, preliminary clusters of countries, based on per capita incomes of $4,000/year and $18,000/year, and energy export/import ratio, are used to facilitate the comparisons (see Figure A1-1 in Annex 1).

The five clusters comprise:

1. **Lower-income (<$4,000/year) net energy importers** (13 countries): Ethiopia, Ghana, India, Kenya, Mongolia, Morocco, Nepal, Pakistan, Philippines, Senegal, Sri Lanka, Tajikistan, and Tanzania.

2. **Lower-income (<$4,000/year) net energy exporters** (7 countries): Cameroon, Congo (Dem. Rep.), Cöte d'Ivoire, Indonesia, Nigeria, Paraguay, and Yemen.

3. **Fast-growth countries** (31 countries): Algeria, Argentina, Botswana, Brazil, Bulgaria, China, Colombia, Croatia, Egypt (Arab Rep.), Iran (Islamic Rep.), Jordan, Latvia, Lebanon, Libya, Lithuania, Macedonia

[2] PCA serves to link indicators through measures of co-variance, and by a statistical estimation process apportions weights systematically. See James I Kenkel (1996) Statistics for management and economics, ISBN 0-534-20370-1

(Rep.), Mexico, Namibia, Peru, Poland, Romania, Russian Federation, Serbia, South Africa, Syria (Arab Rep.), Thailand, Trinidad & Tobago, Tunisia, Turkey, Ukraine, and Uruguay.

4. **Higher-income (>$18,000/year) net energy exporters** (8 countries): Australia, Canada, Denmark, Kuwait, Norway, Qatar, Saudi Arabia, and United Arab Emirates.

5. **Higher-income (>$18,000/year) net energy importers** (29 countries): Austria, Belgium, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hong Kong (China), Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Rep.), Luxembourg, Netherlands, New Zealand, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan (China), United Kingdom, and United States.

Within a cluster, countries may be grouped in performance bands, either for overall performance, for selected supports, building blocks or for individual indicators. High-scoring countries, and the policy instruments that support their success, are then highlighted for analysis. Rather than numerical ranking, countries are described by divisions, the first division comprising the highest 25 percent, the next quarter of countries the second division, and successive quartiles making up divisions three and four.

Chapters 2–5 review the results, including examples of best practices and their implications for ensuring effective energy policies.

2. Energy Equity and Poverty

1. Introduction

Pervasive issues of inequity and poverty motivate a wide range of government policies in virtually all countries. More specifically, when considering inequity as it applies to energy, the focus is on the lack of access to, and the inability to pay for, basic energy services, such as electricity and transportation. Access to these basic services has been closely correlated with increased life expectancy, higher incomes, and improved standards of living. Significant inequities in society are one of the factors that can increase social tensions between those who are advantaged and those who are not. Thus, energy equity policies are major objectives of any national energy policy.

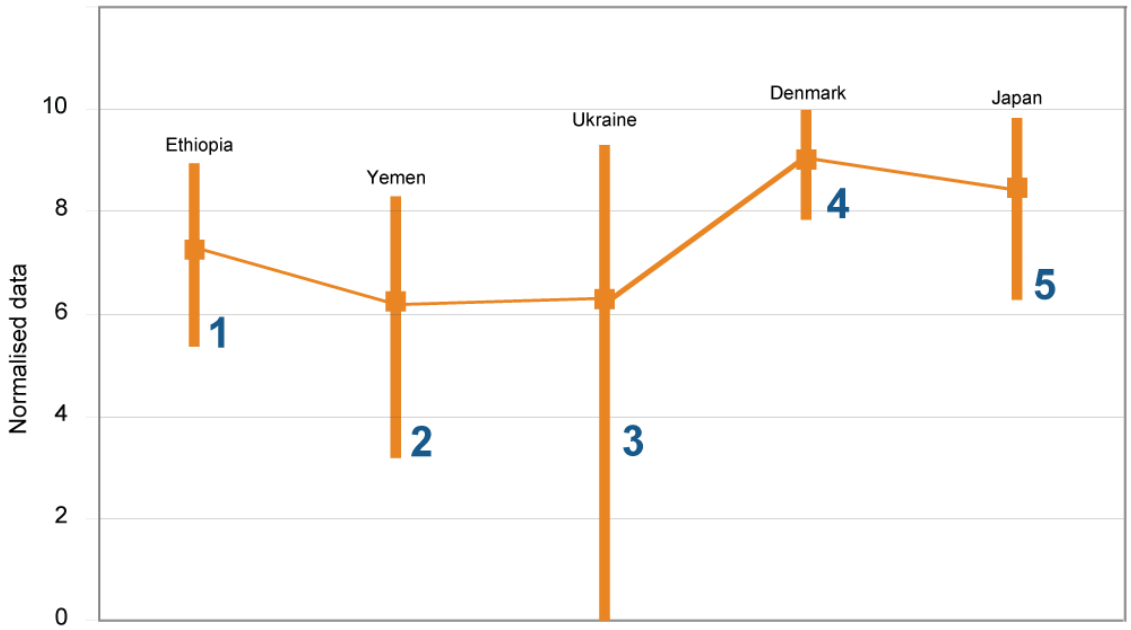
Achievement of energy equity and reduction of poverty are shaped by many factors most often unevenly distributed, both within and between countries. In addition to access to energy products and services, these include domestic natural resources, household disposable income, household energy expenditures as a percentage of total, affordability of energy at market prices, and measures to provide support to low-income households.

Higher-income countries have made significant progress on many energy equity issues. However, the affordability of heating fuels and the cost of gasoline remain potent concerns for the low-income poor and the fixed-income aged in many of these higher-income countries. In most of the lower-income countries, there is still a lack of progress on achieving levels of access and affordability that the bulk of the population in wealthier countries experience. Of the approximately two billion people who do not have access to modern energy, it is estimated that 99 percent live in lower-income countries, with the bulk of these in South Asia, Africa, and Latin America and the Caribbean. In addition, 80 percent of these populations live in rural areas, where the lack of centralisation makes energy access and energy services more difficult. One of the paradoxes of modern society is that many people, often without much education, move to cities for access to modern services including energy, and then live in poverty while trying to find a place in the economic structure. With over half the world's population living in urban areas the problem of energy equity for the urban poor is an increasingly pressing concern for many governments.

This chapter uses the Assessment Index to identify those countries with the most effective energy equity policies. These policies are then analysed and summarised to assist others in shaping and implementing their own national and local policies. This chapter consists of three parts: an introduction, an analysis of policy, and recommendations for policy makers. The policy analysis assesses country policy within clusters, identifying best practices and effective policy frameworks. In this way countries at similar stages of development and with similar energy resources can learn from those who are dealing with similar issues.

Available policy approaches to address energy equity across countries cover a wide spectrum. One overall observation, not surprising, is that the effectiveness of energy equity policies is strongly

Figure 2-1
Range of Gini Index indicator (C31, see Annex 1) measuring wealth distribution for countries in each of the five clusters. Data are normalised so that 10 is the most even distribution. Mean values for each cluster are shown by the square. Data are for 13 countries in cluster 1, 6 in cluster 2, 27 in cluster 3, 4 in cluster 4, and 25 in cluster 5.



shaped by other government policies such as macro-economic policies, particularly public investment and taxation. In addition, energy equity policy needs clearly stated and realistic objectives, a well-considered policy framework backed by comprehensive legislation, and regulations and enforcement of these to enhance the best practices. Finally, the other building blocks in the social capacity and equity support, namely education and health and safety, are critical precursors for achieving energy equity.

2. Policy Analysis

Countries in the Assessment Index

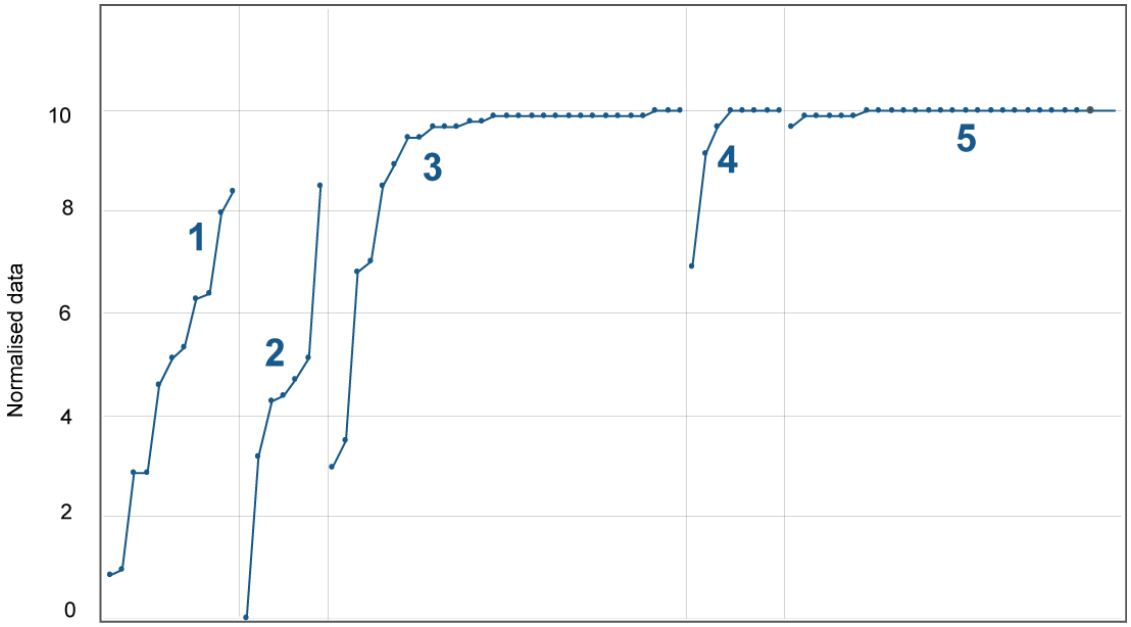
Classification by cluster of countries in the Assessment Index is shown in Annex 2. A general examination of the Index data shows what might be expected – namely that higher-income countries generally show more progress toward energy equity. Figure 2-1 shows the Gini[3] Index, based on averages of values, for countries in each cluster. The Gini Index is a generally accepted measure of wealth distribution, a linear result indicating a normal distribution from poorest to highest. In Figure 2-1, the indicator data are normalised so that the highest possible value is 10 (normal distribution) and the lowest 0 (highly skewed distribution in favour of the wealthy). For this indicator, Denmark has the highest value (most even distribution).

Although the value is not available for every country, it is immediately apparent that the higher-income countries in clusters 4 and 5 tend to have more even distribution of wealth. It is worth noting that the countries in cluster 2 and 3 have lower values than those in cluster 1, perhaps indicating that as poor countries develop, they go through a stage of wealth accumulation in a small percentage of the population.

Figure 2-2 shows the value for the equity indicator (C33) for 88 countries with increasing clusters indicated. There are two immediate results of note: first, higher-income countries (clusters 4 and 5) have clearly achieved greater energy equity. Countries in these clusters have developed very strong institutions that provide a foundation for putting energy policies into effective practice. These institutions include implementation of a "Rule of Law" (as measured by the World Bank), strong protection of property rights (World

[3] http//:hrdstats.undp.org/indicators/147.html

Figure 2-2
Access to electricity (percent of population indicator C33, see Annex 1) normalised to 10 as 100 percent, and grouped by cluster.



Economic Forum), very low levels of corruption (Transparency International), quality of regulations (World Bank), and strength of private institutions (World Economic Forum). They are also countries that provide for an ease of doing business with the international private sector. Second, while there is disparity within each cluster, the disparity is less in cluster 4 and 5 countries. Of particular note is the variability in achievement of energy equity in the large group of cluster 3 countries, where comparing best practices with other countries within the cluster may provide useful information for future development and implementation of policies.

The countries in cluster 1 that show the highest values in terms of the Equity building block are The Philippines, Mongolia and Sri Lanka. For the lower-income energy exporters in cluster 2, Indonesia, Paraguay, and Yemen score high. For the fast-growth countries in cluster 3, most countries have high values in terms of energy equity with only a few exceptions, where household income is still low. Libya, Croatia, Lebanon, and Lithuania show the highest values. The higher income countries in clusters 4 and 5 all show high equity values with very few exceptions. The highest values in cluster 4 are shown by Australia, Canada, and Denmark, and in cluster 5 by Luxembourg, Korea, and Finland. It should be noted that Taiwan, China, shows the highest value among countries in cluster 5, but the lack of data for Taiwan, China, on the Gini index precludes a meaningful score on the overall building block. This will have to be corrected in later assessments.

Priorities and Objectives of Energy Equity Policies

The analysis of the questionnaires sent to country committees leads to the following conclusions. Clarity of energy equity objectives, the assignment of specific responsibilities to key institutions, and the timely implementation of energy equity policy lead to the most effective overall results.

a) Low-income countries (Cluster 1 and 2)

The lower-income, energy-importing countries (cluster 1) are the most vulnerable group of countries. They lack economic development and are often endowed with modest energy resources.

The Philippines Energy Plan[4], implemented in 2005, is the blueprint for “all players in the energy sector for the next ten years.” The agenda focuses on achieving energy independence and enacting power market reforms. One of the government’s

[4] http://www.doe.gov.ph/

When considering inequity as it applies to energy, the focus is on the lack of access to, and the inability to pay for, basic energy services such as electricity and transportation.

main objectives is energy independence: 60 percent self-sufficiency level in 2010. Other energy and sector specific goals include 100 percent village electrification by 2008; increase renewable energy capacity by 100 percent in 10 years; becoming the world leader in geothermal energy; and becoming the largest wind power producer in South East Asia.

In Indonesia, the preparation of legislation follows a procedure set by the government. The initiating ministry forms an interdepartmental team comprising those whose concerns are relevant to the laws/regulations. The initiating ministry drafts the bill/regulation, and it is then sent to Ministry of Law and Human Rights. Key to the success of policies is having clarity around objectives and lines of responsibility, and strong institutions (government and regulators). Coordination among policymakers is also seen as essential. Indonesia has clear targets on innovation to develop key technologies, with anticipated strong and active private sector participation.

b) Fast-growth countries (Cluster 3)

For the fast-growth economies in cluster 3, their energy policies reflect consideration of each of the goals of Energy Equity, Security, and Environmental Sustainability. In general, their policies emphasize energy efficiency, the need for an optimal energy resource mix, application of modern technologies, and limited use of subsidies.

Effective energy equity practices are evident in Lithuania, Libya, Lebanon, and Croatia. Croatia has a policy to help low-income households make their electricity payments.

While South Africa does not lead with a high indicator of the energy equity building block, its policies and their recent evolution and implementation are well worth considering by others, especially in cluster 3. In particular its electrification policy is worthy of note (Box 2-1). Some of the more specific socio-economic benefits of electrification are:

- Job creation in energy-intensive manufacturing
- New employment opportunities (e.g., shops, welding, hair salons)
- Small business development
- Access to appliances (e.g., refrigeration)
- Extended operation and working hours
- Access to communications
- Improved security
- Improved education levels
- Rural development
- GDP increases
- Improved quality of life

Box 2-1: South Africa's Electrification Policy

The National Electrification Programme was started in 1994. Its objective was to electrify rural and urban low-income households which had been deprived of access to electricity during the pre-1994 period. This government programme expected that newly electrified households would switch from using fuel, wood, candles, and batteries to using electricity for their household needs.

Phase 1 of the programme, completed by 1999, aimed at electrifying an additional 2.5 million households on top of the 3 million that had already been electrified by a utility programme begun by ESKOM, called "Electricity for All". Available statistics state that the level of electrification in urban areas in South Africa has risen from 36 percent in 1994 to 90 percent at present. The number of rural households electrified countrywide has risen from 12 percent in 1994 to 52 percent in 2005.

To achieve this, it meant that the electrification programme had to be tackled on a number of fronts in a holistic manner:

- A connection had to be made every 30 seconds for 5 years. A pole had to be placed in the correct position every 10 seconds. Two hundred metres of cable had to be strung and attached every minute.
- The design and construction process had to be formulated.
- The technology had to be perfected.
- The project management aspect was the key component in the construction process. In the course of one year over 200 individual electrification projects had to be planned, designed and executed.
- Social issues, such as affordability, had to be addressed.

Major health benefits were gained through fewer paraffin burns and poisoning, as well as vaccine refrigeration, water pasteurisation and a decrease in respiratory disease.

Another achievement was the reduction in the cost per connection. It was the introduction of a detailed planning, design and project management process as well as detailed standard technical building blocks and indicators that have made the achievement of 1.5 million connections in 5 years with an accompanying 50 percent reduction in cost possible.

Egypt presents a most effective and exemplary energy equity system (Box 2-2). Energy policies provide broad support for low-income households to connect to the electricity grid, and promote small energy-intensive industries.

Box 2-2: Egypt's Approach to Addressing Energy Equity

Egypt has existing policies and institutional frameworks that help the country achieve a high standard of energy equity:

- A rural electrification authority has been established to implement transmission and distribution networks for rural areas and remote communities.
- There is a subsidies policy for the poor.
- A natural gas network is available throughout the country.
- A special tariff exists for low-consumption consumers.

The objectives of Egypt's energy equity policy are to:

- Extend energy infrastructure across the entire country, and
- Ensure energy is available for all at affordable prices.

These structures are performing satisfactorily with indices such as GDP growth rates, energy intensity, energy supply security, infrastructure and quality of supply showing good results.

Egypt's social policies support low-income families and energy policy endorses renewable developments, especially wind and solar, where feasible.

In the developing world, it is often necessary to support the poorest members of society through subsidised services. While in some cases this is a blanket subsidy, in an increasing number of countries subsidies are becoming more focused on the poorest of the poor, driving support to where it is truly needed. There are over 25 examples of this including Egypt, India, Uganda, Morocco and Mongolia, among others.

For example, in India, white ration cards are issued to families whose income is less than Rs11,000/year (US$225). Families typically qualify for subsidised food, health care, and other basic requirements. In some states, these cards also enable families to qualify for electricity, water, and sanitation services. Another card is issued to other families with very modest income, although still below the poverty line, which qualifies them for lower subsidies.

Donor-funded trials are underway to provide subsidies through the private sector. In some cases, electricity wires run past houses, but the cost of the connection, which must be paid up front, is prohibitive to the poor. The Global Partnership on Output Based Aid (GPOBA) has been funding a pilot programme to test the provision of basic services. These subsidies often take the form of capital support for electricity and water connections. GPOBA is looking to subsidise the cost of borrowing for electricity companies, to allow connection fees to be paid over five years. This would allow households to be connected earlier. One such project has taken place in Ethiopia.

Another example of addressing equity challenges took place in Nigeria, which updated its Electric Power Policy in 2005 to include a cost-based analysis to improve electricity access using a feedback mechanism that identifies observed gaps in performance and close them.

Argentina has made major strides in increasing access to modern energy. The country has raised the national electrification rate to 95 percent, even though 30 percent of the rural population still has no access to electricity (Box 2-3).

Box 2-3: Argentina's Energy Equity Policies

Argentina has developed and implemented effective energy policies to increase, and speed up, access to modern energy, and more generally to improve energy countrywide. These policies are supported by the following initiatives:

- Renewable Energies Project for Rural Markets (PERMER) consists of the development and installation of mini-hydroelectric power plants, wind turbines, diesel, or hybrid power plants operated through diesel/wind or diesel/solar or solar/wind systems in small communities, as well as the installation of photovoltaic and/or stand-alone wind systems to provide rural inhabitants not only with electricity.

  Users receive enough energy for their basic lighting and communication needs. The policy is expected to improve the quality of rural life, and to benefit education, productivity, and overall social development. The project has boosted the economic activity of the private sector and created local jobs in the affected areas through raising the demand for the manufacture, operation, sale and maintenance of renewable energy equipment.

- Economic Emergency Law (Law 25561) indirect subsidies aimed at freezing the energy rates paid by the total population.
- Ministerial Resolution (Resolution 456/2004 of the Ministry of Federal Planning, Public Investment and Services) established an Agreement to stabilise the price of bottled butane gas in 10-kilogram bottles to end-users at below market prices.

At the provincial and municipal levels, the following measures have been instituted:

- "Garrafa Social Program" (Law No. 1353 – The City of Buenos Aires), subsidises the purchase of the 10-kilogram bottles of liquefied gas.
- Electricity Subsidising Program (Province of Salta) citizens below the poverty line receive a discount of 60 percent to 100 percent on utility bills.

c) Higher-Income Countries (Clusters 4 and 5)

The energy-exporting countries in cluster 4 have achieved almost complete access to modern energy for their citizens, although households may spend a significant proportion of their income on energy. Poorer members of society frequently find energy expenditures a significant burden, and several governments provide support to them to pay their energy bills.

Denmark is a leader, with an energy equity policy based on strong values that promote equity in

general. Paid for by taxes on income and energy, the policy is implemented through well-developed energy markets. Denmark also has a law (The Electricity Act of 1999) that establishes a formal right of access to electricity to all through provision by cooperative ownership or municipal.

Sweden is also a world leader in energy equity: its entire population has had access to modern energy for a long time, due in all likelihood to social democratic practices and progressive income taxes than to any specific energy policy.

In some countries, policy initiatives are needed to promote new and alternative energy options. Energy-exporting countries can benefit from low-carbon supply options, freeing up hydrocarbons for export.

For most higher-income countries household subsidies are lower than in other clusters. Household expenditure on energy in these clusters as a share of income averages about 23 percent. Major factors shaping energy equity are the degree of market opening to competition, and the cost to modernise technology and for energy efficiency.

The energy policy in France is exemplary in ensuring broad access to affordable modern energy services. Energy legislation has set clear targets for energy equity in terms of efficiency utilizing modern technologies, effective institutional frameworks, and considerable subsidies to low-income. In terms of diversity, comprehensiveness and quality, policies in France are worth highlighting (Box 2-4).

Box 2-4: France's Energy Policy

Several comprehensive laws in France enable energy equity:

- Act 2004-803 on electricity and gas supply companies, which transposes the European Union electricity market directives on establishing a high-level of public service and consumer protection.
- Act 2000-108 on the modernisation and development of public services Act 2006-1537 modified the parts of this law on the relating to the energy sector.

These acts stipulate geographic unity of electricity prices for the regulated market segment, access to grid and energy security. The key objective is to provide affordable energy services for low-income users and to provide aid during the winter heating season in special cases. These strategies for effective energy equity practices hinge on four conditions:

- Efficient development of infrastructure
- A Reasonable price of energy
- Uniform pricing
- Public service

Japan is amongst the best performing countries in the world in delivering energy equity, every inhabitant has access to energy supplies and services. Japan's current policy combines a market mechanism for wholesale power supply with partial deregulation of retail power sales. The effectiveness of Japan's energy equity policy rests

on the clarity of its objectives and its responsibility for how the policy works in practice. Japan's policies were developed with public input, and the policy is enforced by law. Consumers also have access to good information on energy policy. Japan has strong institutions, a strong industrial sector, and is able to control energy costs.

Higher-income countries have stronger institutional frameworks, open markets, and in general, commitments to curbing the adverse effects of climate change through a lower-carbon energy mix. This is achieved through substituting fuel and adopting cleaner conversion technologies. Most policies appear sufficient with clear implementation strategies and adequate feedback structures. While the blanket adoption of one country's strategies is not advisable, Italy (Box 2-5) is a good guide.

Box 2-5: Italy's Market Liberalisation

Italy introduced full electricity market liberalisation in July 2007 for domestic customers and small industrial customers.

In the electricity sector, a wholesale market model has been designed, based on a uniform purchase price at national level to avoid discrimination among customers located in unfavourable areas. It provides for the protection of low-income clients (called a "social subsidy for electricity supply"). Furthermore, since full electricity market liberalisation, a "vulnerable customer regime" was introduced for domestic consumers and small industrial consumers. This implies standard conditions (such as reference price), quality standards, and contractual conditions are set by energy authorities. They also set non-discriminatory conditions for provision of electricity supply and other public services.

It should be noted that these favourable conditions are attained despite the country's promotion of free market competition. Italy's dependence on natural gas is to be modified to improve its energy mix. This explains its high index value for climate change, showing a good example of conformity with international efforts to curb greenhouse gases.

3. Key Lessons for Energy Equity and Poverty

No single factor determines the overall effectiveness of energy equity policy as this examination shows. Combination of factors influence performance, such as high levels of educations and innovation, strong institutions and regulation, a strong economy and even attention to environmental concerns, and an informed populace. It is also important that energy equity policies have milestones that include short-, medium-, and longer-term goals.

Overall, a paucity of effective energy equity policy exists outside the higher-income countries. Where such policy exists, it is largely part of a broader socio-political agenda, such as a rural electrification policy. Often energy equity in these countries is only considered from the perspective of access to modern energy services. Elements of quality, cost, or affordability are often not addressed. Lower-income governments should be encouraged to pursue comprehensive and

The main reason for poor energy equity performance is due to the absence of appropriate and comprehensive policies, and if present, their effective implementation.

coherent policy frameworks, consistent with a clear vision, as a basis for implementing energy equity practices. There is also a shift in priorities as strategies change from lower-income clusters to higher ones.

For most of these lower-income countries, energy equity cannot be separated from poverty and other social concerns, such as health care and education. A policy goal of direct subsidies to the poor, so that a far lower percentage of household income is spent on energy, would drastically improve their situation. This could even take the form of discouraging excessive traditional biomass use for fuel, and improving the affordability of modern energy services. Cluster 1 countries must also make the area attractive to investors and reduce the perceived high level of investment risks.

Implementing an energy equity policy should also consider the following:

Native Natural Resources: A proper assessment of the availability and diversity of all resources must be undertaken. Requisite capacity and modern technology to exploit such resources must be an integral part of the assessment.

Demographics: Reliable and accurate projections of population, taking into account age, gender, and community size in relation to income level, is critical in formulating policy. The need for this is more compelling in most cluster 1 and even cluster 2 countries. Here, the urban poor households in cities often constitute more than 50 percent of total households, and energy consumption is growing rapidly due to population growth rates estimated to be double recent averages. A participative process in the development of policies involving all stakeholders is critical.

Inter-state Relations: There is considerable advantage in pooling resources within and among countries sharing political borders, or grouped regionally. One example is the commitment of countries in South East Europe to liberalise their energy markets in accordance with European Union regulations, following the creation of the Energy Community of South Eastern Europe in 2005. On regional cooperation, several regional and international initiatives specifically tailored to energy issues are available. For example, the D-8 group of developing countries from Africa and Asia, South-South Cooperation, the EU-AU Partnership on Energy, and the Africa-South America Cooperation in Energy.

In summary, the following recommendations arise from the assessment of energy equity policies:

1. Strong institutions are essential

If the poor are to have access to modern energy and energy services, strong policy institutions and leadership are necessary. The main reason for poor energy equity performance is due to the absence of appropriate and comprehensive policies, and if present, their effective implementation.

2. Governments must articulate and pursue clear integrated policy objectives

Most countries pursue energy equity, security and climate change separately, but those that succeed in attaining energy equity generally have balanced and broad energy policies. This is not accidental: achieving social, institutional, and economic goals simultaneously appears to be not only possible, but also essential. Governments must put in place comprehensive and coherent policy frameworks consistent with a clear vision to implement all-inclusive equity practices. Most importantly, once in place, these policies must change only if they are not working – investors need to know that the rules will not change before their investments can be recovered. Enhanced cooperation and integration is the key to accelerating access to energy for all. The disparity in energy equity across clusters can be overcome only through enhanced cooperation and integration between all countries. Sharing with neighbouring countries relevant technology and experiences, on how best to achieve energy equity, can benefit all.

3. Public consultation

Public consultation and feedback at the local level is vital to the subsequent implementation of any energy policy, and even more important for an energy equity policy. The key elements of an effective energy equity policy include a public provided with adequate information, strong institutions.

4. Enhanced global cooperation between higher- and lower income countries

Implementation of policies by developed countries to accommodate the needs of developing countries, with the aim of accelerating achievement of energy equity, is crucial. Issues include technology sharing, capacity building and transferring modern technologies. This should be met with reciprocity, addressing the needs of developed countries for access to natural resources. Such interdependence between resources development on the one hand, and technology and financing on the other, can be a model for a world fast creating a globally interconnected economy.

5. Rural electrification is a benefit

Having a rural electrification authority implements transmission and distribution networks for rural areas and remote communities through grid expansion. A similar natural gas network and subsidies for the poor can do the same.

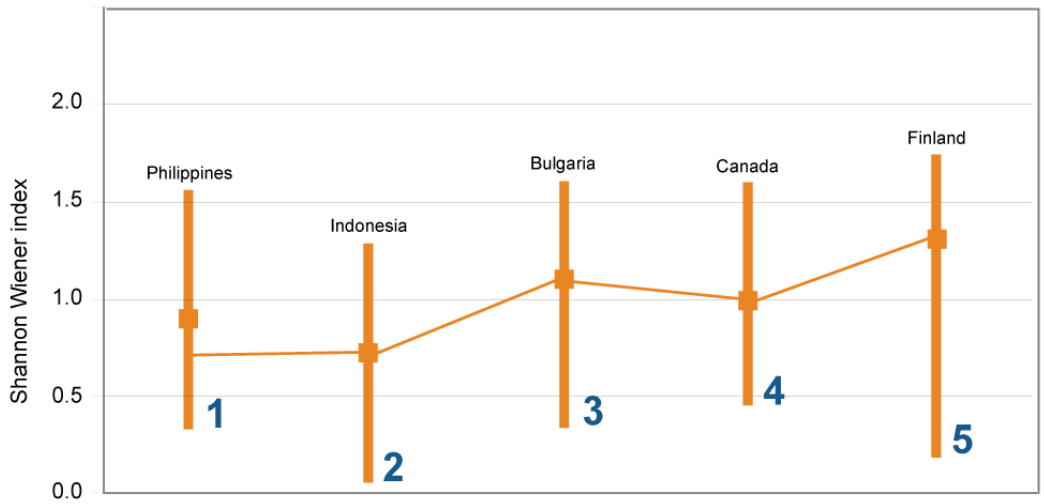
3. Energy Security and the Economy

1. Introduction

Energy security, defined by consuming countries as securing sufficient energy supply[5] at affordable prices to sustain economic development, is an enduring concern for policymakers. This matter, of special interest in the 1970s, has again drawn global attention in recent years because of a number of factors and events: rapid energy demand growth in emerging economies, increasing price volatility in world energy markets, constraints in investments in energy supply, geopolitical tensions in energy-exporting regions, and proactive efforts toward renewable energy development. Major energy importers, such as the United States, the European Union, and Japan, are reshaping their energy strategies. Emerging economies, such as China and India, are actively seeking energy assets overseas. At the same time, energy exporters are demanding for long-term contracts.

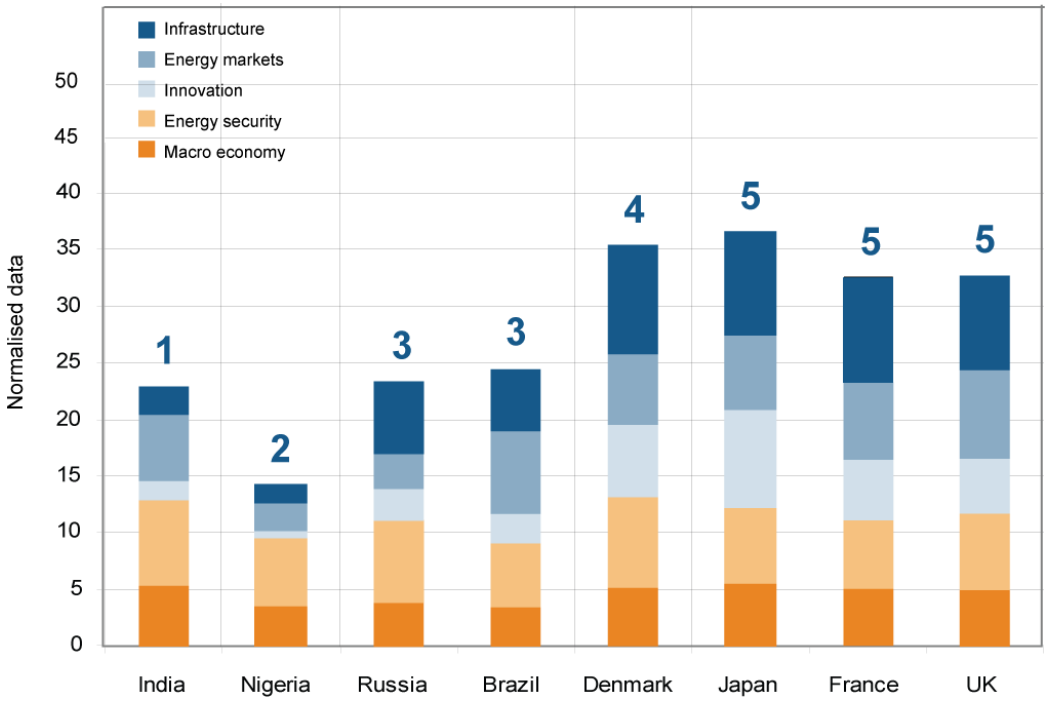
Figure 3-1

Indicator values for diversity of supply (Shannon Wiener Index, B51, see Annex 1) for countries in the five clusters. Mean values for each cluster are shown by the squares; countries with the most diverse energy supply are named at the top. For this indicator, there are data for 13 countries in cluster 1, 7 in cluster 2, 30 in cluster 3, 9 in cluster 4, and 28 in cluster 5.



[5] For energy suppliers, and especially exporters, security of demand is a continuing concern, addressed in part by ensuring a broad energy demand diversity covering countries, industries and uses for energy.

Figure 3-2
The Economy Support for eight countries in the five clusters, broken down by the five building blocks (B1, B2, B3, B4, B5, see Annex 10). For each building block the highest possible normalised value is 10 and the maximum value for the Support is therefore 50.



Energy security has become an area of high priority for most of the world. Figure 3-1 shows the values for the diversity of supply indicator, a main indicator for the energy security building block. There is wide variation in supply security within each cluster.

Figure 3-2 shows that for a range of countries across all five clusters, underlying infrastructure, degree of innovation, and the strength of energy markets are the determining factors in overall energy security. This indicates the importance of policies and practices leading to effective institutions and capabilities in providing an underpinning for energy security.

Energy security is an issue can be addressed by energy policy and strengthening markets. Under many circumstances, markets can enhance security of supply, especially when larger regional markets are created in network-based industries, if they increase the number of alternative suppliers and flatten demand fluctuations (Box 3-1).

Box 3-1: Market Experience in the United States

The US experience with natural gas and electricity markets holds valuable lessons for policymakers.

a) Natural Gas Markets

One good example of well-functioning energy markets is the US is natural gas. Wellhead prices of natural gas were controlled by the federal government in the 1950s, 1960s, and through the 1970s. In the 1970s, demand for natural gas grew rapidly resulting in shortages in some parts of the country where prices were regulated at the wellhead. Producers had little incentive to move gas across state lines because they could sell it at a higher price in the state where it was produced. Over time, the industry was deregulated in terms of wellhead prices and how the gas was transported and delivered. Now, wellhead prices are market-based. Supply and demand are balanced over time as producers have incentives to drill for gas when demand and prices are high. When demand and prices are low, drilling falls back, bringing supply and demand into balance. The

introduction of pipeline gas from Canada and imports of LNG support market-based pricing with investors taking financial risks as in other commodity markets. Both producers and consumers can use hedging and other financial strategies to reduce price volatility. Consumers are protected because retail natural gas prices are still regulated at the distribution company level primarily through traditional cost of service regulation.

b) Electric Power Markets

The US has had several models of electric power deregulation (or reregulation in some instances). The introduction of wholesale competition for generation has had varying success. The California restructuring disaster is best known, which resulted in blackouts and bankruptcies. A failed market design had been at the heart of the prior problems. Other regions have had great success in forcing market-based retail competition, such as the part of Texas within the Electric Reliability Council of Texas (ERCOT). Numerous alternative suppliers are available for most customers. Meanwhile, residential competition never materialised in Maryland. Some market-based systems have not adequately incentivised new generation, resulting in new peak demand levels not being met and retail prices to consumer being some of the highest in the nation. These examples have illustrated that market-based pricing works best when supply constraints are removed. Constrain new supply in a market-based pricing system and prices will rise as demand rises. Regulators have had to be vigilant to protect against market manipulation, which was a part of the California experience.

Markets can also have adverse effects on the security of supply and demand, due to the inability of the market to price the broader benefits of energy security. This must be addressed through energy security policy.

This chapter discusses what constitutes a successful energy security policy. The analysis is based on a detailed review of a number of exemplar countries selected from the top division of energy security policy effectiveness in the Assessment: Japan, France, the United Kingdom, Denmark, Russia, Brazil, India, and Nigeria. These countries include both energy importers and exporters, and the Assessment considers what is needed to achieve a successful energy security policy and how the successful policy can be implemented. Although energy importers and energy exporters have differing broad energy security interests and preferences, they often share some common objectives, such as securing sufficient energy supply to their populations and diversification of energy sources. The unique experiences of the selected energy-importing countries, in particular developed-energy importing countries (cluster 5), are useful for all countries, regardless of cluster.

Characteristics of Assessment

a) Diversity of Economic and Energy Conditions

Before reviewing a country's policy, a note of caution is needed in interpreting any country's specific performance. Care is required before drawing any universal conclusions across countries with diverse political, economic, geological, and

climatic conditions. A successful policy in a specific country is not always feasible in another country. For example, exploring and developing domestic hydrocarbon resources is not the best solution in a country with poor geology or geography. Energy security policies must be developed and implemented in accordance with the specific conditions and constraints of each country.

b) Policy Effectiveness over Time

The effectiveness of policy over time must be considered. Success or failure of a certain energy security policy should be set against how the policy has or has not changed the country's energy security position over time. For instance, even though Country A's energy efficiency is better than Country B's at a certain point of time, it is often difficult to infer that A's energy efficiency policy is superior to B's, because A's energy efficiency may have worsened and B's may have improved during the preceding period. Such an analysis therefore should be made from a dynamic perspective, instead a static, snapshot assessment of a country's situation. Although most of the country responses describe only the current situation in each country, the following analyses try to consider the importance of policy effectiveness over time.

c) Energy Security of Energy-Exporting Countries

We have the question of how best to address an energy exporter's security. Energy exporters have their own agenda that includes securing sufficient demand for their primary and secondary fuels (for example, crude oil and gasoline), access for energy exports to tertiary markets (such as gasoline retail networks) and reducing economic dependence on energy exports over time. Just as energy importers emphasise accessibility or availability to energy resources, energy exporters stress that sovereignty of natural resources is a legally accepted premise for their energy security. To bridge this difference of interests and deepen mutual understanding, energy exporters and importers have entered into dialogues, for example those at the International Energy Forum (IEF). Because WEC has a number of major energy-exporting country members, it is important to consider this perspective. However, this chapter focuses on energy security issues mainly from the energy importers' perspective for a number of reasons.

The first is that both net energy exporters and net energy importers are still domestic energy consumers, and in this sense share a common goal: securing sufficient energy supply at an affordable price to sustain sound economic management. As revealed in the case studies of Russia and Nigeria, net energy exporters are equally interested in policy measures similar to those of energy importers to enhance their energy supply security. It is widely known that some energy-exporting countries suffer shortages of energy supply. Energy conservation or the development of alternative energy has traction in those energy-exporting countries. If energy exporters succeed in improving energy efficiency and developing alternatives, thereby reducing domestic energy consumption, this will certainly help them to increase energy exports or preserve their energy reserves for future development. Preserving energy reserves is consistent with the security needs of energy exporters.

Energy security is a significant issue for both, energy importers and exporters, yet energy importers regard energy security more as an imminent and crucial issue.

The second reason is that the concentration of the sources of globally traded energy in a few countries (especially oil and natural gas) and the expected significant increase in energy demand, energy security concerns will be felt keenly by a large number of energy importers. Discussions over energy security and actual policy actions toward energy security are more often observed in energy-importing countries, whether rich or poor. Energy exporters frequently emphasise their national sovereignty over their energy reserves and this can raise fears by energy importers that they will be unable to secure a sufficient energy supply. Energy security is undoubtedly a significant issue for both energy importers and exporters, yet it is fair to say that energy importers have regarded energy security more as an imminent and crucial issue.

This chapter discusses energy security issues mainly from the net energy importers' perspective, in part because the bulk of questionnaire responses are from energy-importing countries. In subsequent assessments, a broader range of energy-exporting country responses should be available.

Country Snapshots

Eight countries are reviewed fall in the following clusters:

- Lower-income – energy importers (cluster 1): India
- Lower-income – energy exporters (cluster 2): Nigeria
- Fast-growth countries (cluster 3): Brazil and Russia
- Higher-income – energy exporters (cluster 4): Denmark
- Higher-income – energy importers (cluster 5): Japan, France, and the United Kingdom

a) India (Lower-income – energy importer)

India is a typical, developing energy-importing country. Because of its rapid energy demand growth, which surpassed its growth in domestic energy production, its energy imports are growing very fast. India currently faces a difficult task of how to reconcile economic growth, improve living standards, secure a sufficient energy supply, manage domestic environmental preservation, and control greenhouse gas emissions. While this is never an easy task, all of the developing countries sooner or later will face this situation. India's case study in this sense is an invaluable part in this study.

b) Nigeria (Lower-income – energy exporter)

Being the largest oil and gas producer in Africa, Nigeria is a model of a developing energy-exporting country. Despite its ample natural resources, energy distribution to its population is still insufficient. For a country like Nigeria, therefore, ensuring an adequate and secure domestic energy supply is equally important as securing a sustained demand for its energy exports. Many developing energy-exporting countries have domestic energy supply challenges

and Nigeria's example helps us to appreciate better policies.

c) Brazil (Fast-growth country)

Brazil has abundant energy resources including large hydrocarbon reserves in its offshore areas, hydropower and biomass. To cope with growing energy demand, Brazil has a strong energy security policy covering optimised development of its electric power system, efficient use of energy, and improvement of energy self-sufficiency, through developments such as ethanol produced from sugar cane. As a fast-growth country with abundant energy resource, Brazil's case study provides a unique example in this study.

d) Russia (Fast-growth country)

Russia is the largest hydrocarbon reserves holder and producer in the world. Naturally, one of its energy security objectives is security of demand. Russia attracted global attention in January 2009 when it halted natural-gas exports to Europe. Russia faces the question of how best to address energy transit issues. Because cross-border energy trade is expected to increase in the future, the transit issue will needs to be resolved to allay concerns of both energy importers and exporters. Russia is keen to improve its energy efficiency and increase its development of renewable energy sources.

e) Denmark (Higher-income – energy exporter)

Denmark has been successful in substantially raising its share of renewable energy in its total energy supply. Other countries have a high share of renewable energy, such as New Zealand, Norway, and Iceland; Denmark is unique in that it has significantly raised the renewable energy share after the consecutive oil crises in the 1970s while having few hydropower resources. Denmark's policy initiative worked remarkably well: using more renewable energy has provided both energy security and climate change benefits. Denmark's experience is important as an example in tackling climate change.

f) Japan (Higher-income – energy importer)

Japan is an excellent example of how demand-side energy security measures can work well, especially in the areas of energy efficiency and diversification of energy sources. After experiencing severe impacts of the first and the second oil crises in 1973 and 1979, Japan has worked intently on the more efficient use of energy to reduce the economic impact of uncontrollable energy price fluctuations. Indeed, Japan became the most energy-efficient economy in the world. Given its poor domestic energy resource base and inherent vulnerability to energy supply shocks, Japan is an excellent model in the study of energy security policy.

g) France (Higher-income – energy importer)

Similar to Japan, France also lacks ample domestic energy resources. It, however, was remarkably successful in increasing nuclear energy as a domestic energy source. The French government's strong commitment, as well as its close coordination with industry, is an integral part of

France's energy security. One notable aspect of energy security policy is that France has also succeeded in fostering a globally competitive industry in the nuclear energy sector. In this sense, France's energy security policy has had a favourable effect also from an industrial policy standpoint.

h) United Kingdom (Higher-income – energy importer)

The UK has had a successful experience in developing its domestic hydrocarbon resources in the North Sea following a long history of coal production. Achieving self-sufficiency in energy supply is always the goal for every energy importer, but this is not always feasible (subject to domestic conditions, including resource availability and others). The UK had achieved self-sufficiency, and North Sea production has entered into decline. Additionally, the UK has emphasised a market-oriented approach to energy policy, serving as an example of a country that liberalised not only its domestic oil market but also its gas and power markets. The UK has also recognised the importance of energy supply infrastructure as a way to facilitate fluid market transactions.

2. Policy Analysis

This section discusses the key elements of each country's energy security policies. The discussion of country examples starts with lower-income countries (clusters 1 and 2), followed by higher-income exporters, and then higher-income energy importers.

a) India

India's key objective of energy policy is "to reliably meet the energy demand of all sectors in an economically rational manner while also meeting the vital energy needs of poorer households." This objective is the fundamental principle in the Integrated Energy Policy (IEP), a comprehensive energy policy document approved by the government in 2008.

India has had some success in developing domestic energy resources over the last decade. Domestic energy development is considered a high priority due to the increasing dependence on imported commercial fuels, undermining India's energy security. The most evident effort in this area is observed in oil and gas exploration. India launched a new licensing policy titled "New Exploration and Licensing Policy (NELP)" in 1997. Although few foreign companies entered the Indian exploration sector, several significant discoveries were made in offshore acreage, and oil production from those new fields is expected to ease the growing gap between domestic demand and production.

India has seriously engaged in improving its energy efficiency through its Energy Conservation Act in 2001 and founding the Bureau for Energy Efficiency in 2002. The IEP also reinforces this effort by setting targets in several sectors (Box 3-2). India's energy efficiency has steadily been improving, but remains significantly behind the world average.

Box 3-2: India's Energy Efficiency Improvement Policies

Faced with severe energy shortages, India has been keen to improve its energy efficiency. Such efforts first materialised with the Energy Conservation Act in 2001, followed by the founding of the Bureau of Energy Efficiency in 2002 as a separate entity to oversee energy efficiency improvements.

To reinforce the objective of the Act, the IEP also highlights the significance of energy efficiency by defining it as one of the fundamental principles. The Act provided several numerical targets, which include improving coal-fired power generation efficiency to 42 percent, increase in share of railway transportation of total cargo transportation to 50 percent, improvement of fuel efficiency of automobiles by half, and so on. In addition to the numerical targets, the IEP also promotes public transportation, public funding to introduce advanced technologies, efficiency improvement of water pumps in the agricultural sector, and energy conservation guidelines as an effective means to enhance energy efficiency.

To enhance its energy security, India still has to solve many issues, including institutional capacities, development of human resources, and development of effective monitoring systems of policy implementation. The current GDP intensity of energy supply remains high compared with countries at a comparable stage of development. The energy pricing system will need to be modified to encourage energy-efficient use. Energy subsidies, a politically sensitive issue, need to be reduced and prices raised to encourage more investment.

b) Nigeria

The primary objective of Nigeria's energy security policy lies in securing sufficient energy supply to its population. Although Nigeria is the largest oil and gas exporter in Africa, this objective remains aligned with that of most energy importers.

The "National Energy Policy" has security as a major policy goal (Box 3-3). This includes bringing electrification to 75 percent of the population by 2020, diversification of power-generation fuels including wider application of renewables in the power sector, intensive exploration for oil and gas, self-sufficiency in petroleum products, and development of gas supply networks in the gas-distribution sector.

Although electrification tops the policy goals, the share of population who has access to electricity is in fact far short of this target. Large-scale investment is needed if the target is to be reached; to facilitate such investments, strong institutions and appropriate government policy are required. In reality, the government is considering incentives such as suspending import duties or tax exemptions to encourage investment, but progress to date has not been significant. Development of strong institutions and ensuring transparent and consistent energy policy are needed to accelerate the process.

Nigeria also faces other energy security challenges such as meeting the rapid growth in domestic energy demand and high dependence on fossil fuels. Developing renewable energy and improving energy-efficiency are both major issues for Nigeria in the future.

Box 3-3: Nigeria's National Energy Policy

The document "National Energy Policy" contains the primary policy guidelines for energy security policy in Nigeria. The policy was initially drafted and approved by the Nigerian government in 1996, and then was revised in 2003 to reflect environmental changes surrounding Nigeria's energy sector. The revised policy was reviewed by an inter-ministerial committee chaired by the Nigerian president. The government has published the full text of the policy on its website.

The policy covers all energy sources from fossil fuels to renewables, and it provides specific goals and policy options to achieve them. The policy also pays close attention to the demand side and identifies areas that require the government's policy actions. Some of targets provided in the policy such as electrification, however, have not been achieved so far.

c) Brazil

Brazil is seeking to enhance its energy security through a combination of:

- optimised operation and planned expansion of its electric power system;
- efficient use of the energy;
- energy self-sufficiency.

This strategy provides energy in a sustainable way, and at a cost that does not compromise the economic and social development of the country.

The main primary energy source is hydropower and Brazil has one of the largest resources of renewable (hydro and biomass) and inexpensive electricity in the world. Security is further enhanced by thermal plants serving as reliable backups. In 2008, some 45 percent of Brazil's total energy needs were accounted for by renewables. Also significant were biomass for co-generation in industry, and ethanol fuel for automobiles.

Since the middle 1970s, the Brazilian electric power system has been operated in an integrated way with the objective of achieving synergies while minimising the overall costs of production of electricity. This has required an extensive grid of transmission lines that enables the optimal use of energy storage in hydropower plant reservoirs.

Exploitation of the remaining very large hydro potential, especially in the north of the country, is being encouraged by the government. In particular, the government is supporting hydropower plants using innovative engineering concepts that lead to a minimum environmental impact and have the support of local communities.

A major Brazilian oil company is coordinating a technology program with universities and suppliers with the intent to develop hydrocarbon exploration

and production technologies for production in ultra-deepwater areas off the coast – as much as 3,000 meters. The company invested approximately US$ 800 million in research and development in 2008.

To further strengthen energy security the government is promoting the development of nuclear energy (Box 3-4). This would allow use of the large deposits of uranium available within the country.

The government is also fostering regional energy integration with its neighbours, aiming to strengthen Brazil's energy security by increasing that of the entire region.

Box 3-4: Brazil's Energy Plan to 2030

PLAN 2030, developed in 2008 by the energy research company, EPE, for the Ministry of Mines and Energy, outlines the basis of an energy expansion strategy for Brazil. This aims to ensure the longer-term development of economic and sustainable energy supply, with emphasis on the most efficient use of the energy. By 2030, oil, hydroelectricity, energy from sugar cane, and natural gas will meet about 77 percent of energy consumption. New nuclear power plants are also planned during this period.

d) Russia

Russia, one of the largest oil and gas exporters in the world, shares several common objectives such as energy supply diversification or energy-efficiency improvement with energy importers. The main objectives of Russia's energy security policy are diversification of energy supply, improvement in energy efficiency, securing energy supply to all its population, optimising exports and decreasing transit risks.

Among energy-security objectives, energy efficiency has incurred steady improvements. Russia's GDP intensity of energy supply (tons oil equivalent per thousand US$ year 2000) as of 2006 was 1.81. Although this is still much higher than the non-OECD average of 0.70, it has significantly improved from 2.37 in 2000. Russia is intensifying its efforts to improve further energy efficiency as it targets the reduction of CO_2 emissions.

As for its energy exports, Russia has emphasised the importance of long-term contracts with consumers to enhance security of demand, and has secured and renewed a number of long-term contracts of natural gas with European customers. In addition, in March 2009, Russia started to export its first liquefied natural gas cargo from the Sakhalin 2 project as a means to diversify the domestic source of natural-gas exports. Russia also seeks to upgrade its refining capacities and increase the supply of higher value-added petroleum products, but progress to date is limited.

Transit risk is increasingly a big issue for Russia. Consecutive conflicts with Ukraine over its gas-exporting terms have been intensifying since 2006. In this regard, Russia is actively engaging to build so-called "bypass pipelines" which minimises the

number of transit countries[6]. The Russian government also published "Conceptual Approach to the New Legal Framework for Energy Cooperation (Goals and Principles)" in April 2009, which claims that a new international framework that effectively deals with transit issues is required[7]. Ensuring stable energy exports is of vital importance for Russia, and thus the country can be expected to work toward solving this issue in the near term.

To enhance its energy security, Russia has several large challenges ahead. The first and foremost is to remove obstacles in promoting energy-efficiency improvements. Such obstacles include subsidised domestic energy prices that discourage energy conservation as well as adequate investment in infrastructure. Effective institutions and specialised manpower to manage energy consumption more effectively are also needed. The government is drafting a new energy strategy for the period to 2030 and is expected to develop more full-fledged measures to ensure continuous improvement in overall energy efficiency (Box 3-5 for the current strategy).

Box 3-5: Russia's Energy Strategy up to 2020

"Russian Energy Strategy up to 2020" was developed by the Ministry of Energy with the collaboration of other ministries and research institutions, and approved by the government in August 2008. The strategy document best reflects current Russian energy policy. The coverage of the strategy is extensive from oil and gas to renewable energy. It provides specific goals and measures to achieve the goals in each energy sector. It also provides detailed statistics of Russia's energy sector and its demand and supply outlook up to 2020.

Two principal objectives of the strategy are the efficient development of natural and energy resources and the efficient use of energy to achieve economic growth and improvements of living standards. Under these objectives, the strategy lists three challenges: improving the qualities of fuels, enhancing competitiveness of energy products, and increasing exports of value-added products.

A new energy strategy up to 2030 is currently under development.

e) Denmark

The primary objective of Denmark's energy security policy is diversification of its energy supply. In the early 1970s, imported oil accounted for almost 90 percent of the primary energy supply in Denmark; this high oil dependence caused economic difficulties during the oil crises. Denmark has worked hard to diversify oil supplies and develop substitutes for oil.

The fuel switch occurred in the power sector from oil to coal at first, and this increased the share of coal in energy supply to above 90 percent. Concern about over-dependence on coal emerged,

[6] Examples of such pipelines are Nord Stream project (from Russia directly to Germany crossing Baltic Sea) and South Stream project (From Russia crossing Black Sea to Southern Europe)

[7] The entire texts can be downloaded from Kremlin web-site (http://www.kremlin.ru/eng/text/docs/2009/04/215305.shtml) accessed on July 8, 2009

and the government encouraged natural gas as a fuel for district heating and electricity supply. The share of natural gas has risen gradually since 1985 to 16 percent in 2007.

Renewable energy is also promoted by the government through a variety of policy measures. In the power sector, for instance, electricity generated from renewable energy is guaranteed a minimum purchasing price and a priority access to the power grid. According to the country response, wind power and biomass energy are subsidised. Furthermore, a tax system referred to as the "Green Tax Package" was introduced in 1995. In the Package, a CO_2 tax was introduced, and its taxation rate is highest for electricity usage followed by oil products, natural gas, coal, and combustible waste. Renewable energy is exempted from this CO_2 tax. Thanks to these policies, the share of renewables in energy supply has increased from 2.9 percent in 1980 to 16.8 percent in 2007, which is significantly higher than the OECD average (6.7 percent). It should be noted that Denmark's significant increase in renewable energy was achieved because of the country's unique wind resource, its government's commitment to support renewable energy development, and linkage with the extensive power grid network in Europe (Box 3-6). In addition, strong environmental awareness by the Danish public also facilitates the country's proactive policy to increase the use of renewable energy.

Declining domestic oil and gas production has become a major challenge for the country's energy security. In addition, how to develop additional and reliable renewable energy may become a substantial issue for Denmark. Large-scale introduction of wind power raises a concern over the integrity of the grid system. The country response indicated that Denmark requires close international cooperation to cope adequately with this concern.

Box 3-6: Balancing wind power in Denmark

In 2008, Denmark generated 19 percent of its electricity from wind power, almost 25 percent in western Denmark, and below 15 percent in eastern Denmark. The east and the west of Denmark still remain unconnected.

The west Danish grid is connected to the Norwegian, Swedish, and German grids. The interconnectors were built as export lines of Norwegian and Swedish hydroelectric power to Germany, but have found a new use in helping to balance the highly variable wind output from Denmark.

Essentially all Danish wind power is "exported" to Norway and Sweden. These countries dynamically balance the interconnected grid using their extensive hydroelectric generating capacity that can be adjusted rapidly to compensate for the highly variable Danish wind. In essence, water is held back in Norway and Sweden when the wind blows in Denmark. This conserved water can produce power when it is needed.

However, as a consequence of the EU Renewable Energy Directive, both Sweden and Norway now have very ambitious plans to install their wind power. This will change the present very favourable situation for Denmark

dramatically in a few years. Already there have been several situations with zero prices in western Denmark due to high wind-power generation and low consumption, and limited possibilities to export. The number of such situations will rise in the future, and will probably even turn to negative pricing as the Nordic electricity exchange, Nordpool, opens up for negative pricing in the autumn of 2009. This highlights the importance of three things:

- Access to balancing power possibilities in electricity systems with a high percentage of intermittent wind power – preferably low carbon options
- The role of transmission capacity – the transmission capacity has to be increased substantially with more intermittent power
- Adequate market pricing signals reach all market actors – including wind power generators.

f) Japan

Because Japan has very limited indigenous energy resources and most of its energy supply depends on imports, energy security has been regarded as a critical policy issue, especially since the 1970s. Two measures are highlighted as pillars of Japan's energy security policy: energy conservation and non-oil-based energy. In addition, enhancing emergency preparedness through building strategic oil reserves has been added as an important component of policy.

Japan has made a significant achievement in energy conservation by reducing its GDP intensity per energy demand by 42 percent from 1973 to 2006 (Box 3-7). The "Act on Rational Use of Energy" was formulated in 1979 and became the fundamental legislation guiding Japan's conservation efforts. The Act has been amended three times to update changes in demand patterns and to cope with climate change. To improve energy-efficiency effectively, close collaboration between the government and industry has been critical. The government sets a clear vision and makes a strong commitment toward energy efficiency improvements, and the industry proactively responds to such government guidance. In addition, the experience of consecutive oil crises strongly motivated the public to save energy.

Diversification from oil has also occurred since the 1970s. The 1980 "Act on Promotion and Development of Alternative Energy" sets a target of alternative energy in relation to oil, and encourages both the government and the private sector to promote alternative fuel developments. With this Act as the basis for energy policy, various specific instruments, regulation and administrative guidance enable the use of conventional energy supplies other than oil. Building an emergency stockpile began in the 1970s, and at the end of 2007, Japan held oil stockpiles equivalent to 174 days of consumption.

Natural gas, as well as nuclear power, has been regarded as a centrepiece of energy source diversification in Japan. The use of natural gas was promoted by the Act, which resulted in substantial growth gas demand in the power, residential/commercial, and industry sectors.

Japan's natural gas supply has been almost fully met by imports in the form of LNG, which is characterised by long-term contract for more than ten years which ensures a stable supply for Japan. In addition, since its first importation from the US (Alaska), Japan succeeded to expand LNG supply source countries, and last year imported LNG from 14 countries, mainly located in Asia-Pacific and Middle East region. While most supply is still based on long-term contracts, Japanese LNG buyers are now making best use of spot procurement, which gives them flexibility to deal with fluctuations in supply and demand of natural gas.

As for the future challenges, reducing Japan's dependency on oil is still regarded as a major goal. This requires continuous efforts in energy conservation and diversification. Promoting non-fossil fuels, such as nuclear power or renewable energy, is also considered a major option crucial to enhancing energy security as well as meeting greenhouse gas reduction targets. Indeed, revising the existing law on alternative energy introduction and creating a new act to promote alternative energy were discussed and finally approved by the Japanese Diet on 1 July 2009. Such measures to adopt renewable or nuclear energy often require additional costs burdens to industrial players and final consumers. To facilitate the implementation of such measures, public support backed by strong awareness of the importance of energy security, is an important factor. In the case of nuclear energy, public acceptance is a big challenge for Japan, while renewable energy is increasingly becoming the preferred option of the Japanese public.

Box 3-7: Japan's "Act on Rational Use of Energy"

Originally enacted in 1979, the Act has been the fundamental piece of legislation underpinning Japan's energy conservation efforts. The Act required industry to conserve energy through criteria established by the government.

The Act was amended in 1997 after the conclusion of Kyoto Protocol and the revised act includes a number of additional obligatory measures, such as the 'top runner program' for automobiles and electric appliance, and the requirement for large-scale industry (manufacturing, electric supply, gas supply, and heat supply) to submit mid- to long-term energy conservation plans and report annual energy consumption.

While energy consumption in industrial sectors was greatly reduced under these measures, energy use in commercial, residential, and transportation sectors were less successful. Amendments in 2002 and 2005 targeted commercial, residential and transportation sectors, and mandatory efficiency standards were imposed in buildings, truck and rail transportation.

g) France

The primary objectives of France's energy security policy are to reduce hydrocarbon energy imports and diversify its energy supply (Box 3-8). Reducing the impact of uncertain fossil-fuel markets, especially volatile oil prices, on France's economy has been a vitally important objective, especially

given that France has very limited hydrocarbon energy reserves.

Nuclear energy has been a central focus for France's energy security since 1970. The share of nuclear energy in total power generation increased from 8.1 percent in 1973 to 75.3 percent in 1990, and its share has remained slightly below 80 percent since 2000. This is the highest share in the world and the key has been the strong guidance by the French government in the development[8] of nuclear energy in close collaboration with domestic industrial players. The French public's strong awareness of the importance of energy security also played an important role in supporting nuclear power generation.

The promotion of renewable energy, as well as energy conservation, has also played a major role in French energy security. Regarding renewable energy, in particular, France has historically utilised hydropower generation. Since the enactment of the Grenelle Framework Law in 2008, which aims to double the share of renewable energy in electricity generation, more active promotional measures are being developed. As noted for Japan, promoting renewable energy often requires the public's willingness to bear the additional burdens in adopting renewable energy. In this sense, the process of drafting the Grenelle Framework Law involved a public consultation process, which helped to raise public awareness of the significance of energy policy. As for energy conservation policy, France has introduced a labelling system for home electronics in the residential sector and provides interest-free loans for energy-efficient housing. These policies have enabled a 30 percent improvement of GDP intensity from 1973 to 2007.

Regarding the future, France will have to face several issues related to nuclear-power development, including the disposal of high-level nuclear waste, the reprocessing of spent nuclear fuel, and continuing public acceptance. The country also needs to proceed with the replacement of its aging nuclear reactors. To decommission and dismantle old reactors incurs significant costs, and indeed the country has already begun to raise the necessary funds for this. France, furthermore, is facing increasing pressure from the European Union to liberalise its domestic energy market. A major issue for France is how to reconcile its traditional principles of energy security with EU requirements for increased market liberalisation.

Box 3-8: France's Nuclear Energy Policy

Nuclear energy has been at the centre of France's energy security policy since 1970. Then French Prime Minister Pierre Messmer identified nuclear energy as the key energy source for France's future and introduced the so-called "Messmer Plan" to activate investments in nuclear energy in 1974. This plan was the catalyst of France's nuclear development because substantial investments were made in line with this plan.

The French government has been deeply involved in the nuclear-energy value-chain from R&D to plant construction and operation.

[8] It may be useful to note that the widespread power grid in Europe has supported the growth and high share of nuclear power in total power generation in France.

Nuclear energy development has been facilitated by close relationships and coordination between the government and industry. Key energy companies are Electricite de France (EdF) as a power supplier, and Areva as a nuclear-energy company. The fact that both of these companies are stated-owned companies gave the government an effective tool to pursue its nuclear energy policies.

France has also succeeded in developing a competitive nuclear industrial player, Areva, with strong government supports. Its nuclear energy policy has been successful from an industrial policy perspective.

h) United Kingdom

In the United Kingdom two measures of energy security policy are highlighted: the promotion of domestic energy development and investment in the energy supply infrastructure. The UK has intensively explored and developed oil and gas fields in North Sea since the late 1960s and has developed a significant number of oil and gas fields in the 1980s, moving the UK into a position of self-sufficiency. North Sea oil and natural gas production peaked in 1999 and 2000, respectively, and the UK is no longer self-sufficient. How to address declining domestic production is one of the key issues for the country's energy policy. To encourage further exploration and development in the North Sea, the government is simplifying the licensing process and examining other incentives.

With domestic hydrocarbon energy production decreasing, renewable energy is expected to play a major role in the UK's energy security policy. The UK is geographically a favoured location for wind-power generation, and the government's support for substantial developments rests on the view that wind could become a major electricity supplier.

The UK has also promoted investments in energy infrastructure to ensure flexible and reliable energy supply. For example, even after market liberalisation in the 1980s, the government provided incentives to network operators to continue to invest; regulated third party access tariffs system were developed to meet this objective (Box 3-9).

Box 3-9: The United Kingdom's Market-based Approach to Energy Security

The UK's policy emphasizes the strong role of markets, rather than sole reliance on direct government control or regulations, in implementing energy policy. This approach is applied across the board, not only in developing supply networks, or the procurement of energy, but also in encouraging switches in energy supply mix.

The wholesale market for natural gas and electricity is well developed in the UK. Many participants trade energy commodities in the market, such as natural gas or electricity, and transaction prices are readily available. With the liquidity of a commodity and its price transparency ensured, anyone can enter the market to buy and sell energy at any time at market prices. From the UK's energy policy perspective, development of this situation has enabled the goal of energy supply security.

A well-designed overall energy policy enhances not only energy security but also achieves other important objectives, such as mitigating climate change.

Commodity futures are also actively traded in the market allowing assessment of possible forward prices. Thus for example, a surge in the forward price of electricity would suggest future supply shortage and this information can encourage decisions to invest in increased power generation. A market-based approach is also used to address climate change through the emissions trading system.

Securing sufficient and reliable supply to meet growing natural gas demand will be a major challenge for the UK. Natural gas is a key component in the country's climate change policy, and gas demand is expected to increase for the foreseeable future. The UK's policy response has been to encourage energy efficiency, reduce demand for gas, and promote diversity of supplies. Most natural gas imports come from Norway through pipelines, and new LNG terminals, allowing wider sourcing of imports, are being developed. Licensing and planning procedures have been simplified to encourage the private sector to invest in gas storage facilities, providing flexibility during periods of peak demand.

3. Key Lessons for Energy Security and the Economy

The eight countries described in this chapter set out to improve their energy security. Japan adopted regulations and a unique system, the top-runner program, to promote energy efficiency improvement. France developed and implemented a package of policies including government financing for energy efficiency investment and introduction of a labelling system. Regarding the diversity of supply, France and Japan introduced more nuclear energy and Denmark more renewable energy. The United Kingdom has strengthened its energy infrastructure to ensure reliable and flexible supply and is now looking to renewables.

All IEA member countries are obligated to develop strategic reserves. Japan in particular has developed an extensive stockpile, and it holds an inventory equivalent to 174 days of consumption. Facing rapidly growing domestic demand, India has tried to ensure that its energy supply will sustain its economic growth. While some progress in India's energy security policy has occurred, such as domestic oil and gas development, the country still has a number of energy security challenges such as subsidised energy prices and inadequate institutional capabilities. Brazil enhanced its energy security by utilising its abundant energy resources including hydrocarbon resources, hydropower, and biomass. Although Russia and Nigeria are energy-exporting countries, they have recognised the importance of energy efficiency and improving and diversifying energy sources, and have implemented related policies. They have also pursued policy to enhance security of demand by promoting appropriate infrastructure investment, diversification of export outlets, and development of long-term contracts with consumers.

Based on our analysis of all the countries covered in the Assessment and the eight countries in particular, the following key messages and recommendations emerge.

1. Effective institutions and capabilities

In pursuit of energy security policies, a country needs to have effective institutions to develop appropriate energy security policies and to monitor their implementation. Sufficient local expertise and the collection of relevant statistical data are also very important in developing and reviewing energy security options. Although these capabilities are not always available for all countries, it should be noted that the effectiveness of energy security policies are enhanced with these capacities. At the same time, it is important to note that international cooperation can supplement an individual country's efforts in this area.

2. Long-term policy with clear vision and consistent commitment by government

The second recommendation is a clear vision of energy security policy and ensuring the government's commitment to that vision. The vision must be based on the best scientific knowledge available, be non-biased, and account for the country's individual conditions including native resources, economic development goals, industry needs and so on. To achieve this vision an energy security policy should be designed and implemented, to encourage requisite energy investments for the long term. A well-designed overall energy policy enhances not only energy security but also achieves other important objectives, such as mitigating climate change. Thus, the approach must be integrated. In the case of France and Japan, both governments set a clear vision: to prioritize nuclear-energy development in France's case, and improve energy efficiency in Japan's. These two governments continue to make a strong commitment to achieve their visions by allocating sufficient government funds to their policy priorities. Because energy security measures are sometimes costly and cannot be pursued by private entities alone, government commitment is a necessary condition for a successful energy security policy.

3. Efficient energy pricing

Efficient energy pricing strongly enables energy efficiency improvement and energy investment. In all four of the higher-income countries, high oil prices in the 1970s were major factors in improving energy efficiency and developing domestic energy sources from oil, natural gas, nuclear, and renewable sources. Undoubtedly, price signals worked effectively to promote energy security policies in these countries. As we observed in India, Nigeria, and Russia, energy security efforts, such as energy-efficiency improvements or the introduction of alternative energy, must have a rational set of economic incentives if they are to be realised. Consumers will want to save more energy if they find it makes economic sense. Investors will invest more if energy investments bring a higher return, as may be the case under liberalised energy markets. Appropriate price signals ensure that energy security measures are most effective. Although it is not necessarily limited to energy pricing, the United Kingdom has adopted a market-based approach toward energy security, and it has worked effectively. It is important to note that well-developed and well-timed energy infrastructure plays an important role in this approach.

Industry knows how to implement policy options through its business experience in the marketplace.

4. Cost-effectiveness of policy

Energy security policy needs to be designed and implemented in a cost-effective way. Although public awareness of energy vulnerability is a critical requirement in building support for an energy security policy, it is essential that the policy be cost-effective to succeed. An important way of pursuing this is to fully utilise the best available technology. Thus, it is important to promote energy RD&D to find new technological solutions to energy security and also climate change. To address global energy challenges, technology transfer and international energy cooperation also play key roles.

5. The critically important role played by industry players

Even though the government has a thoughtful vision and has set clear targets, success of such goals requires strong commitment by industry players, who will make many of the necessary investments. Industry knows how to implement policy options through its business experience in the marketplace.

Appropriate involvement of government and industry stakeholders and close coordination between government and industry are keys to implementing successful energy security policy. A good example is France's nuclear energy development. The French government had a clear vision and promoted nuclear energy. Industrial players such as EdF or Areva, both of which are partly state-owned, played a very important role.

Cooperation and coordination between the government and industry certainly assisted in successful nuclear energy developments in France. Japan's energy efficiency improvement can also be regarded as a good combination of government policy and private sectors' efforts. The Japanese government after the oil crises in the 1970s implemented energy efficiency policy while Japanese industries made serious efforts to streamline their energy consumption to maintain international competitiveness, thus ensuring commercial survival. Other good examples are the measures taken to increase the natural gas supply in Japan and the UK. Under the clear vision of the governments to emphasis energy security, promotion of natural gas as a part of energy source diversification, gas import source diversification, and necessary infrastructure development were implemented by energy industries.

6. Consideration of each country's unique background

The final recommendation is the recognition of each country's uniqueness. France prioritised nuclear energy because of its limited domestic hydrocarbons. The United Kingdom's policy in adopting market mechanism was feasible and effective because of its historical familiarity with market principles. Denmark succeeded in raising its share of renewable energy thanks to its geography and demographics. Brazil is emphasising optimal use of abundant domestic energy resources. The best energy security measures will vary across countries depending on various situations and unique conditions.

This chapter features successful examples of energy security policies. From our analyses, it is possible to infer that an energy security policy is more likely to be unsuccessful if the abovementioned conditions are lacking.

Developing and implementing successful energy security policy is never an easy task. It is one of the most important policy priorities regardless of market conditions, and policymakers should always pay sufficient attention. Enhancing energy security is a never-ending endeavour, thus sincere efforts to identify the best options for sound energy security policy, regardless of country context, is a very valuable enterprise.

4. Climate and Environment

1. Introduction

Energy and climate have been linked for a long time. Analysing the climate helps anticipate changes in energy demand and commodity prices. Over the past few years, however, the causality between the two has been altered. Whereas the environment used to be seen as an input into human activity in the past, changes in the climate are now seen as an output of energy sector activity, with a closer link between the two.

Since pre-industrial times, increasing emissions of greenhouse gases (GHGs) from human activity have led to a marked increase in atmospheric GHG concentrations. Between 1970 and 2004, global emissions of CO_2, CH_4, N_2O, HFCs, PFCs, and SF6, weighted by their global warming potential (GWP), have increased by 70 percent from 28.7 to 49 Gigatonnes of carbon dioxide-equivalent (Gt CO_2-eq). Between 1990 and 2004, the increase was 24 percent.

The energy sector is the largest contributor to climate change, as it produces nearly 60 percent of GHG emissions, and was responsible for the largest growth in global GHG emissions between 1970 and 2004 (+145 percent). The weight of the energy sector in terms of its emissions means there is no adequate restraint to climate change without solutions from the energy sector.

CO_2 is the largest emissions source, having grown by about 80 percent between 1970 and 2004, and a distinctive acceleration in annual emissions rates during recent years. The global mean concentration of CO_2 in 2005 was 379 ppm; that of all six GHG gases approaches 450 ppm, and is growing at increasing rates. The urgency of the problem is suggested by the Intergovernmental Panel on Climate Change. If humankind wished to limit the global mean temperature increase to 2°C, 450 ppm is the level at which greenhouse gas (GHG) concentrations need to be stabilised.

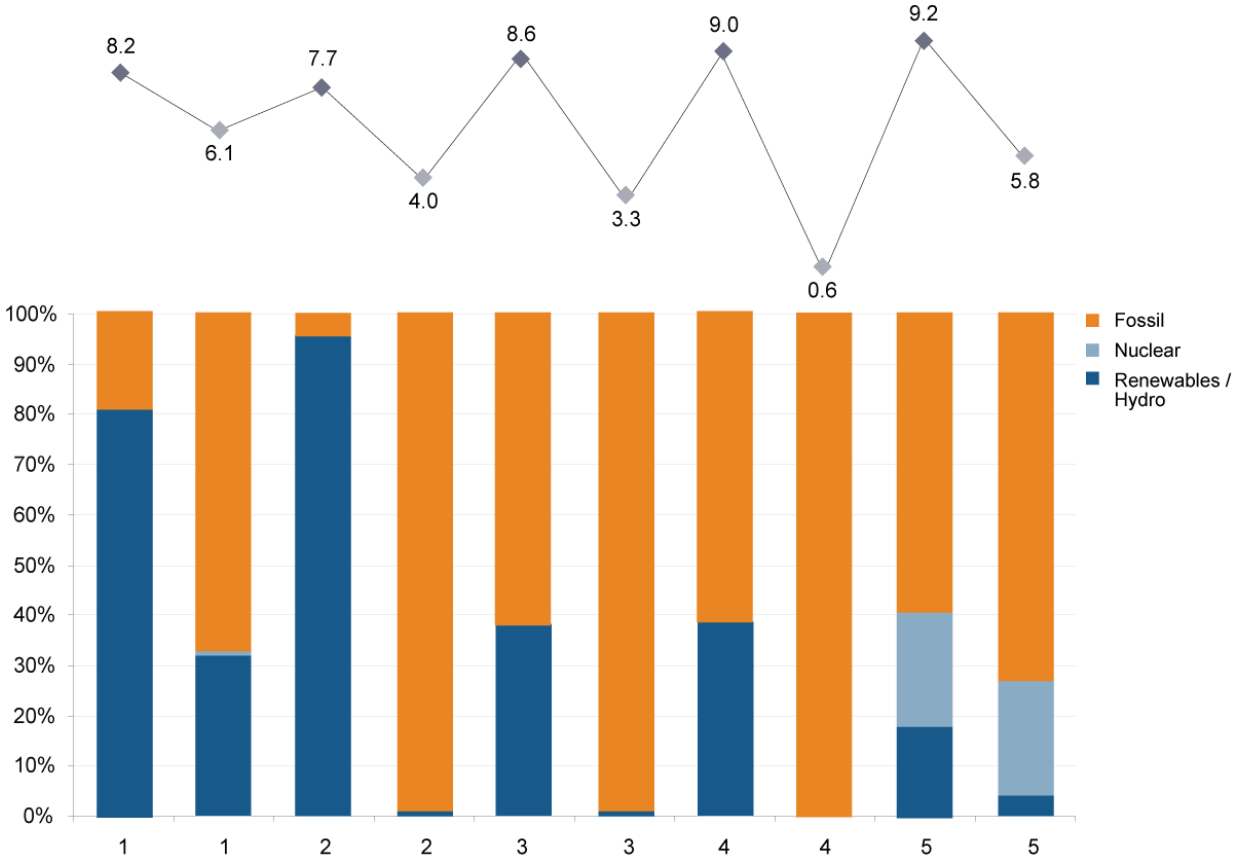
The fifteenth session of the Conference of the Parties (COP) to the Climate Convention in December 2009 in Copenhagen (COP-15) will be a decisive step in the attempt to address climate change at the global level, building on the Bali Road Map and Action Plan that attempted to tackle five major areas of action: (a) a shared vision for long-term cooperation, including a long-term global goal for emission reductions, (b) enhanced national and international action on mitigation of climate change, (c) enhanced action on adaptation, (d) enhanced action on technology development and transfer and (e) enhanced action on the provision of financial resources and investment.

This chapter reviews the climate and environmental dimensions behind existing energy policies, using the Assessment Index and questionnaire responses from the member countries. The aim is to identify how energy policies can best address environment issues. Given the forthcoming conference in Copenhagen, there is a special focus on climate change.

The analysis was carried out in three stages:

- Identification of key factors explaining the best results within the Environment support of the Assessment Index.

Figure 4-1
Fuel mix for countries in the top (high scores) of the Environment Support (see D, Annex 1) compared to those (low scores) performing less well (see Annex 3).



- Examination of policy implementation, including objectives, priorities, and the obstacles faced by policymakers. This detailed analysis has been conducted across the five clusters and used the responses from the questionnaires received from Member committees (see next section)

- Development of a list of criteria and fundamental challenges in designing and implementing effective climate-energy policies based on our analysis (see Section 3, this chapter).

2. Policy Analysis

Results from the Assessment Index

The country classifications of the Assessment Index, shown in Annex 2, highlight a key determinant of effective energy policy: the share of renewable energy in the overall energy mix, a product of renewable native resources. Countries with a high level of using renewable resources, mainly hydro, have high values for the Environment support. This is valid across all clusters and is shown dramatically in Figure 4-1.Countries with a relatively high share of renewable and/or nuclear energies in their total primary energy consumption tend to score high in the Environmental Support. The figure compares countries scoring at the top of the Environmental Support within each cluster with a lower Environmental Support.

For lower-income, energy-importing countries in cluster 1, Kenya, at the top of Environment Support, has a significant hydro share in its power generation (51 percent), together with other renewable energy, such as geothermal (14 percent). The same applies for Nepal (100 percent hydro), Tanzania (52 percent), and Ghana (67 percent), which also are in the first division of the Environment support, with domestic electricity generation coming almost all or significantly from hydroelectric plants.

For lower-income, energy-exporting countries in cluster 2, Democratic Republic of Congo, which scores in the top division in Environment, is in a similar situation with electricity essentially being generated from hydro (almost 100 percent), leading to a CO_2 content of electricity that is the lowest of all WEC member countries (3 g/kwh). The same applies for Cameroon (94 percent) and Paraguay (100 percent).

This hydro situation is found in the other clusters as well. In the fast-growth economies of cluster 3, countries like Colombia (79 percent), Brazil (83 percent), Peru (79 percent), Namibia (94 percent), and Uruguay (64 percent) benefit from their significant hydroelectric resources and top the scoring on Environment. In cluster 4, Norway with a share of 98 percent for hydropower achieves remarkable results. For higher-income, energy-exporting countries in cluster 5, the top ten countries for Environment, including countries like Switzerland (53 percent), New Zealand (55 percent hydro and 8 percent geothermal), Austria (59 percent), and Iceland (73 percent hydro and 27 percent geothermal), have a large renewable asset in hydro, but geothermal for some of them.

However, the Assessment Index reveals interesting examples of top division countries in Environment support that do not have a power sector based significantly on renewable energy, specifically hydro.

In cluster 1, the Philippines has a rather balanced electricity mix based mostly on fossil fuels (oil, gas, and coal for 54 percent) with renewable energy (hydro and geothermal) amounting to 36 percent of total electricity generation. Yet, the Philippines scores fifth highest in this cluster, ahead of countries with almost 100 percent renewable power.

The Côte d'Ivoire is another example. In cluster 2, it scores second for Environment while its electricity mix shows a share of 73 percent for gas. Top division countries of cluster 3 include Mexico, Lithuania, and Russia. For cluster 4, Australia places third.

For higher-income, energy-importing countries in cluster 5, Sweden, Finland, the United Kingdom, Belgium, and Slovenia belong to the top division countries for the Environment, while their share of hydro in their electricity mix is limited. Interestingly, the share of nuclear power for those countries is significant. Nuclear also plays a significant role in Switzerland, placed first in cluster 5 for Environment, but also in cluster 3 and 4 for countries like Lithuania, Russia and to a lesser extent, Canada.

From this first analysis, three main considerations emerge:

- High hydroelectricity production in a country is an important enabler of effective energy policies regarding environment and climate.
- Other factors play a role as demonstrated by countries with a limited or low hydro potential that score high in the Index.
- The role of hydropower differs across clusters, with a higher weighting for cluster 1

and 2 countries that tends to decrease in the other clusters, and where nuclear power plays a complementary role in clusters 4 and 5.

Priorities and Objectives of Climate Policies

Analysis of the questionnaires sent to member committees lead to two main conclusions. First, climate and environmental concerns exist across many countries leading to a wide variety of policies. Almost all countries that answered this questionnaire indicated that policies were in place to tackle climate and environmental issues. Second, the practical challenges differ significantly across nations, as well as the human and technological means each country can mobilise. This leads to different priority sets and different policy tools for the countries in the various clusters.

a) Lower-income Countries (Clusters 1 and 2)

Demand growth in those countries tends to be extremely rapid and in many cases higher than GDP growth.

Access to modern energy is a high priority in these countries. It is viewed as a critical element of development that can, at the same time, bring positive effects on indoor pollution and on emissions reduction through, for instance, forest preservation.

These tensions on the investment side are widely reported in the member committees' answers. This situation, combined with tight access to capital, tends to favour investments in greenhouse gas emitting technologies, such as natural-gas-fired power plants, which have short construction time and are less capital-intensive.

Costs of mitigation measures essentially shape energy policy. The higher costs of low-emission technologies, and their consequences on growth and development, are a key concern. These additional costs are magnified by the fact that those technologies are often imported, require large capacity-building efforts, and often have domestic price structures with significant levels of subsidies.

In this context, energy efficiency is seen as an essential tool that enables emission and pollution reduction in a cost-effective way while reducing the need for new investments and increasing energy security.

The spectrum of sectors involved in implemented policies is broad: transport, buildings, appliances, and electricity generation. Regarding the latter, India has set a target: gross efficiency of power generation should be increased from the current average of 30.5 percent to 34.0 percent. Some countries underline the fact that energy efficiency also concerns actions of the maintenance of existing power plants. Senegal, for example, indicates that more than one quarter of installed power generation capacity is unavailable.

Energy pricing is a critical element of energy efficiency. Unbalanced energy price structures tend to hinder energy efficiency efforts through "rebound effects." The Indian approach to energy policy shows that "energy efficiency can be promoted by setting appropriate prices" (Box 4-1).

Box 4-1: India's "Integrated Energy Policy"

Enacted in 2008, the policy states that many of the recommended initiatives would reduce the greenhouse gas intensity of the economy by as much as one-third:

- Energy efficiency in all sectors
- Emphasis on mass transit
- Active policy on renewable energy that stipulates renewable portfolio standard
- Promotion of biofuels and fuel wood plantations
- Greening India's programme to bring 33 percent of the country's land under forest cover
- Accelerated development of nuclear and hydro electricity
- Technology missions for clean-coal technologies
- Focused R&D on many climate friendly technologies
- A mission to make solar power an economic option to coal-based power

It is worth mentioning the concern of adaptation common to many countries in this cluster. Some plans are being developed to enhance knowledge of the possible effects of climate change locally. Nigeria, for instance, has a plan with three objectives:

- Improved understanding of the key drivers of climate variability and climate change.
- Assessment of vulnerability and impacts, including social and economic vulnerability.
- To increase resilience of communities by enhancing their capacity to cope with the impact of climate change.

Some key elements of climate and environment policies can be identified from the responses of the member committees in clusters 1 and 2:

- **Enhance energy efficiency.** Many of the measures reported rely on norms and standards.
  - In the transportation sector, Nigeria, for instance, is developing a modern urban transportation plan to phase out environmentally unfriendly motorcycles and single-cylinder, two-stroke-cycle engines, and replacing them with large urban transportation buses (a mix of electric drives, compressed natural gas, diesel engines, tramways, railways, and subways).
  - In buildings, Indonesia developed in 2005 a policy of energy efficiency in government buildings.
  - India set up a Bureau of Energy Efficiency with wide competencies over transport, building, electricity generation, and appliances through labelling,

benchmarking, and dissemination of information.

- **Invest in hydropower.** This is favoured, with due consideration to sustainability issues such as population displacement and biodiversity, in countries with hydro potential, and is in line with previous conclusions drawn from analysing the Index.
- **Promote biofuels.** Many countries have biofuel targets.
- **Facilitate the participation of private investors.** Increase the level of investments and the potential diversification of technologies.
- **Enhance energy price structures** and target subsidies in well-defined customer categories to enhance the efficiency of the energy sector, sustain growth, and ease investments, while addressing the social issues of access and energy poverty.
- **Increase efforts in capacity building** to enhance local skills. Nigeria, for example, has a policy for empowering small and medium-sized enterprises.
- **Promote technology transfer** through capacity building and cooperation with foreign companies or states.

b) Fast-growth Countries (Cluster 3)

Demand growth and the need for investment remain high concerns for cluster 3 countries, with two main challenges as identified by the member committees:

- Promote technology transfer through capacity-building and cooperation with foreign companies or states.
- Public acceptance. Almost all countries report concerns, especially the lack of public support for new electricity infrastructures; transport infrastructure is less impacted.
- Efficiency of price structures, through market-oriented reforms, especially in the power sector to enhance the efficiency of pricing, sustain investment levels, and foster energy efficiency to reduce the carbon intensity of electricity production.

Access is not a key issue for most cluster 3 countries, but remains a concern for some of them, mainly in sub-urban and rural areas. Actions in favour of rural electrification can be combined with renewables. Argentina, for instance, has put in place the Renewable Energies Project for Rural Markets (PERMER) (see Box 2-3). This project aims at providing electricity from renewables to the 30 percent of its rural population with no electricity.

Options for low-carbon technologies in electricity generation are many. Hydropower development remains a high priority in countries with hydro potential.

Most countries have a renewables target, with some countries putting in place incentive schemes through feed-in tariffs. However, some member

committees report issues regarding the cost of support to renewables with potential negative implications on electricity prices.

Several countries report their intention to develop nuclear power, and combined cycle gas turbines as a means to mitigate carbon emissions, in particular in countries with gas resources, for example, Mexico and Egypt.

All countries report interest in biofuels and many have set targets. Brazil has developed an extensive biofuel policy based on the use of ethanol as a car fuel. PROALCOOL (National Ethanol Program) was established in the 1980s, as a response to the increase of oil prices, in order to reduce oil dependency. Today the Brazilian market for fuel-flex cars, mainly using ethanol, has achieved the exceptional mark of 86 percent of the total car sales in the country.

Energy efficiency remains a top priority in cluster 3 countries, with dedicated administrative organisations that coordinate efforts and define norms, standards, and labels across all sectors. Efforts toward effective energy-efficiency policies build on long-term action and capacity to organise constant monitoring of results, with feedback on norms and standards on the demand side and market organisation on the supply side. One example of this type of policy is the Brazilian program of energy savings and efficiency in the electricity sector, PROCEL, set up in 1985 (Box 4-2).

Policies are often put in place after experimentation. For instance in Mexico, subsidies for replacing household electric appliances (refrigerators, air conditioners, etc.) with more efficient ones were given out only in a small region in northern Mexico for several years. Its local success contributed to it becoming a nation-wide program.

Box 4-2: Brazil's Programa Nacional de Conservação de Energia Elétrica (PROCEL)

PROCEL is Brazil's national electricity-saving program. Its principal goal is to promote energy production and consumer savings by avoiding the waste of energy, reducing costs and increasing investments in the energy sector, establishing energy savings aims, and planning the energy expansion of generation and transmission.

The principal actions considered are reduction of technical losses of energy suppliers and best use of electric energy, avoiding wastefulness.

The program was launched after the oil crises in 1981 with high efficiency equipment granted a label of superior energy efficiency. In recent years, it has been introduced in a broader sense to other sectors, including for example, sanitation, education, industries, local administration and public illumination, to set initiatives for energy optimisation, energy efficiency projects and information systems.

The results obtained during the development of PROCEL's activities are presented in terms of investments and saved resources (energy and new investments).

Yearly Results and Investments obtained by PROCEL

	1986/ 2003	2004	2005	2006	2007
Total Investment (BRL[9] million)	666.08	94.15	98.02	113.24	52.78
Energy Saved (billions kWh/year)	17.22	2.373	2.158	2.845	3.930
Peak Demand Reduction (MW)	4,633	622	585	772	1,357
Equivalent Power Plant (MW)	4,033	569	518	682	942
Postponed Investment (BRL billion)	10.65	2.50	1.77	2.23	2.76

Cumulative Results PROCEL

Total Investment (BRL million)	1.02
Energy Saved (billions kWh/year)	28.5
Peak Demand Reduction (MW)	7,969
Equivalent Power Plant (MW)	6,744
Postponed Investment (BRL billion)	19.9

Structural market reform is being used to increase the efficiency of plants and energy systems. In the electricity sector, rules favour the efficient dispatching of plants and "yardstick competition" through benchmarking.

Industry is a common target for energy efficiency in cluster 3 countries, which have a significant industrial sector. Some countries underline the importance of the economic structure on emissions and stress the importance of policies aimed at increasing the share of services in the economy. As an example, Mexico states "Structural economic changes led to a different energy profile, many energy-intensive industries moved out of the territory, increasing the growth of the service portion of the economy." In this same country, information dissemination through sharing best practices is one of the policy tools put in place through a National Prize for Energy Conservation in small, medium, and large entities. The prize is awarded by the president for the best energy conservation scheme in industry and commerce. In Argentina, the Energy Secretariat, through the Energy Efficiency Coordination Office, carries out the Program for Increasing Energy Efficiency in Industrial Productivity, which is environmentally sustainable, in the Small- and Medium-Sized Enterprises sector in Argentina (PIEEP), with funds from the German Technical Cooperation Agency GTZ (Gesellschaft für Technische Zusammenarbeit). The objective of the PIEEP is to encourage industries to execute actions oriented to environmentally sustainable and efficient use of resources, increasing their productive efficiency and competitiveness.

In the transportation system, beyond the biofuel targets already mentioned, reported policies in this area often include targeted actions aimed at incentivising investments in more efficient vehicles. For instance, Egypt has a scheme to encourage taxi drivers to buy new, more efficient, and less

[9] BRL is Brazilian Real (equivalent to approx US $0.55)

polluting cars. Bulgaria invokes tax structure reforms that favour newer cars. South Africa is planning to introduce a similar tax reform for vehicles based on emissions. Infrastructure development is also reported by some member committees with new roads to limit congestion and the development of mass transit systems.

Norms and standards for energy efficiency in buildings are being put in place. Technical solutions depend on the local situation of each country; countries with solar potential have a priority for solar heating, as in the case of Mexico with a project to make solar water heaters compulsory in new buildings. Other countries focus on enhancing the efficiency of heat networks, for example, Latvia. Innovation-driven policies face important challenges in cluster 3 countries while many member committees mention the critical role of technology transfer and the use of new technologies to mitigate emissions.

In spite of these financial and capacity-building challenges, some policies to promote efforts on R&D and technology diffusion are in place:

- Mexico passed a law in October 2007 where 0.65 percent of the value of oil and gas production by PEMEX will be dedicated to fund oil and gas and sustainability R&D programs. These are just now being implemented.

- Some countries underline the importance of pooling efforts on a regional basis. Egypt has set up a Centre of Excellence for renewable energy and has established a regional partnership with North African countries and the Middle East.

- Thailand is putting in place a promotion scheme for localising the manufacture of “eco cars” (production lines being set up).

Many countries stress the role of Clean Development Mechanisms (CDMs) as a tool to support technology diffusion. Some countries have structured their efforts through policies aimed at promoting the development of CDM projects (see the examples of Tunisia and Argentina with the creation of the Argentine Office of Clean Development Mechanism).

Finally, it is worth noting that some countries in cluster 3 are making significant moves toward an integrated approach for climate change-oriented policies and establishing specific climate strategies. This is the case, for instance, in Mexico with the Special Climate Change Program (Programa Especial de Cambio Climatico). This program has gone through a large public input process that ended in April 2009. It considers low-carbon interventions for Mexico and sets 303 goals on CO_2 emissions reduction, 42 of them directly related to the energy sector.

c) Higher-income Countries (Clusters 4 and 5)

Investment remains a key challenge in these clusters: meeting growing demand since growth rates are often lower than in lower-income clusters and the need to replace aging infrastructures.

Public acceptance of new energy infrastructures is a major hurdle to investments. This difficulty is present in all energy sectors (especially for electricity, but also for the transportation and the oil and gas sectors) and affects all types of investments, including renewables and power networks. Countries have developed strategies to address this particular issue, with contrasting results. Policies and practices include:

- Siting procedures with transparent public debates involving all stakeholders.
- Support for local communities with local compensation in some cases.
- Social and environmental responsibility, often cited by member committees as a means for companies to enhance trust and facilitate public acceptance.

Building public consensus emerges as a priority not only for specific infrastructures but also at the national level. Regarding the choice of some technologies, nuclear is illustrated by the consultation process set up by the UK government in recent years toward a nuclear renaissance in this country.

With regard to the design of climate-oriented policies to identify priorities and address the economic implications of those policies on the citizens and particular sectors, new approaches are being implemented in some countries and others have well-developed processes, such as Sweden (Box 4-3).

Box 4-3: Sweden's Lawmaking Process

Sweden has a well-defined, participatory law-making process, with the following stages:

1. The Initiative: although most legislative proposals before the Riksdag (Swedish parliament) are initiated by the government, some bills may be based on suggestions put forward by the Riksdag or by private citizens, special interest groups or public authorities.

2. The Inquiry Stage: before the government can draw up a legislative proposal, the matter in question must be analysed and evaluated. The task may be assigned to officials from the ministry concerned, a commission of inquiry or a one-person committee. Inquiry bodies, which operate independently of the government, may include or co-opt experts, public officials and politicians. The reports setting out their conclusions are published in the Swedish Government Official Reports series (Statens Offentliga Utredningar, SOU).

3. The Referral Process: before the government takes up a position on the recommendations of a commission of inquiry, its report is referred for consideration to the relevant bodies. These referral bodies may be central government agencies, special interest groups, local government authorities or other bodies whose activities may be affected by the proposals. This process provides valuable feedback and allows the government to gauge the level of support it is likely to receive. If a number of referral bodies respond unfavourably to the recommendations, the government may try to find an alternative solution.

4. Government Bill: when the referral bodies have submitted their comments, the ministry responsible drafts the bill that will be submitted to the Riksdag. If the proposed law has important implications for private citizens or the welfare of the public, the government should first refer the proposal to the Council on Legislation to ensure that it does not conflict with existing legislation.

5. The Parliamentary Process: responsibility for approving all new or amended legislation lies with the Riksdag. Legislative proposals, whether proceeding from the government or a private member, are dealt with by one of the parliamentary committees. Any of the Riksdag's 349 members can table a counter-proposal to a bill introduced by the government. Such a proposal is called a motion. If a motion is formally adopted in the Riksdag, the government is bound to implement its provisions. When the committee has completed its deliberations, it submits a report and the bill is put to the chamber of the Riksdag for approval. If adopted, the bill becomes law.

6. Promulgation: after its successful passage through the Riksdag, the new law is formally promulgated by the government. All new or amended laws are published in the Swedish Code of Statutes (abbreviated in Swedish as SFS).

Concerns about the efficiency of energy price structures are often reported by member committees, in particular within the electricity sector. Price volatility in recent years and during the current economic crisis has made more difficult investment decisions in both exporting and importing countries. Moreover, many countries in clusters 4 and 5 have conducted power sector reforms and opened their electricity markets. These moves toward more competitive electricity markets have led to positive results in terms of short-term efficiency, the development of power trading, and new incentives to improve generation efficiency.

On the other hand, results on long-term efficiency appear more varied, and some member committees indicate concerns about the ability of current markets to trigger the necessary level of investments, either because of poor long-term signals and contractual arrangements, or because of the presence of low inherited tariffs.

These investment hurdles are of particular significance as many of the cluster 4 and 5 countries have committed to binding reductions that require significant investments in low-emission technologies. As a matter of fact, a majority of those countries belong to the Annex 1 of the Kyoto Protocol and have emission targets for 2012.

Addressing the issue of public acceptance, while meeting reasonable and predictable construction times, is a crucial challenge for the effectiveness of policies aimed at orienting investments toward climate-friendly solutions.

One of the innovative instruments developed to trigger a cost-effective shift in favour of low-emission technologies is cap and trade. The European Union has introduced an Emission Trading Scheme (ETS) that has operated since 2005. Australia and New Zealand are planning to implement a cap-and-trade system and a

legislative process has begun in the United States toward the adoption of such a mechanism.

Intense debates around this new policy tool have stressed the importance of the design of the system for effectiveness. Recently, the European Union has introduced substantial elements to revamp the design of its ETS:

- Increase the long-term perspective of the price signal in line with the long lifetime of investments; bankability of permits between periods should facilitate this long-term perspective.
- All new investments in the electricity sector should pay for their emissions.
- Progressive phasing out of free allocation to existing installations and full auctioning for the electricity sector by 2013.

In cluster 4 and 5 countries, many policies are in place to incentivise the deployment of renewables, feed-in tariffs, Renewable Portfolio Standards or market mechanisms like “green tags or certificates”. Two main issues are raised by member committees regarding these policies:

- Concerns regarding the price level of feed-in tariffs and its economic consequences in case of massive success of the incentive. Some European countries have recently introduced quantitative caps in terms of installed capacity to limit these potential effects.
- The intermittency of some renewables like wind and solar power can have negative impacts on the security of supply when massively deployed. Denmark illustrates the importance of well-developed networks and strong international cooperation to address this issue. Japan is developing a sustained R&D policy effort on storage batteries that could also provide a long-term solution to intermittency of some renewables.

Measures to support carbon capture and storage demonstrations are also underway. The European Union, for instance, has recently decided to allocate the proceeds of the auctioning of 300 million ETS allowances to twelve carbon capture-and-storage demonstration projects and also to innovative renewable technologies.

At the end-use level, a very wide spectrum of policies is in place:

- Labelling, norms, and standards, tax credits, and market mechanisms like “white certificates” are widely used (Box 4-4). Taxation is also reported by some member committees; in Sweden for example, a carbon tax has had very clear results on emissions especially in the district-heating sector where oil and coal have been almost totally phased out.

Box 4-4: White Certificates in Italy

At present, Italy has in force legislation that promotes actions to improve end-use energy efficiency (Ministerial decree 20 July 2004). Electricity and gas distributors have to comply with energy-saving goals fixed by National Authority. Companies can meet these targets directly by actions improving energy efficiency in the residential and industry sectors, and also indirectly buying "white certificates" generated by savings obtained by others electricity and gas companies or ESCOs. Energy savings goals set by Ministerial Decree 21 December 2007 are:

Year	Electricity (Mtep/y)	Natural gas (Mtep/y)
2008	1.2	1.0
2009	1.8	1.4
2010	2.4	1.9
2011	3.1	2.2
2012	3.5	2.5

- Notably, in the transportation sector, the efficiency of new passenger cars in the European Union has been rising over the past decade. This has resulted in carbon emissions for personal cars falling from about 185 g CO_2/km in 1995 to below 160 g CO_2/km in 2007. This trend is expected to continue, as the European Union has introduced CO_2 emission limits for new passenger cars of on average 130 g/km from 2012 onwards, with a long-term target of 95 g CO_2/km in 2020. A good example of incentive pricing applied to reduction of CO_2 emissions is in France, with its innovative "bonus-malus" scheme for new cars. This policy has had significant impacts on purchase decisions (Box 4-5).

Box 4-5: Bonus-Malus for New cars in France

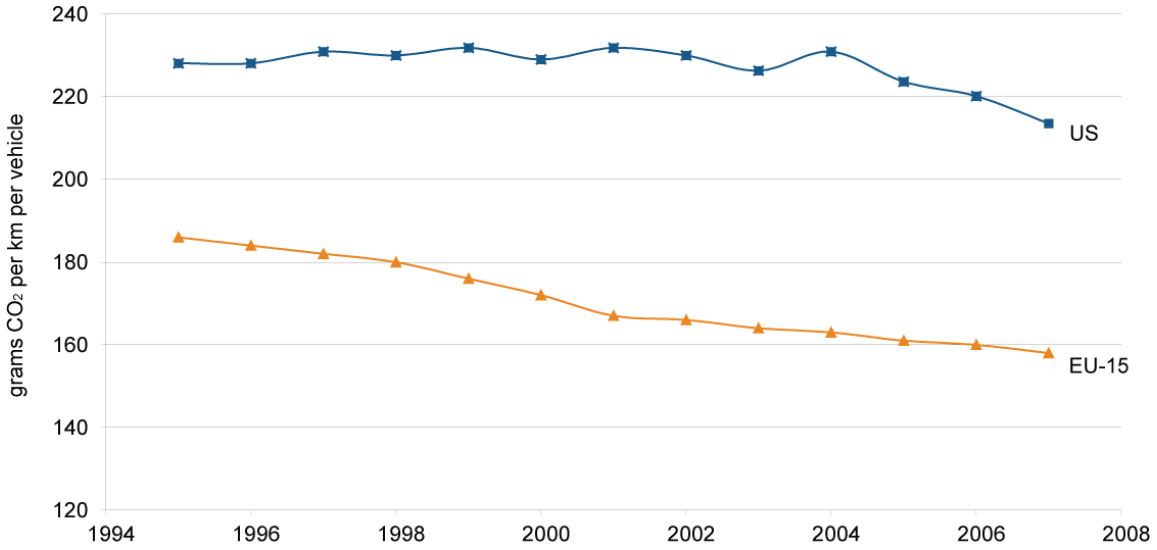
France has implemented a combination bonus and penalty system (bonus-malus) to encourage the purchase of low-emitting vehicles. Bonus applies to new vehicles purchased from 5 December 2007 and depends on the level of CO_2 emissions:

- -€5,000 for vehicles emitting less than 60 g CO_2/km
- -€1,000 for those emitting less than 100 g CO_2/km
- -€700 for those emitting between 101 and 120 g CO_2/km
- -€200 for those emitting between 121 and 130 g CO_2/km

The penalty applies to new vehicles purchased as of 1 January 2008 emitting more than 160 g CO_2/km:

- + €200 for vehicles emitting between 161 and 165 g CO_2/km
- + €750 for vehicles emitting between 166 and 200 g CO_2/km
- + €1,600 for vehicles emitting between 201 and 250 g CO_2/km
- +€2,600 for vehicles emitting over 250 g CO_2/km

Figure 4-2
EU-15 and US CO_2 emissions for light vehicles
Source: EU Commission, US Department of transport



- Planned new fuel economy regulations in the United States will require a combined (car and light truck) fleet average of 35.5 mpg, up from the current level of 25 mpg, which has changed little over the past few years (Figure 4-2).

- Measures to disseminate information, especially to the public, have also been developed. For instance, Sweden reports the public funding of local energy and climate advisors for individuals and businesses that have a direct impact on the demand for energy services in buildings. The training of installers is a key element for deploying new technologies at the end-use level and to ensure quality of new energy services.

3. Key Lessons for Climate and Environment

1. Long-term policies are key

Energy transitions are made out of concrete investment choices. “Stop and go” actions have severe consequences on costs in the energy sector, not only by destroying potentially large amounts of capital, but also by hindering capacity building and the accumulation of know-how, which is essential to cost containment and innovation. Assessing the various technologies, their costs, and their maturity taking into account local conditions is a critical element of resilient policies across economic cycles.

2. Efficient energy pricing is essential

To make the investments required, energy prices that actually reflect the total cost of investments are necessary. Adequate pricing strongly enables energy efficiency. This principle needs to be reconciled with the social goals of each country in meeting the objective of developing access to energy. Targeting energy subsidies to those who most need them can be an example in that direction that emerged from our policy analysis.

3. Cost-effectiveness is a challenge

Cost-effectiveness is a common challenge. The success of environment and climate policies relies critically on the ability to mitigate costs while mitigating pollutants and GHG emissions.

4. Policy design matters

If not well-designed, policies will not deliver expected results with the risk of systemic consequences, as illustrated during the recent

financial crisis. This also underscores the importance of coordination of the different dimension of climate policies that encompass a wide range of sectors and technologies with many different tools. An integrated approach will help avoid inconsistencies.

5. Broad policy experience exists across countries

Environment and climate are clearly identified as essential dimensions of energy policies. Taking into account their native energy resources, skills, and the availability of technologies, countries are setting up concrete actions for an energy transition toward a sustainable low-carbon economy.

6. Address public acceptance

Effective environment and climate policies have to address the public acceptance issue.

7. Use best available low- or no-carbon technologies

To minimise costs, policies should make the most out of the best available low- or zero-emitting technologies. Energy efficiency, with technologies like building insulation, efficient lighting, and more efficient engines for vehicles and heat pumps, are needed. On the electricity generation side, technologies like hydro, nuclear, wind situated in the best locations, super-critical coal plants, and combined cycle gas turbines are among the best. From our analysis, the development of hydro resources plays an important role in successful climate policies, especially in developing and emerging countries.

8. RD&D efforts have to be enhanced

To prepare for the future, our technology portfolio has to be enlarged to reduce emissions to appropriate levels. These technologies include at the end-use level electric vehicles, new materials for building insulation, second-generation biofuels, and at the electricity generation level, solar photovoltaics, carbon capture and storage, and Generation IV nuclear.

9. Technology transfer is a key priority

Technology transfer requires measures to promote joint ventures with foreign partners and to protect intellectual property. These policies supplement international price mechanisms to finance the incremental costs of the first plants and accelerate the learning curve. This illustrates the complementarities of price and other policy instruments and could contribute to the debate over National Appropriate Mitigation Actions and financing.

5. An Integrated Approach to Energy Policy

1. Energy: A Changing Agenda

Energy, vital for human survival, is the life blood of modern society. Current energy supply and use patterns are shaped by a multitude of factors, the most important of which are geology, location, values, and inertia in supply and demand. Geology and location define resources. Values, climates, and incomes shape consumption patterns. Well-structured, open, and transparent markets coordinate supply and demand via prices over time. Inertia is a by-product of the long lead times in developing and implementing energy production and consumption technologies.

Even during politically and economically stable periods, deciding energy policy is often constrained by past decisions while trying to anticipate new possibilities and needs. In a time of great transition, what was merely difficult can seem insurmountable. The shifting strength and needs of nations, as seen in the recent rapid growth in Asia and in the challenge of climate change, are exerting great pressure on the energy system that has operated over the past two centuries.

There is now no single global energy policy. Policies are set in a local or national context, reflecting local or regional priorities, even if the consequences of the policy reach beyond national borders. In its simplest expression, energy consumption is closely related to personal income and energy supply to local resources.

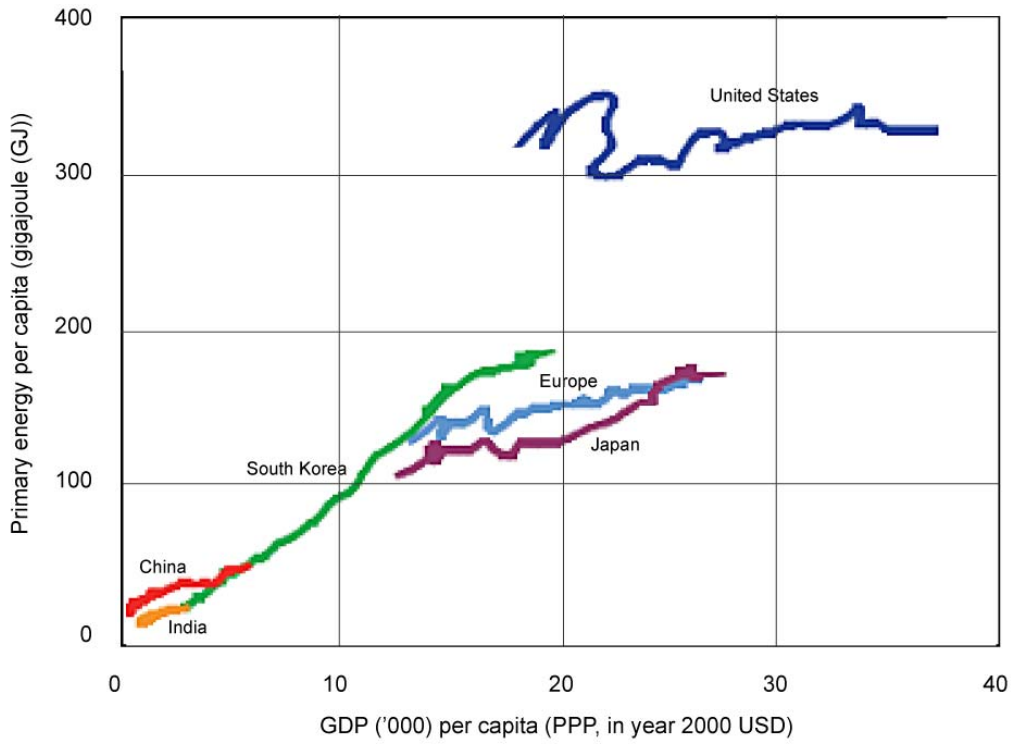
Countries at low-income levels are initially preoccupied with ensuring a regular supply of traditional fuels and then replacing them with more modern substitutes, such as kerosene, LPG, and electricity. Infrastructure is lacking, mobility rudimentary, and industry in its infancy.

At around $3,000/year/capita, energy demand soars as industrialisation begins. There are massive investments in material-intensive infrastructures, cities rapidly expand, mobility surges, and heavy energy-intensive industry begins to dominate the economy. At around $10,000/capita/ year, energy demand slows, and as income further increases, services grow faster than industry. As many basic households' needs are met, growth slows and concerns about living conditions, including the environment, increase. Above $25,000/year/capita, little additional energy is needed.

Looking forward, a critical question arises. At what level will countries now low on the energy ladder (Figure 5-1), such as China, stabilise their energy demand as income grows? At 100 GJ/capita/year, or closer to Japan's or Europe's levels of 150 GJ/capita/year? Or, could they attain levels currently in the United States? And can higher-income countries reduce energy demand while growing energy services?

In most countries, energy demand is first met by local supply. Local resources (and available technology) have been fundamental shapers of energy supply. As demand grows and the local supply is outstripped, dependence grows on imported energy in most countries. Imported energy can mean greater risks of supply, leaving countries to the uncertainties of geopolitics. This is true of many countries today. Thus, a key focus of

Figure 5-1
Primary energy demand versus income per capita from 1970 to 2005.
Source: Shell International BV, 2009



energy policy is to ensure the security of energy supply, be it domestic or imported, or a combination of both.

Energy supply and use has significant effects on the natural environment and on human health. These vary from damage to local ecosystems, to regional water availability and quality, air pollution, and more recently, the global impact of greenhouse gas emissions and ocean pollution. Environmental policies are often first designed to respond to local issues, but more generically also relate to the level of a country's development.

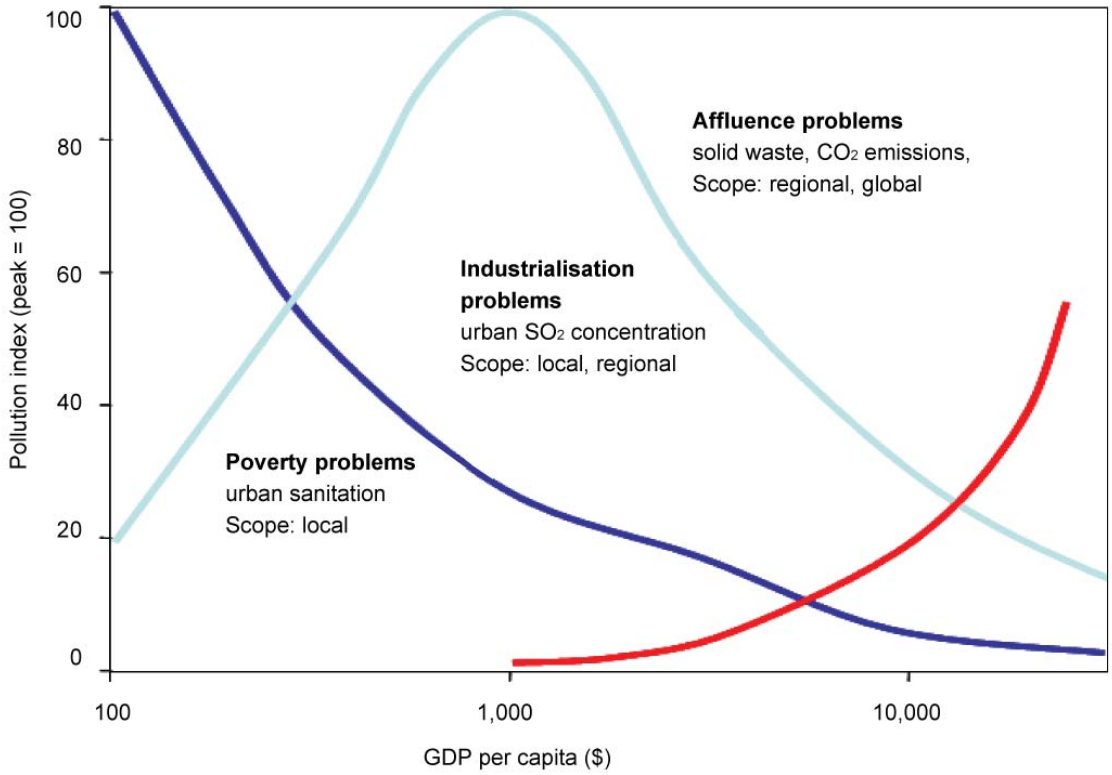
Countries at different stages of development have different environmental objectives. The priority for low-income countries is to address local poverty and health-related problems, such as urban sanitation (Figure 5-2). Solutions to these problems require little advanced technology and are typically undertaken at relatively low levels of income (below $2,000 per capita/year). The next priority for a developing country is local and regional impacts related to industrialisation. Addressing air and water pollution requires more sophisticated and expensive technologies. The priorities in high-income countries are related to affluence, such as large volumes of solid-waste disposal and greenhouse gas emissions, such as CO_2. Solutions to these problems are costly and complex, sometimes requiring regional global agreements.

Today, energy policy has a strong environmental dimension, and the future pattern of energy supply and demand will be shaped by the way people respond to the major environmental challenges, such as climate change.

The desire in many societies for some measure of equity has highlighted the importance of equity policies, in particular that all should have the opportunity to meet their basic energy needs.

Finding adequate policy responses to energy security, environment, and climate change are bedrock objectives for the WEC. However, energy touches on many more policy areas. For example, energy and energy services drive the modern economy and electricity is the critical ingredient of the new digital age. Energy and energy services are usually major employers and a critical source of government revenue and path to better military

Figure 5-2
Environmental priorities and stages of Development.
Source: World Bank, 1992



security. Each area has compelling logic and interest groups complicate and politicise the making of energy policy.

None is more difficult to handle than climate change, with its complex science, uncertainty around regional impacts, and which at its heart requires the near-abolition of the combustion of carbon, the basis of the bulk of energy technologies. The goal of this assessment report is to accelerate the global achievement of energy equity, security, and environmental sustainability by sharing good policy and its practices.

2. Energy Dilemmas and Trade-offs

The analysis of the Assessment Index results leads to three main conclusions:

- The presence of strong enabling factors such as institutions, healthcare, and education are critical for the effective design and implementation of effective energy policy.
- For high-income countries the quality of infrastructure and the degree of innovation are also essential enablers of an effective energy policy.
- For low-income countries attention to social issues, such as education and equity, are good indicators of a more effective energy policy and its implementation.

The top performers overall of the higher-income importers (cluster 5) also tend to score well on energy security; Finland and Sweden are good illustrations. While they depend highly on imports, they have very diverse energy supplies and adequate oil stocks. They also have efficient and competitive energy markets, only electricity transmission and distribution remain regulated, while all other energy markets are open and competitive. Such countries show low network losses and an adequate capacity margin which contribute to the high level of security.

Higher-income countries, both importers and exporters (in Clusters 4 and 5) that perform well on

There is now no single global energy policy. Policies are set in a local or national context, reflecting local or regional priorities, even if the consequences of the policy reach beyond national borders.

the overall Index have high-quality infrastructures and good performance in addressing climate change. Notably the biggest difference between higher-income countries and the others is found in the quality and reliability of their infrastructure.

For fast-growth countries in cluster 3, those with strong economies and markets, as measured by Macro-economy, Goods and factors markets, and the Energy markets building blocks, were in the first division.

For the lower-income countries in clusters 1 and 2, the best performers did well on equity and health measures. Indonesia in cluster 2 and Sri Lanka in cluster 1 were exceptional performers on the country overall Index and on equity.

The review of the Assessment results points to lessons for successful energy policy. Defined in more detail in the prior three chapters, they:

- Strong, open and effective institutions, both government and business, are critical.
- Governments must pursue clear, consistent long-term oriented policy objectives.
- Public acceptance of energy policy is essential.
- Business plays a crucial role.
- Policy design matters, based on efficient energy pricing and cost-effectiveness.
- Global cooperation between higher and lower income countries is needed; technology transfer is a key priority and needs international policies.
- RD&D efforts have to be enhanced and with cooperation between governments and between governments and industry.
- Priority should be placed to the selection of the best available low- or no-carbon technologies.

Dilemmas and Trade-offs

These proposals do however hide a number of difficult dilemmas and trade-offs that policymakers face:

1. Government institutions are only strong if supported broadly across a country. A lack of trust in politicians (and business) can undermine institutions. More significantly in a networked world, with strong local activists, the power for change can lay as much with local communities as with government institutions or business.

2. Ideally, governments should pursue a consistent, long-term vision. For a world in transition certainties are not easy to come by. What lies on the other side of a transition may seem alien and threatening to many. So governments may prefer to deal with the shorter-term issues, and limit their longer-term vision. However, if the energy challenges are to be met they must learn to handle adequately these longer-term issues.

3. Many of the social consequences of new energy investments will be shouldered locally, not country-wide, and may be difficult to mobilise public acceptance where it matters most.

4. Business plays a central role, but may be constrained by the politicisation of energy issues and the legitimacy of non-governmental organisations in many countries.

5. Policy design based on efficient energy pricing and cost-effectiveness seems to be common sense and should be the cornerstone of any energy policy. However, in many countries, particularly at a time of economic stringency, it can be difficult to pass on costs to consumers. Additionally, cost control is a key underpinning of any country's energy policy, but this can be difficult at times of rapid development and rising capital costs. Looking longer term, there remains the question of how best to design a pricing logic for pricing ecosystem services and climate change? It is important that an international pricing mechanism with a viable enforcement structure be set up.

6. Global cooperation is needed, but in critical areas, such as global climate-change agreements, it may be difficult to achieve given the large stakes involved. To complicate matters, inter-state relations are shaped by many other things than straight energy issues, from the macro-economy to military security and terrorism. Technology transfer may be a key priority, but it may be difficult to implement in its pure form of simply transferring technology from one party to another, given the desire of many organisations to protect intellectual property. International cooperation is called for to ensure that such transfers can take place within rules of law.

7. Given the exceptional challenges that the energy industry faces, energy RD&D efforts have been unimpressive. How best to improve? Predominantly with government-backed research centres? If so how can the resultant new technologies best be transferred to business and be implemented. Which technologies should be emphasised? The importance of examining public-private partnerships seems paramount.

8. The selection of the best available low- or no-carbon technologies may need a higher priority. Many low-carbon technologies are in development, such as fossil-fuel power plants with carbon capture and storage, others such as nuclear power may have the challenge of public acceptance in many countries. Who determines what is "best"? Governments picking winners has not always been successful and may lead to costly "technology lock-in" as new and better technologies emerge. This enforces the need for governments to set clear and concise rules and to be consistent, so that the marketplace can apply its rules to find the most cost-effective solutions. Initially the need will be for significant investment in currently available technologies, both on the demand and supply side.

The present economic and financial crisis only complicates decision-making. The public's priorities have shifted toward jobs, incomes, and simple survival. High energy prices are more of a concern and climate change has dropped down the priority list. In summary, energy policymaking will be more

The selection of the best available low- or no-carbon technologies may need a higher priority. This enforces the need for governments to set clear and concise rules, so that the marketplace can apply its rules to find the most cost-effective solutions.

complex going forward. What are the new rules for policymakers?

3. Building Effective Energy Policy

Effective energy policy must address these policy dilemmas in this new world of energy. The results of this Assessment hint at the basic elements of effective energy policy and implementation:

1. Strong, open, and effective institutions

Energy is moving to the centre stage of policymaking in a world more concerned with energy supply issues and climate change than in the past. This requires strong and open institutions, which are well coordinated, have a clearly defined role and visible responsibility. To be fully effective energy and environment policy must be managed from a strong government department, headed by a senior minister. Given the absence of this in most countries, a fundamental reform of national energy governance is needed.

Governance structures must clarify the roles and responsibilities of the lead ministry, and the relationships between the lead and other Ministries. Specifically, this requires clarity over roles in policy development, consultation, implementation, and enforcement.

In some countries, especially those in clusters 1 and 2, substantial effort will be required to improve the capacity of ministries and government. Efforts are underway using donor assistance. For example, in Nigeria the draft national climate change policy has been developed with the support of the Canadian International Development Agency (CIDA).

Openness will require widespread public dissemination of relevant information on energy and environmental issues. A good example is Sweden where environmental laws regarding the permitting process for infrastructure include obligatory public consultations during the entire process from beginning to implementation.

Furthermore changes in educational material to drive step-change in attitudes over the generations will be required. The Czech Republic offers examples of state programs in support of energy savings and in the use of renewable energy.

2. Long-term vision and public acceptance

Long-term views needs to be more open to uncertainty, recognising that in many critical areas there is learning inherent in progress, from the local effects of climate change, to the emergence of the best low- and no-carbon options, and the new patterns of energy supply and demand. There will be greater emphasis on identifying new vulnerabilities as they arise and finding solutions for their mitigation, with a likelihood of moving toward more local and more resilient energy structures.

Business needs, and will continue to need, a certain degree of planning security if business is to translate a government's policy and society's desires into concrete investments. In the energy

industry, that investment is particularly long-lived. Therefore policy decisions relating to these industries get locked in for a long time. Most importantly, policies should not radically change every time there is a change in government, creating business uncertainty about the rewards of its investments. France's nuclear programme is an example of successfully using long-term views to shape shorter-term investment.

However, in this century, societies will repeatedly find themselves confronted with major new challenges, such as climate change, aging populations, and large-scale shifts in the locus of economic activity. Electoral consensus concerning established policies will almost certainly shift as new priorities emerge. Therefore, economic and energy policy will continue to undergo, sometimes radical, reform.

Governments need to think ahead and establish clear and stable rules for the elaboration, adaptation, and revision of major reforms that complement the established legislative processes of representative democracy. These rules should contain strong educational and consultative elements, and they should be defined individually for each major policy area. They should encompass time lines for revision of reforms, including minimum delays between amendments to allow a realistic picture of their results, as well as regular, pre-scheduled reviews of legislation. There should be a premium placed on high-quality foresight as a basis for building flexibility into energy infrastructures.

Local involvement and public acceptance of any new strategy or policy direction are essential. The art of building local support, through consultation and participation of all stakeholders, needs to be fostered. Greater emphasis should be placed on public engagement and overtly rewarding local districts that contribute to solutions, for example, through investments, job creation, and positioning of energy research centres.

3. Cost Effectiveness and Efficient Markets

Cost effectiveness and efficient markets are central to an effective energy policy. As important as new technologies will be, the technologies that are mature and competitive must be deployed without delay. These include energy efficiency solutions, hydro-, nuclear- and wind-power, and high-efficiency coal and combined-cycle gas plants. For this to happen, costs must be a product of the most effective ways of investing in and running energy activities, and real energy prices must reflect all investment, operating and environmental costs.

Dealing with climate change will have associated costs and these costs, whether for mitigation or adaptation must be carefully assessed and decisions made about which costs are effective and are to be accepted.

4. Policy Design and the Role of Business

Conceptual developments are needed to handle decision-making based on future rather than present values in a world where scarce land, water, air, ecosystem services, and resources will all be

priced. There will be a need to ensure coherence of policy tools as present methods are progressively superseded by new approaches. The approach to policy design will have greater emphasis on monitoring, feedback, and learning. There will be preferences for options that provide co-benefits, e.g., removing black carbon by replacing cooking stoves in poorer villages, which helps both to improve human health and address climate change. Policymakers at all levels should push for these elements in policy design.

The contribution of business as investors, risk takers, and implementers, with a continual check on reality, is critical in framing intelligent policy frameworks and selecting the best energy options. Governments must set the priorities and the policies and then monitor the results, not implement the policies. A good example is the Top Runner programme in Japan, which is a voluntary agreement between government and industry in achieving energy efficiency objectives.

5. Broad-based, global policy and technological cooperation

As important as strengthening local participation and decision-making is, the establishment of a fully functioning regional and global governance structure, which respects national sovereignty, is also necessary to address international energy issues. These include handling oil and gas supply risks through increased consumer/supplier and consumer/consumer coordination. New institutions may be needed or older ones (such as the IEA) strengthened. Better machinery for gaining and implementing agreement on responses to climate change and burden-sharing will be required. These will need to be closely linked to broader negotiations on security, trade and development assistance. As the world moves from a primary focus on mitigation for addressing climate change to consider and implement adaptation, a new and more local climate change agenda will emerge with greater scope for sharing of local experiences, which should be networked at a global level.

The importance of new policy and technical solutions to solve energy and environmental problems is understood. In a world where much of what is learned today becomes obsolete within a few years, continual learning is a given. Rather than focus on the limits of technology transfer, the aim should be to set up a worldwide network of cross-country and cross-industry collaborative research centres and demonstration projects seeking the best low- and no-carbon options. There is significant cross-country collaboration on technology research. Good examples are the multi-country support for nuclear fusion research through the International Thermonuclear Experimental Reactor project, and the recently announced U.S.-China Clean Energy Research Centre.

Thus, with strong institutions, with visionary leadership cognisant of public needs, operating cost-effectively in efficient markets, utilising the best of policy design, working closely with industry and developing technologies and policies collaboratively across countries, the main pillars of effective energy policy are at hand.

6. Conclusions and Next Steps

1. Conclusions

This is the very first Assessment undertaken by the World Energy Council (WEC) and the first of its kind. There are many areas to improve the methodology and much to be learned on how best to use the results. The Assessment will improve immeasurably over time as more and more countries examine their data and report more extensively on their energy policies and how they have worked in practice.

This Assessment should catalyse much broader evaluation and the sharing of best practices in energy policymaking across countries and stakeholders. Everyone can benefit by this. The sharing of experience of policy in practice that results from this work will have the effect of accelerating everyone's ability to achieve more effectively their energy goals, starting with climate change, but including enhancing long-term global energy security, and reducing energy poverty. The net result will be more sustainable economic and social systems. In this spirit recommendations derived from this assessment are included below.

2. Recommendations

This is a time of great change with an ever-lengthening list of global challenges with energy touching on all of them. We need to ensure that our thoughts and actions can shape the new world of energy and build a path to a more sustainable energy future. What approach should we take?

Below are some recommendations from this Assessment for government, business, and other stakeholders and the WEC.

Government

- Government as a whole needs to accommodate the size, scale, and pace of needed development in the energy sector. Government must also ensure that energy strategy and policy are commensurate with the necessary tasks. Leadership at the highest level is required, ideally, through a dedicated ministry run by a senior minister, responsible for leading major new energy and climate initiatives, and advised by other ministries as needed

- Such a ministry must ensure that it has a workable and agreed-to long-term energy strategy supported by a planning machinery to progress toward short- and medium-term goals. Open and participative dialogue with all stakeholders is essential to building strong public acceptance for the resulting energy policy and plans. In particular, government needs to be more receptive to business. The ministry needs to lead on engaging with regional and international communities to address multi-country issues on such topics as regional energy policy and global climate change.

- Given the pace and scale of likely energy developments, more effective approaches to gaining local public acceptance for siting large projects and infrastructure are needed.

This is a challenging time for government, business and other stakeholders. More than ever before, the interests of all stakeholders must be as aligned as possible in the interests of all.

- For example, open, community-wide discussion and the lessons derived from such discussions should be applied to "zoning" to pre-approve energy projects. Good experience on this comes from the UK, specifically on approving new nuclear plants, and from the substantial general experience on nuclear development in France and from Denmark.

Business

- Business has a very valuable contribution to addressing global energy issues, given that many large energy companies operate in a wide range of jurisdictions. There is a special role to be played in collectively advising and shaping global energy policy that reflects the realities of experience gained in a wide range of countries.

- Business needs to engage openly and constructively with all stakeholders, without special pleading. In particular, business has to actively play its part in securing public acceptance of new projects.

Other Stakeholders

- Other stakeholders – a diverse group including civil society, various associations, political parties, the media, and the public – should recognise the critical importance of making intelligent and timely policy, because energy is essential to our collective future.

- A veto from any group should be avoided; however, the fractious nature of collective energy and environment policy can make this difficult. Thus, appropriate mediation may be needed to strengthen cooperation.

World Energy Council

- WEC members should speak with one voice to all stakeholders and cover all policy areas, whether climate change, security, equity, environment, and economy, targeting venues to emphasise energy role in each area (for example, COP-15, Davos, and UNDP).

- Ensure WEC members endorse that having available the widest set of energy options is essential for ensuring the most effective energy policy.

- Create a bank of energy policies, based on this Assessment, as a source of best practices and advice to stakeholders.

This is a challenging time for government, business and other stakeholders. More than ever before, the interests of all stakeholders must be as aligned as possible in the interests of all.

3. Next Steps

Not all WEC member committees have fully analysed and reported results. Many member committees responded to the two questionnaires and commented in detail on the earlier drafts of this Assessment. In addition, the Economics Advisory Group and the Committee of Experts have

suggested various ways of improving the methodology. Proposed areas of further work are recommended in the following three areas:

Enhancement of Assessment Index

- **Improvement of the Assessment Index**
  Several member committees suggested that aspects of the structure of the Assessment Index, the indicators of the building blocks, the sources of the indicators, the normalisation of the indicators and the weighting of the indicators, could be improved. The indicators will be refined as some of them are proxies and may not adequately reflect an element of the building blocks. Additional indicators may be added as appropriate and existing indicators may improve, especially as questions are raised from this study.

  In this report, the Assessment Index is based primarily on annual data, but the reliability of the Index may be improved by using data trends covering several years. The Assessment Index will be reviewed and updated periodically.

- **Extensive analysis of Assessment Index**
  The Assessment Index should also be analysed at a deeper level. For example, more work needs to be done on correlations between the building blocks and individual indices and with other measures.

Development key messages for all countries

The application of the overall key messages of the report to a country requires careful translation. This will require close collaboration with member committees. Every country is at a different stage of development and progress toward its own goals. Ideally, the Assessment should not only show where a country stands, but also how a country might improve from its current state to its stated goal, with specific examples. The next Assessment should also ensure that the key messages are tailored for use of all countries regardless of their stages of development.

Examining policies at a deeper level for each country

For this report, countries were asked to provide in the questionnaire details on the two policy areas in which the Assessment Index indicated they were best at. In fact, it may be a country's third or fourth best policy area that is still better than many others, and others may benefit from more knowledge of it. Future Assessments should examine more policies to ensure that a country's best practices are available for the benefit of all. One of the issues worth examining might be the cost of public policies, setting them against the benefits gained.

Acknowledgments

I would first like to thank the WEC member committees for their responses to the questionnaires and their comments on the draft report. Obviously, the conclusions would have no value if they had not come from those who are working everyday under policies and observing and reporting how they work in practice.

The members of the Study Group, especially Brasil Geraldo Filho, Jean-Eudes Moncomble, and Maria Sunér Fleming, who faithfully attended all meetings, deserve our utmost thanks. Special thanks to Hardiv Situmeang who assisted on many issues and occasions in helping enhance the quality of the report, and to Simon Godwin for important discussions, and data, on transport.

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C.P. Jain
Chair, Studies Committee

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[10] The Committee members have agreed to provide insight and recommendations on the process and the conclusions drawn going forward, but have not reviewed this document as of 1 October 2009

Annex 1: Methodology

1. Overall Methodology

This chapter outlines the methodology used in the World Energy and Climate Policy: 2009 Assessment. The methodology consists of two parts:

- An evaluation of existing national policies, regulations, and standards, in general as well as for energy in particular, and their effectiveness in energy practices. This is related to the overall capability of a country to develop and implement energy policy and practices, based on a broad range of indicators (currently 46) from publicly available data. These are shown in Table A1-1 in the appendix to this annex.
- An analysis, based on feedback from WEC members, of specific energy policies within a country, and how they have worked or are working in practice. Included in the analysis is a compilation of key lessons learned from the country responses.

A comparison within and between countries to provide examples of policies and practices is then undertaken, and summarised in this report under three broad categories – energy equity, energy security, and climate change.

In comparing countries, one needs be aware of the existing differences in economic development, natural resources, and the wide variation in policy focus and objectives. Nevertheless, many countries still present broadly similar circumstances so that countries and can be grouped together for purposes of comparison. The assessment considers five groups of countries or "country clusters," reflecting the relative balance of economic development and energy resources.

These five country clusters, shown in Figure A1-1, comprise the following countries:

1. **Lower-income (<$4,000/year) net energy importers** (13 countries): Ethiopia, Ghana, India, Kenya, Mongolia, Morocco, Nepal, Pakistan, Philippines, Senegal, Sri Lanka, Tajikistan, and Tanzania.

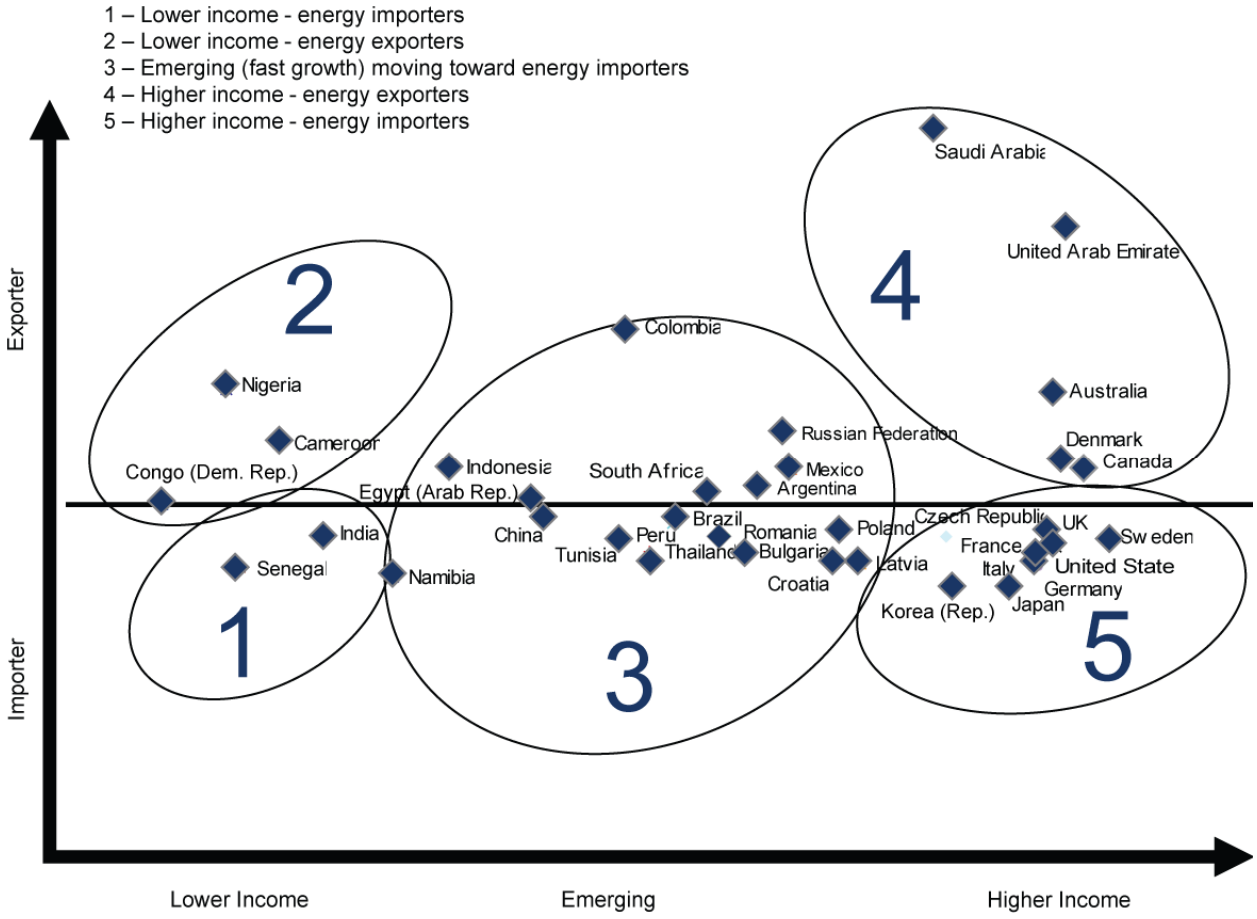
2. **Lower-income (<$4,000/year) net energy exporters** (7 countries): Cameroon, Congo (Dem. Rep.), Cöte d'Ivoire, Indonesia, Nigeria, Paraguay, and Yemen.

3. **Fast-growth countries** (31 countries): Algeria, Argentina, Botswana, Brazil, Bulgaria, China, Colombia, Croatia, Egypt (Arab Rep.), Iran (Islamic Rep.), Jordan, Latvia, Lebanon, Libya, Lithuania, Macedonia (Rep.), Mexico, Namibia, Peru, Poland, Romania, Russian Federation, Serbia, South Africa, Syria (Arab Rep.), Thailand, Trinidad & Tobago, Tunisia, Turkey, Ukraine, and Uruguay.

4. **Higher-income (>$18,000/year) net energy exporters** (8 countries): Australia, Canada, Denmark, Kuwait, Norway, Qatar, Saudi Arabia, and United Arab Emirates.

5. **Higher-income (>$18,000/year) net energy importers** (29 countries): Austria, Belgium, Cyprus, Czech Republic, Estonia, Finland,

Figure A1-1
Country Clusters (with examples)



6. France, Germany, Greece, Hong Kong (China), Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea (Rep.), Luxembourg, Netherlands, New Zealand, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan (China), United Kingdom, and United States.

Part I – The Overall Assessment

Central to Part I is the Assessment of Energy Policies and Practices Index (Assessment Index), measuring the extent to which a country has the necessary attributes in place to achieve its energy policy objectives. The Index measures energy policy effectiveness, such that the higher the value of the index the more effective is a country's energy policy.

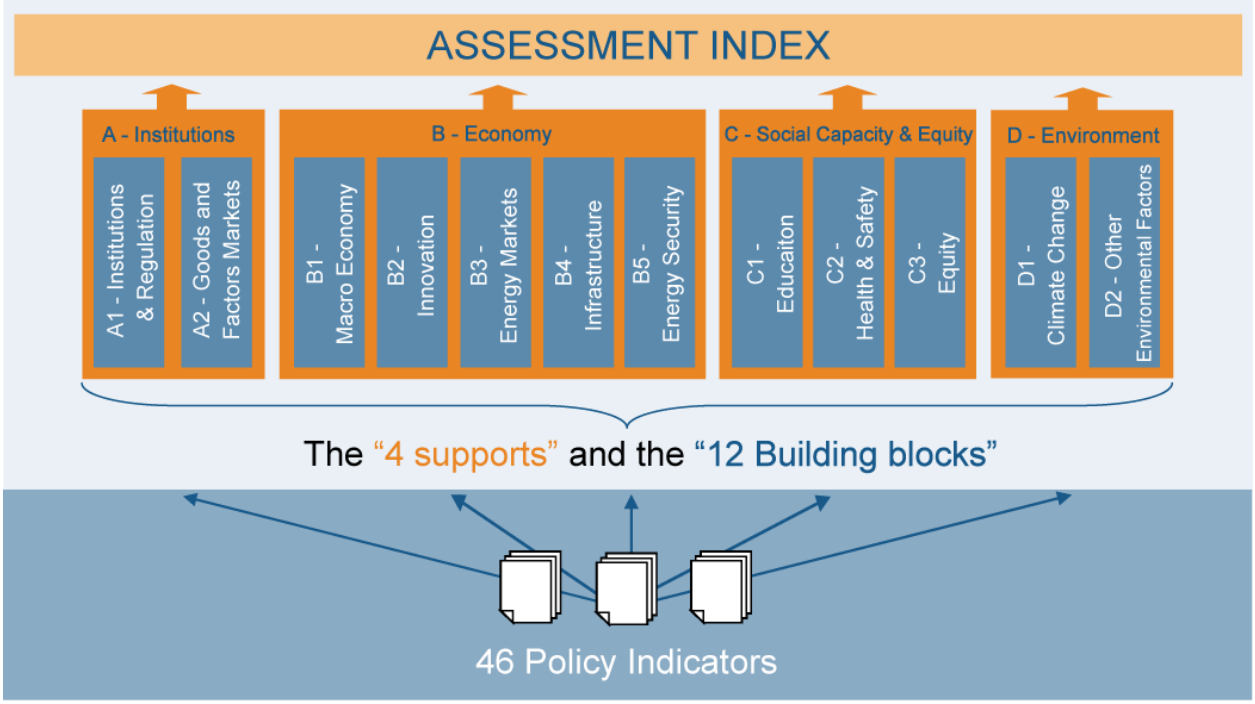
The Index is based on the principle that the effectiveness of national energy policy is determined by four key factors or 'supports,' which in turn are composed of 12 'building blocks.' Each building block has a number of indicators to assess the performance of a country. The number of indicators per building block varies from a minimum of three to a maximum of six (there 46 indicators total).

The Assessment Index structure is presented in Figure A1-2.

The four supports and their 12 building blocks are:

- **Institutions**, with two building blocks: Institutions and Regulation; and Goods and Factors Markets. Institutions are an essential pre-requisite for successful policy development. This support measures the capacity, robustness, and transparency of decision-making bodies in developing, implementing and enforcing policies.

Figure A1-2
Assessment Index Structure



- **Economy**, with six building blocks: Macro-economy; Innovation; Energy Markets; Investment; Infrastructure; and Energy Security. This support measures the strength and structure of an economy, and its ability to innovate and invest to ensure that energy is supplied reliably and securely. A strong building block for economy allows for high-quality policy and practices.
- **Social capacity and equity**, with three building blocks: Education; Health & Safety; and Equity. This support examines the overall wellbeing of society and is the base on which energy services are provided. Strong societies with access to modern forms of energy are critical to inspiring best practice.
- **Environment**, with two building blocks, Climate Change and Other Environmental Factors. The condition of the environment is one key indicator of the performance of policy. This becomes more important as economic development takes place, and thus varies across country clusters.

Details of the building blocks and indicators are included below in Box A1-1 and in Table A1-1.

Box A1-1: Supports and Building Blocks

A. Institutions

A1. Institutions and regulation: energy systems require capital-intensive investments which can be made possible only if investors have a strong expectation that expropriation is not likely. This requires that the government guarantees that rule of law is enforced, property rights are respected, a high level of security is ensured with low levels of corruption, and that private arrangements be facilitated by providing the right "checks and balances" in the economy such as minority shareholder's protection, auditing standards, and the ability of courts to equitably settle disputes.

A2. Goods and factors markets: energy systems do not work in isolation from other parts of the economy. They require the use of other goods and services, of capital, and the employment of workers. As a consequence, efficient goods and services, financial and labour markets are key enablers of effective energy policies.

B. Economy

B1. Macro-economy: energy is an essential element of economic growth and development. One of the major achievements of effective energy policies is their ability to sustain growth. On the other hand, a strong and stable economy, namely low cost of capital and low inflation rates provide a positive support for the implementation of business policies, not least in business. These policies facilitate the mostly highly capital-intensive investments of the energy sector.

B2. Innovation: Innovation is very important to support the continuous development of new solutions to the ever-changing challenges emerging in the energy sector, as companies and governments struggle to find new energy resources and new ways to use existing ones in a sustainable, efficient and safe manner. This requires an environment that is conducive to innovative activity, supported by both the public and the private sectors.

B3. Energy markets: Efficient energy markets are a key result of effective energy policies. This building block measures the efficiency of energy markets (in particular the presence and effectiveness of price signals) by looking at the level of subsidies and the share of the energy spending in the economy. The share of FDI in energy investments is also a potential indicator of the openness of a national energy system.

B4. Infrastructure: The existence of a high-quality infrastructure is critical for ensuring the efficient functioning of the energy system—economies depend on electricity supplies (and other sources of energy) free of interruptions and shortages, to ensure that businesses and factories can work unimpeded. High-quality infrastructure also helps ensure that households receive reliable energy at affordable prices. Energy systems depend also on many other key infrastructures: roads, rail, ports to transport the fuels or the materials, and telecommunication networks that enable modern and reliable management of the system, etc.

B5. Energy security: Secure supplies of energy are critical for the efficient functioning of all economies. At the same time, secure and predictable foreign demand for energy resources is critical for energy rich countries. Security of supply/demand is also essential to avoid extreme price volatility of energy resources with consequent negative economic impact. Energy security, in that perspective, has two main dimensions:

- Long-term security measures the risks of demand (or supply) shocks and disruptions. It is measured by the diversity of supply/demand (a more diverse supply/demand is more resilient to shocks), the degree of reliance on imports, and the energy intensity of the economy (energy consumption/GDP) – the less an economy is “dependent” on energy, the less it is exposed to potential shocks.

- Short-term security: measured by the existence of spare capacity or reserves (e.g., in the form of oil stocks, gas storage or spare electricity generation capacity).

C. Social Capacity and Equity

C1. Education: A high standard of education is an important pre-condition for a skilled labour force and for sustaining a robust rate of innovation. It is thus important to help guarantee investment in and the efficient functioning of the energy system. This building block measures the quantity and quality of education in the general population, the training of professionals, and the availability of engineers and scientists.

C2. Health and safety: Investments in health services and in safety are important not only for the wellbeing of the society (and therefore the capacity/flexibility to adjust to changes), but also for the performance of the economy and its energy sector as it helps ensure a more productive workforce.

C3. Equity: Balanced distribution of income and access to services (including energy) are important elements for the development of a country and the creation of a productive environment in which policies, including energy policies, can be implemented. Policies must play a role in the avoidance of social tensions within a country by preventing an inordinate level of inequalities (e.g., access to affordable energy).

D. Environment

D1. Climate Change: This building block measures the performance of a country in terms of its policies to reduce greenhouse gas emissions (measured as CO_2 equivalent). This is measured for example by considering emissions per capita but also emission per unit of economic output and the emissions intensity of key sectors (electricity generation and transport).

D2. Other environmental factors: The environmental performance of a country's energy policy is also measured through a factor connected to its levels of air and water pollution, and water stress.

2. Calculation of the Assessment Index

The process adopted in calculating the Assessment Index is:

- Data collection: data were obtained from published, international sources.
- Unavailable data: were excluded from the calculations for a building block.
- Normalisation: data were normalised via homogeneous transformation to a range of 0 to 10 (with 0 as the low value and 10 the high value).
- Weighting: weights were calculated for each building block, supports, and overall Assessment Index using averages and equal weighting.
- Presentation of results: the results of the Assessment Index are presented in four divisions within each cluster.

Data collection and sources

The principle behind the data collection was to obtain data from published, international sources that would allow ease of comparison and replicability. Details of sources are included in the table at the end of this annex. One complication was around the timing of the data; collecting information from different sources meant that the latest available data is not always for the same year for every indicator. For most of the indicators the most recent date was 2006 and as such this has been used in this analysis.

Unavailable data

One of the main difficulties in the analysis has been data availability. Overall, around 15 percent of data was missing, predominantly for countries in clusters 1 and 2. Some indicators are heavily impacted by the missing data. In the current assessment, unavailable data gaps were not filled. Where the lack of data made the indicator unsuitable, the indicator was dropped. There are currently 46 indicators in the index out of a total of the 57 indicators originally selected. For the remaining missing data, the number was left blank and not included in the average when calculating the index, except for RD&D indicator, where missing values were set at zero.

Normalisation

To allow comparison between indicators and enable the data to be aggregated into an index, the raw data was normalised. Normalisation was done using homogeneous transformation to a range of 0 to 10 (where 0 is the low value and 10 the high value). For some indicators, the highest value in the raw data equaled the highest normalised value; and for some indicators the lowest value in the raw data equaled the highest normalised value; finally for some indicators, an optimal intermediate value, equal to the highest normalised value, was used. This is the case where the indicator presented U-curve characteristics. For example, the capacity margin in the electricity sector, where 25 percent reserve margin was set as optimal value, and values scored less well the greater the absolute value difference to this optimum.

Weights in Assessment Index

In the Assessment Index, the weighting of each of the indicators, building blocks, and supports is crucial to the final result. Ideally, this weight is based on the effectiveness in achieving the energy policy objectives. Additionally, some indicators may be more significant in achieving the overall effectiveness of the building block and these indicators are given a stronger weight.

In this initial examination of weighting, an equal weighting approach has been used. Other methods were considered in this initial examination, such as the Principal Component Analysis (PCA) and experts to determine the weights using the Analytic Hierarchy Process (AHP). The difference in results using different weighting methods was minimal. This will be examined in ongoing Assessments.

Presentation of results

For each country in the Assessment, there is a set of indicators and calculated values for building blocks, supports, and the Assessment index. These values have been placed in order, and for each value countries are identified as belonging to one of four divisions, each containing one quarter of the countries:

- First division: classified in top 25 percent
- Second division: classified in range 25–50 percent
- Third division: classified in range 50–75 percent
- Fourth division: classified in bottom 25 percent

The divisional results by cluster are shown in Annex 2.

Part II—Policy instruments analysis

The policy analysis establishes the rationale behind a country's achievement of its energy policy objectives. It is also important to understand the trade-offs and tensions between the different objectives and elements of energy policy. Effective energy policies often have to simultaneously reconcile economic, social, environmental, and institutional objectives. These various dimensions, however, might not always be compatible. For example, addressing climate change has cost implications which can lead to higher energy prices, with consequences on economic growth and social cohesion.

A questionnaire was sent to each member committee in WEC. The purpose was to validate the data used in the Assessment Index and to obtain specific country examples of energy and/or energy-related policies and how they have worked in practice. The questionnaire focused on:

- Lessons learned from effective policies and what are the factors that supported effective policies (and lesson from less effective policies and what are the constraints or barriers that limited the success of such policies)
- Policy analysis: an overview of key national (and international) policies related to some of the key energy issues, such as
  - Energy prices
  - Public acceptance of new infrastructure
  - Energy security
  - Energy efficiency
  - Renewables
  - Climate change
  - Access to energy and affordability
  - RD&D

Therefore, the analysis of the policy responses obtained from the questionnaire focused on firstly examining the link between the Assessment Index and actual policies, by identifying energy policy and non-policy related factors that influenced

performance in the strongest (i.e., best performing) building blocks. Similarly such analysis assisted in clarifying the key constraints and barriers to achieving high performance.

Secondly, the analysis of the responses provided information on the salient energy policies in each country for key policy area. This provided an overview of ‘best practice’ country examples.

Finally, the responses to the questionnaire from the member committees provided the material used in the analysis of policies whose results are summarised in Chapters 2 to 5 of this report.

Appendix: Assessment Indicator

Table A1-1
Indicators and Data Sources

Support: Institutions				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
A1. Institutions	A11. Rule of law	World Bank Governance Indicators	Index based on expert assessment; range from -2.5 to 2.5 with high number indicating better performance	Measures perceptions of agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
	A12. Protection of property rights	World Economic Forum, Global Competitiveness Report	Index based on survey; range from 0 to 10 with high number indicating better performance	This component is from the Global Competitiveness Report's survey question: "Property rights, including over financial assets are poorly defined and not protected by law (= 1) or are clearly defined and well protected by law (= 7)."
	A13. Level of corruption	Transparency International	Index based on surveys and expert assessment; range from 0 to 10 with high number indicating better performance	Measures the overall extent of corruption (frequency and/or size of bribes) in the public and political sectors.
	A14. Regulatory quality	World Bank Governance Indicators	Index based on expert assessment; range from -2.5 to 2.5 with high number indicating better performance	Measures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
	A15. Private institutions	WEF – Global Competitiveness Report	Index based on surveys; range from 0 to 10 with high number indicating better performance	Measures transparency and quality of reporting standards in private companies
A2. Goods and factors markets	A21. Goods markets	WEF – Global Competitiveness Report	Index based on surveys; range from 0 to 10 with high number indicating better performance	Measures the efficiency of goods markets to produce the right mix of products and services given supply-and-demand conditions.

Support: Institutions				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
A2. Goods and factors markets	A22. Financial markets	WEF – Global Competitiveness Report	Index based on surveys; range from 0 to 10 with high number indicating better performance	Measures the efficiency of the financial sector to allocate the resources saved by a nation's citizens as well as those entering the economy from abroad to their most productive uses.
	A23. Labour markets	WEF – Global Competitiveness Report	Index based on surveys; range from 0 to 10 with high number indicating better performance	Measures the efficiency and flexibility of the labor market to ensure that workers are allocated to their most efficient use in the economy.
	A24. Ease of business	World Bank (Doing business project)	Time in days	The measure captures the median duration that incorporation lawyers indicate is necessary to complete a procedure with minimum follow-up with government agencies and no extra payments.

Support: Economy				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
B1. Macro-economy	B11. GDP growth rate	International Monetary Fund	Gross domestic product, constant prices, annual per cent change	Annual percentages of constant price GDP are year-on-year changes; the base year is country-specific. This average over 10 year period (1995-2005)
	B12. Inflation rate	International Monetary Fund	Average consumer prices. Annual per cent change	This data averages inflation over a five year period 2000-2005. Data for inflation are averages for the year, not end-of-period data.
	B13. Long term interest rate	Global Insight	Long term interest rates (10 yrs)	This data averages interest rates over a five year period 2000-2005. Data for interest rates are averages for the year, not end-of-period data.
	B14. GDP per capita	International Monetary Fund	Percentage	Gross domestic product based on purchasing-power-parity (PPP) per capita GDP.
	B15. Industry share of GDP	World Bank Development Indicators	Industry share of GDP in percentage	Industry covers mining, manufacturing (also reported separately), construction, electricity, water, and gas. Total GDP is measured at purchaser prices. Value added by industry is normally measured at basic prices.

Support: Economy				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
B1. Macro-economy	B16. Investment/ GDP	World Bank Development Indicators	Gross Capital Formation as % of GDP (2005)	Gross capital formation consists of outlays on additions to the fixed assets of the economy pus net changes in the level of inventories and valuables.
B2. Innovation	B21. Total R&D expenditure/ GDP	UN Human Development Index	Research and Development expenditures as % of GDP (average 2000-2005)	
	B22. Energy R&D/GDP	International Energy Agency	Government Energy R&D expenditures as % of GDP	
	B23. Innovation index	World Bank	Knowledge Index	Innovation index - index calculated as part of the broader World Bank Knowledge index
B3. Energy markets	B31. Energy intensity	International Energy Agency	Percentage	Total Primary Energy Supply/GDP (PPP) (toe/thousand 2000 US$ PPP) – for year 2006
	B32. Oil products price wedge	International Energy Agency	Difference between wholesale and retail (pre-tax) gasoline prices	
	B33. Technical efficiency	International Energy Agency	Technical efficiency of fossil fuel power plants	
B4. Infrastructure	B41. Quality of infrastructure (general)	WEF – Global Competitiveness Report	Index based on survey; range from 0 to 10 with high number indicating better performance	
	B42. Reliability in gas networks infrastructure (network losses)	International Energy Agency	Percentage	Network distribution losses as percentage of gas consumed
	B43. Reliability in electricity networks infrastructure (network losses)	International Energy Agency	Percentage	Network distribution losses as percentage of electricity generation

Support: Economy				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
B5. Energy security	B51. Diversity of supply	International Energy Agency	Shannon-Wiener index for the total primary energy supply (range from 0 to 1.94)	This measure used the Shannon Wiener index, calculated on the Total primary Energy Supply and based on a maximum of seven different fuel supplies.
	B52. Energy investment/ Total investment	National accounts	Gross capital formation in the energy sector over total gross capital formation	
	B53 Capacity margin (electricity)	European Transmission System Operator, Asia-Pacific Economic Cooperation, Arab Union of Producers, Transporters and Distributors of Electricity, North American Electric Reliability Cooperation	Margins calculated as difference between net generating capacity and peak demand	
	B54. Stocks of oil (commercial and government owned)	Joint Oil Dta Initiative (JODI)	Number of days of consumption	Industry and Government-Controlled Petroleum Stocks
	B55. Level of import/consumption (for net energy importers)	International Energy Agency	Net Energy Imports	The measure describes the country' net energy imports, i.e., imports minus exports for total energy. A positive number denotes net imports, and a negative number denotes net exports.

Support: Social capacity and equity				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
C1. Education	C11. Enrolment percentages (for secondary education)	UN Human Development Index	Net secondary enrolment rates (%) – 2005	Where 2005 data not available 1991 data is used.

Support: Social capacity and equity				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
	C12. Number of engineers and scientists	UN Human Development Index	Tertiary students in science and engineering	
	C13. Internet users	World Bank	Internet users (per 100 people)	
C2. Health and safety	C21. Health spending/capita	UN Human Development Index	Health expenditure per capita (PPP USD) - 2004	
	C22. Life expectancy	UN Human Development Index	Life expectancy at birth (years) – estimates for 2000-2005	
	C23. Infant mortality	UN Human Development Index	Infant mortality rate (per 1,000 live births) - 2005	
C3. Equity	C31. Gini index	UN Human Development Index	Gini Index (2007)	Measure of income inequality. A value of 0 represents absolute equality, and a value of 100 absolute inequality.
	C32. Energy spending/Households income	World Bank	Calculated as spending on housing, electricity, gas and fuels as a percentage of total household spending	
	C33. Access to electricity (% of population)	UN Human Development Index	Electrification rate (%) – 2000-2005 (Data refer to the most recent year available during the period specified)	

Support: Environment				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
D1. Climate change	D11. CO_2(eq) emissions per capita	International Energy Agency	CO_2/Population (t CO2/capita) - 2006	

Support: Environment				
Building Block	Indicator	Source	Type of Indicator	Description of Indicator
	D12. CO_2(eq) emissions per unit of GDP	International Energy Agency	CO_2/GDP (kg CO_2/2000 US$) - 2006	
	D13. Emissions intensity of power sector	International Energy Agency	Emissions per electricity generation (CO_2/kWh) - 2006	
D1. Climate change	D14. Emissions intensity of industry (CO_2 per GDP from industry sector)	Yale – Environmental Performance Index	.85 tons of CO_2 per $1000 (USD, 2005, PPP) of industrial GDP (Estimated value associated with 50% reduction in global GHG emissions by 2050, against 1990 levels)	Original data from International Energy Agency and World Development Indicator
D2. Environmental factors	D21. Air pollution	Yale – Environmental Performance Index	Index (0 to 100) – Air Pollution (effects on human) from EPI 2008	Combines indicators for Urban particulates, Indoor air pollution and local ozone
	D22. Water quality	Yale – Environmental Performance Index	Index – water quality (0 to 100) from EPI 2008	Original data from UNEP GEMS/Water
	D23. Biodiversity	Yale – Environmental Performance Index	Index (0 to 100) – Biodiversity and Habitat from EPI 2008	Combines indicators for Conservation risk index, Effective conservation, Critical habitat protection, Marine Protected Areas
	D24. Water stress	FAO – Aquastat database	Percentage – water withdrawal over water resources	Total water withdrawal per capita (m^3/inhab/yr)) divided by Water resources: total renewable per capita (actual) (m^3/inhab/yr)

Annex 2: Country Data Tables

The Country Data Tables annex contains tables of calculated data for all supports and building blocks, based on publicly available data, covering the 88 countries covered by World Energy and Climate Policy: 2009 Assessment.

How to read the Country Data Tables

The annex is divided in two sections:

- The first shows the results for supports and Assessment Index by cluster (Tables A2-1)
- The second section shows results for building blocks by cluster (Tables A2-2)

Within each cluster, the countries are presented in alphabetical order.

Within each table, for each support and building block, there are two pieces of data:

- the calculated value of the support or building block
- the division to which the country belongs within that cluster, based on its relative assessed valuation.

Table A2-1
Cluster 1 – Supports and Assessment Index

	Institutions		Economy		Equity		Environment		Assessment Index	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Ethiopia	2.8	4th	3.3	4th	2.7	4th	7.5	3rd	4.0	4th
Ghana	3.8	2nd	3.4	3rd	3.8	3rd	7.8	2nd	4.7	2nd
India	5.1	1st	4.2	1st	4.4	2nd	6.1	4th	5.0	1st
Kenya	4.0	2nd	3.4	3rd	3.4	4th	8.2	1st	4.7	2nd
Mongolia	3.2	4th	3.6	2nd	5.2	1st	6.3	4th	4.6	3rd
Morocco	4.1	1st	3.8	1st	4.9	2nd	6.7	3rd	4.9	2nd
Nepal	2.6	4th	3.3	3rd	3.6	3rd	7.9	1st	4.3	3rd
Pakistan	3.5	3rd	4.0	1st	4.0	2nd	5.3	4th	4.2	4th
Philippines	3.7	2nd	3.6	2nd	5.5	1st	7.6	2nd	5.1	1st
Senegal	3.3	3rd	2.8	4th	3.1	4th	6.9	3rd	4.0	4th
Sri Lanka	4.7	1st	3.6	2nd	4.9	1st	7.5	2nd	5.2	1st
Tajikistan	1.6	4th	3.1	4th	3.8	3rd	6.1	4th	3.6	4th
Tanzania	3.5	3rd	2.8	4th	3.3	4th	7.8	1st	4.3	3rd

Cluster 2 – Supports and Assessment Index

	Institutions		Economy		Equity		Environment		Assessment Index	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Cameroon	2.3	2nd	3.4	2nd	3.4	2nd	7.5	2nd	4.1	2nd
Congo (Dem. Rep.)	0.1	4th	5.3	1st	1.2	4th	7.7	1st	3.6	3rd
Cöte d'Ivoire	2.2	2nd	3.7	1st	2.3	3rd	7.5	1st	3.9	3rd
Indonesia	3.4	1st	3.5	2nd	4.7	1st	6.8	3rd	4.6	1st
Nigeria	3.9	1st	2.9	3rd	2.7	3rd	7.1	3rd	4.1	2nd
Paraguay	2.2	3rd	2.9	3rd	4.7	1st	7.2	2nd	4.3	1st
Yemen	-	-	2.5	4th	3.6	2nd	4.0	4th	3.4	4th

Cluster 3 – Supports and Assessment Index

	Institutions		Economy		Equity		Environment		Assessment Index	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Algeria	2.0	4th	4.4	2nd	5.5	3rd	6.5	3rd	4.6	4th
Argentina	2.3	4th	4.6	2nd	5.8	2nd	7.9	1st	5.1	3rd
Botswana	5.1	1st	4.3	3rd	2.8	4th	6.5	3rd	4.7	4th
Brazil	3.3	4th	4.3	2nd	5.4	3rd	8.3	1st	5.3	2nd
Bulgaria	4.3	2nd	4.4	2nd	6.2	1st	6.6	3rd	5.4	2nd
China	4.3	3rd	5.8	1st	5.3	4th	6.2	3rd	5.4	2nd
Colombia	4.0	3rd	3.9	4th	5.5	3rd	8.5	1st	5.5	2nd
Croatia	4.6	2nd	4.9	1st	6.2	1st	7.2	2nd	5.7	1st
Egypt (Arab Rep)	3.6	3rd	4.4	2nd	5.6	3rd	6.2	3rd	5.0	3rd
Iran (Islamic Rep.)	4.0	3rd	4.5	2nd	6.1	2nd	6.2	3rd	5.2	3rd
Jordan	6.0	1st	4.0	3rd	5.9	2nd	6.0	4th	5.5	1st
Latvia	6.3	1st	3.9	3rd	6.1	2nd	8.6	1st	6.2	1st
Lebanon	5.0	1st	3.6	4th	6.4	1st	4.9	4th	5.0	3rd
Libya	0.9	4th	4.2	3rd	6.7	1st	3.3	4th	3.8	4th
Lithuania	5.9	1st	5.7	1st	6.4	1st	8.3	1st	6.6	1st
Macedonia (Rep.)	3.5	3rd	3.4	4th	5.0	4th	6.1	4th	4.5	4th
Mexico	4.0	3rd	3.9	3rd	5.9	2nd	7.3	2nd	5.3	2nd
Namibia	4.9	2nd	4.1	3rd	2.6	4th	7.6	1st	4.8	3rd
Peru	3.8	3rd	3.8	4th	5.4	3rd	7.7	1st	5.2	3rd
Poland	4.9	2nd	5.1	1st	6.1	1st	7.2	2nd	5.8	1st
Romania	4.6	2nd	4.0	3rd	6.0	2nd	7.2	2nd	5.5	2nd
Russia	3.1	4th	5.0	1st	5.8	3rd	7.3	2nd	5.3	2nd
Serbia	3.4	3rd	3.8	4th	-	-	-	-	3.6	4th
South Africa	6.5	1st	5.1	1st	4.0	4th	6.5	3rd	5.5	1st
Syria (Arab Rep.)	2.8	4th	2.8	4th	5.4	3rd	4.8	4th	3.9	4th
Thailand	5.4	1st	4.5	2nd	5.6	3rd	7.1	2nd	5.7	1st
Trinidad & Tobago	4.4	2nd	4.5	2nd	6.2	1st	5.7	4th	5.2	3rd
Tunisia	5.6	1st	4.8	1st	5.9	2nd	6.8	2nd	5.8	1st
Turkey	4.5	2nd	4.2	3rd	5.0	4th	6.7	2nd	5.1	3rd
Ukraine	3.2	4th	4.6	1st	6.0	2nd	5.4	4th	4.8	4th
Uruguay	4.8	2nd	2.5	4th	6.1	1st	7.5	1st	5.2	2nd

Cluster 4 – Supports and Assessment Index

	Institutions		Economy		Equity		Environment		Assessment Index	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Australia	9.2	1st	6.1	2nd	7.7	1st	7.6	2nd	7.7	2nd
Canada	9.1	2nd	7.0	1st	7.6	1st	8.1	1st	8.0	1st
Denmark	9.7	1st	7.2	1st	7.5	2nd	7.6	2nd	8.0	1st
Kuwait	6.0	4th	4.0	4th	6.7	3rd	3.5	4th	5.0	4th
Norway	8.6	2nd	6.3	2nd	7.4	2nd	9.0	1st	7.8	2nd
Qatar	6.6	3rd	5.3	3rd	6.1	4th	0.6	4th	4.6	4th
Saudi Arabia	5.0	4th	4.6	4th	5.9	4th	4.9	3rd	5.1	3rd
United Arab Emirates	6.4	3rd	5.7	3rd	6.4	3rd	3.5	3rd	5.5	3rd

Cluster 5 – Supports and Assessment Index

	Institutions		Economy		Equity		Environment		Assessment Index	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Austria	8.5	2nd	6.2	2nd	7.6	2nd	8.2	1st	7.6	1st
Belgium	7.2	3rd	5.9	3rd	7.2	3rd	-	-	6.8	3rd
Cyprus	6.9	3rd	5.0	4th	6.0	4th	6.2	4th	6.0	4th
Czech Republic	6.1	4th	5.8	3rd	6.5	4th	5.8	4th	6.1	4th
Estonia	7.4	3rd	5.0	4th	6.6	4th	7.5	3rd	6.6	3rd
Finland	8.9	1st	7.5	1st	8.1	1st	8.8	1st	8.3	1st
France	7.5	3rd	6.3	2nd	7.7	1st	7.8	2nd	7.3	2nd
Germany	8.3	2nd	6.6	1st	7.6	2nd	7.8	2nd	7.6	2nd
Greece	5.1	4th	5.2	4th	7.3	3rd	7.2	3rd	6.2	4th
Hong Kong, China	8.9	1st	4.5	4th	6.4	4th	-	-	6.6	3rd
Hungary	5.6	4th	5.0	4th	6.4	4th	7.8	2nd	6.2	4th
Iceland	8.9	2nd	5.9	3rd	7.6	2nd	8.0	2nd	7.6	2nd
Ireland	8.9	2nd	5.8	3rd	7.2	3rd	7.5	3rd	7.4	2nd
Israel	7.0	3rd	5.9	2nd	6.8	4th	6.6	4th	6.6	4th
Italy	4.7	4th	5.4	3rd	7.3	3rd	7.6	2nd	6.3	4th
Japan	7.6	2nd	7.4	1st	7.5	2nd	7.6	3rd	7.5	2nd
Korea (Rep.)	6.8	3rd	7.0	1st	8.2	1st	7.1	4th	7.3	2nd
Luxembourg	8.3	2nd	5.3	4th	8.6	1st	6.8	4th	7.2	3rd
Netherlands	8.9	1st	6.3	2nd	7.7	1st	6.2	4th	7.3	2nd
New Zealand	9.2	1st	6.0	2nd	7.4	2nd	8.7	1st	7.8	1st
Portugal	6.1	4th	5.3	4th	7.0	3rd	7.9	2nd	6.6	3rd
Slovakia	6.2	4th	5.4	4th	6.4	4th	7.3	3rd	6.3	4th
Slovenia	5.9	4th	5.7	3rd	7.2	3rd	7.9	2nd	6.7	3rd
Spain	6.4	4th	5.6	3rd	7.6	2nd	7.3	3rd	6.7	3rd
Sweden	9.0	1st	7.2	1st	8.0	1st	9.0	1st	8.3	1st
Switzerland	9.2	1st	7.2	1st	7.7	2nd	9.2	1st	8.3	1st
Taiwan, China	6.6	3rd	6.3	2nd	-	-	6.2	4th	6.4	4th
United Kingdom	8.6	2nd	6.2	2nd	7.3	3rd	8.2	1st	7.6	1st
United States	8.9	1st	6.7	1st	7.9	1st	7.4	3rd	7.7	1st

Table A2-2
Cluster 1 – Building Blocks

	A1: Institutions and regulations		A2: Goods and factors markets		B1: Macro-economy		B2: Innovation	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Ethiopia	2.2	4th	3.4	4th	3.1	3rd	0.0	4th
Ghana	3.9	1st	3.6	4th	3.1	3rd	0.3	4th
India	4.8	1st	5.3	1st	5.2	1st	1.6	1st
Kenya	2.7	3rd	5.3	1st	1.9	4th	1.4	1st
Mongolia	2.3	4th	4.2	2nd	4.4	2nd	0.4	4th
Morocco	3.7	2nd	4.5	2nd	5.2	1st	1.3	1st
Nepal	1.8	4th	3.3	4th	4.8	1st	0.7	3rd
Pakistan	2.7	3rd	4.3	2nd	3.1	4th	0.6	3rd
Philippines	3.3	2nd	4.1	3rd	3.2	2nd	0.9	2nd
Senegal	3.0	2nd	3.7	3rd	4.2	2nd	0.7	2nd
Sri Lanka	4.5	1st	5.0	1st	3.2	3rd	1.2	2nd
Tajikistan	1.3	4th	1.9	4th	2.8	4th	0.5	4th
Tanzania	2.8	3rd	4.1	3rd	2.9	4th	0.5	3rd

	B3: Energy markets		B4: Infrastructure		B5: Energy security		C1: Education	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Ethiopia	4.8	4th	4.4	1st	5.5	4th	1.4	4th
Ghana	6.3	2nd	4.1	2nd	5.9	2nd	2.4	3rd
India	5.9	3rd	2.3	4th	7.8	1s	2.6	2nd
Kenya	3.5	4th	3.4	3rd	6.8	1s	3.2	2nd
Mongolia	2.9	4th	2.9	3rd	6.7	2nd	3.6	1st
Morocco	7.9	1st	3.7	2nd	4.8	4th	2.7	2nd
Nepal	5.2	3rd	1.8	4th	5.8	3rd	1.5	4th
Pakistan	6.7	2nd	4.5	1st	7.8	1s	1.9	3rd
Philippines	8.1	1st	4.2	2nd	6.2	2nd	3.9	1st
Senegal	6.4	2nd	1.9	4th	4.5	4th	0.6	4th
Sri Lanka	8.5	1st	4.5	1st	5.4	4th	1.9	4th
Tajikistan	5.4	3rd	3.5	3rd	5.5	3rd	3.4	1s
Tanzania	2.0	4th	2.1	4th	5.6	3rd	2.1	3rd

	C2: Health and safety		C3: Equity		D1: Climate change		D2: Environmental factors	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Ethiopia	1.1	4th	5.5	4th	9.7	1st	5.3	4th
Ghana	2.9	4th	6.1	3rd	9.4	1st	6.1	2nd
India	3.6	2nd	7.1	2nd	7.6	4th	4.6	4th
Kenya	1.9	4th	5.0	4th	8.9	2nd	7.4	1st
Mongolia	4.3	2nd	7.6	1st	5.6	4th	7.0	1st
Morocco	4.8	1st	7.1	2nd	8.0	4th	5.4	3rd
Nepal	3.5	3rd	5.7	3rd	9.7	1st	6.0	2nd
Pakistan	3.0	3rd	7.0	2nd	7.8	4th	2.8	4th
Philippines	5.1	1st	7.5	1st	9.0	2nd	6.3	2nd
Senegal	2.9	3rd	5.6	4th	8.4	3rd	5.4	3rd
Sri Lanka	5.5	1st	7.3	1st	9.2	2nd	5.9	3rd
Tajikistan	3.7	2nd	4.2	4th	8.7	3rd	3.5	4th
Tanzania	1.9	4th	5.8	3rd	8.6	3rd	7.1	4th

Cluster 2 – Building Blocks

	A1: Institutions and regulations		A2: Goods and factors markets		B1: Macro-economy		B2: Innovation	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Cameroon	1.5	2nd	3.0	3rd	3.8	1st	0.6	3rd
Congo (Dem. Rep.)	0.2	4th	0.0	3rd	1.0	4th	0.0	4th
Côte d'Ivoire	1.2	3rd	3.2	2nd	2.5	2nd	0.6	2nd
Indonesia	2.6	1st	4.2	1st	3.7	1st	0.7	1st
Nigeria	2.3	1st	5.5	1st	3.6	2nd	0.7	2nd
Paraguay	1.2	3rd	3.1	2nd	2.1	3rd	0.8	1st
Yemen	1.8	2nd	-	-	2.0	3rd	0.1	3rd

	B3: Energy markets		B4: Infrastructure		B5: Energy security		C1: Education	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Cameroon	6.9	1st	3.2	3rd	6.1	1st	2.5	1st
Congo (Dem. Rep.)	4.0	3rd	8.8	1st	6.0	2nd	0.0	4th
Côte d'Ivoire	5.8	2nd	3.7	2nd	8.0	1st	0.4	3rd
Indonesia	6.2	2nd	4.3	2nd	5.2	3rd	2.4	1st
Nigeria	2.7	4th	1.3	4th	5.9	2nd	1.6	2nd
Paraguay	6.8	1st	4.7	1st	4.0	4th	2.4	2nd
Yemen	5.1	3rd	2.0	3rd	5.8	3rd	1.4	3rd

	C2: Health and safety		C3: Equity		D1: Climate change		D2: Environmental factors	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Cameroon	1.5	2nd	6.2	2nd	9.9	1st	5.0	3rd
Congo (Dem. Rep.)	0.0	4th	3.6	4th	9.8	1st	5.6	2nd
Côte d'Ivoire	0.5	3rd	6.0	3rd	8.8	3rd	6.2	1st
Indonesia	4.9	1st	6.9	1st	7.7	3rd	6.0	1st
Nigeria	0.8	3rd	5.6	3rd	8.9	2nd	5.4	3rd
Paraguay	5.4	1st	6.4	2nd	9.0	2nd	5.4	2nd
Yemen	2.9	2nd	6.5	1st	6.9	4th	1.2	4th

Cluster 3 – Building Blocks

	A1: Institutions and regulations		A2: Goods and factors markets		B1: Macro-economy		B2: Innovation	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Algeria	1.9	4th	2.2	4th	5.7	1st	1.1	4th
Argentina	1.9	4th	2.7	4th	3.5	3rd	2.4	2nd
Botswana	6.0	1st	4.1	3rd	5.7	1st	1.7	3rd
Brazil	4.0	2nd	2.6	4th	3.4	3rd	2.5	1st
Bulgaria	3.7	3rd	5.0	2nd	4.5	2nd	2.3	2nd
China	3.7	3rd	4.8	2nd	7.1	1st	2.5	2nd
Colombia	3.6	3rd	4.4	3rd	3.3	4th	1.2	4th
Croatia	4.3	2nd	4.8	2nd	5.2	1st	3.2	1st
Egypt (Arab Rep.)	3.8	2nd	3.4	4th	3.8	3rd	1.3	3rd
Iran (Islamic Rep.)	1.0	4th	7.1	1st	4.0	2nd	1.0	4th
Jordan	6.1	1st	5.9	1st	4.0	2nd	2.5	2nd
Latvia	6.0	1st	6.5	1st	5.0	1st	2.2	2nd
Lebanon	2.8	3rd	7.1	1st	3.4	3rd	1.9	3rd
Libya	1.7	4th	0.1	4th	4.6	2nd	3.0	1st
Lithuania	5.7	1st	6.0	1st	5.5	1st	3.5	1st
Macedonia (Rep.)	3.1	3rd	3.9	4th	3.8	3rd	0.5	4th
Mexico	3.7	3rd	4.3	3rd	3.7	3rd	2.0	2nd
Namibia	5.7	1st	4.1	3rd	4.2	2nd	1.0	4th
Peru	3.4	3rd	4.3	3rd	3.9	3rd	1.0	4th
Poland	4.5	2nd	5.2	2nd	4.9	2nd	2.5	1st
Romania	4.0	2nd	5.3	2nd	3.1	4th	1.9	3rd
Russian Federation	1.6	4th	4.5	2nd	4.0	3rd	3.0	1st
Serbia	2.6	3rd	4.3	3rd	2.2	4th	2.0	2nd
South Africa	6.6	1st	6.5	1st	4.1	2nd	2.7	1st
Syria (Arab Rep.)	2.5	4th	3.1	4th	3.0	4th	1.1	4th
Thailand	4.3	2nd	6.5	1st	5.4	1st	1.9	3rd
Trinidad & Tobago	4.7	2nd	4.0	3rd	5.4	1st	1.8	3rd
Tunisia	5.4	1st	5.8	1st	4.7	2nd	1.6	3rd
Turkey	4.1	2nd	4.9	2nd	2.4	4th	2.1	2nd
Ukraine	1.8	4th	4.5	2nd	3.1	4th	2.5	1st
Uruguay	5.3	1st	4.2	3rd	2.2	4th	1.6	3rd

	B3: Energy markets		B4: Infrastructure		B5: Energy security		C1: Education	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Algeria	6.0	3rd	6.0	1st	4.7	4th	2.6	4th
Argentina	8.1	1st	5.8	2nd	6.7	2nd	3.9	3rd
Botswana	5.0	3rd	4.9	3rd	4.8	4th	2.2	4th
Brazil	7.2	1st	5.5	2nd	5.8	3rd	3.4	3rd
Bulgaria	4.2	4th	5.6	2nd	5.3	3rd	4.6	1st
China	6.3	2nd	7.1	1st	6.4	2nd	2.7	4th
Colombia	4.9	4th	3.3	4th	7.8	1st	4.7	1st
Croatia	7.3	1st	5.6	2nd	5.6	3rd	4.5	2nd
Egypt (Arab Rep.)	7.3	1st	4.6	3rd	7.9	1st	3.1	3rd
Iran (Islamic Rep.)	6.2	3rd	6.4	1st	6.5	2nd	5.7	1st
Jordan	6.4	2nd	5.4	3rd	4.1	4th	3.6	3rd
Latvia	6.8	2nd	4.2	3rd	4.4	4th	4.6	2nd
Lebanon	6.0	3rd	5.4	2nd	3.7	4th	4.2	3rd
Libya	3.8	4th	3.5	4th	5.6	3rd	4.9	1st
Lithuania	6.9	2nd	7.4	1st	6.3	2nd	5.0	1st
Macedonia (Rep.)	7.1	1st	2.0	4th	7.5	1st	3.5	3rd
Mexico	7.8	1st	4.1	3rd	5.8	3rd	4.7	1st
Namibia	6.0	3rd	5.0	3rd	6.1	2nd	1.4	4th
Peru	5.8	3rd	4.5	3rd	5.8	3rd	4.3	2nd
Poland	6.9	2nd	5.9	2nd	6.9	2nd	4.6	2nd
Romania	6.4	2nd	4.1	4th	7.1	1st	4.2	2nd
Russian Federation	3.0	4th	6.2	1st	7.1	1st	4.4	2nd
Serbia	4.8	4th	3.2	4th	7.6	1st	-	-
South Africa	6.0	3rd	6.7	1st	7.1	1st	3.1	4th
Syria (Arab Rep.)	6.2	2nd	2.2	4th	4.9	3rd	2.3	4th
Thailand	6.1	3rd	4.7	3rd	6.2	2nd	3.1	4th
Trinidad & Tobago	1.8	4th	6.4	1st	4.4	4th	4.6	2nd
Tunisia	7.8	1st	6.0	2nd	6.9	2nd	4.4	2nd
Turkey	6.5	2nd	6.3	1st	6.0	3rd	3.2	3rd
Ukraine	4.4	4th	5.7	2nd	7.2	1st	4.7	1st
Uruguay	7.0	1st	1.7	4th	4.4	4th	4.7	1st

	C2: Health and safety		C3: Equity		D1: Climate change		D2: Environmental factors	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Algeria	4.9	4th	8.8	1st	8.3	2nd	4.7	4th
Argentina	6.3	1st	7.3	3rd	8.8	1st	6.9	1st
Botswana	1.6	4th	4.7	4th	7.0	3rd	6.0	2nd
Brazil	5.8	2nd	7.1	3rd	9.0	1st	7.7	1st
Bulgaria	5.9	1st	8.0	2nd	7.1	3rd	6.0	2nd
China	5.4	3rd	7.8	2nd	6.9	3rd	5.6	3rd
Colombia	5.7	2nd	6.2	4th	9.1	1st	8.0	1st
Croatia	6.4	1st	7.7	2nd	8.2	2nd	6.1	2nd
Egypt (Arab Rep.)	5.1	4th	8.7	1st	7.7	2nd	4.6	4th
Iran (Islamic Rep.)	5.1	4th	7.4	3rd	7.1	3rd	5.4	3rd
Jordan	5.5	3rd	8.8	1st	7.2	3rd	4.7	4th
Latvia	6.0	1st	7.7	3rd	8.9	1st	8.4	1st
Lebanon	5.5	2nd	9.5	1st	5.7	4th	4.1	4th
Libya	5.6	2nd	9.7	1st	6.5	4th	0.0	4th
Lithuania	6.1	1st	8.2	2nd	8.9	1st	7.7	1st
Macedonia (Rep.)	5.8	2nd	5.8	4th	7.5	3rd	4.7	4th
Mexico	5.9	1st	7.2	3rd	8.1	2nd	6.6	1st
Namibia	2.9	4th	3.5	4th	9.6	1st	5.7	3rd
Peru	5.2	3rd	6.8	3rd	9.2	1st	6.3	2nd
Poland	6.4	1st	7.5	3rd	7.3	3rd	7.1	1st
Romania	5.6	2nd	8.1	2nd	7.8	2nd	6.5	2nd
Russian Federation	5.1	4th	7.9	2nd	6.5	4th	8.1	1st
Serbia	-	-	6.7	4th	6.4	4th	-	-
South Africa	2.8	4th	6.0	4th	6.7	4th	6.4	2nd
Syria (Arab Rep.)	5.6	2nd	8.2	1st	7.0	3rd	2.6	4th
Thailand	5.2	3rd	8.5	1st	8.0	2nd	6.2	2nd
Trinidad & Tobago	5.4	3rd	8.5	1st	5.0	4th	6.3	2nd
Tunisia	5.7	2nd	7.7	2nd	8.6	2nd	5.0	3rd
Turkey	5.3	3rd	6.5	4th	7.7	2nd	5.6	3rd
Ukraine	5.3	3rd	7.9	2nd	5.5	4th	5.3	3rd
Uruguay	6.2	1st	7.6	3rd	9.4	1st	5.6	3rd

Cluster 4 – Building Blocks

	A1: Institutions and regulations		A2: Goods and factors markets		B1: Macro-economy		B2: Innovation	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Australia	9.3	1st	9.1	1st	5.5	3rd	4.9	2nd
Canada	9.3	2nd	9.0	2nd	5.9	2nd	5.6	1st
Denmark	9.7	1st	9.7	1st	5.1	4th	6.3	1st
Kuwait	5.8	4th	6.1	4th	5.4	4th	1.5	4th
Norway	9.0	2nd	8.1	2nd	6.1	1st	5.5	2nd
Qatar	6.7	3rd	6.6	3rd	7.9	1st	2.5	3rd
Saudi Arabia	4.7	4th	5.3	4th	5.5	3rd	1.5	4th
United Arab Emirates	6.2	3rd	6.6	3rd	5.9	2nd	3.1	3rd

	B3: Energy markets		B4: Infrastructure		B5: Energy security		C1: Education	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Australia	6.3	2nd	7.8	2nd	6.3	2nd	6.5	1st
Canada	6.6	1st	8.6	1st	7.9	1st	6.5	1st
Denmark	6.4	2nd	9.4	1st	8.0	1st	5.8	2nd
Kuwait	6.2	3rd	5.2	4th	3.8	4th	4.3	3rd
Norway	6.8	1st	7.5	3rd	6.3	2nd	4.8	2nd
Qatar	2.6	4th	6.8	3rd	4.0	4th	3.8	3rd
Saudi Arabia	5.1	3rd	6.0	4th	5.4	3rd	2.9	4th
United Arab Emirates	3.7	4th	8.1	2nd	5.5	3rd	3.6	4th

	C2: Health and safety		C3: Equity		D1: Climate change		D2: Environmental factors	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Australia	8.2	1st	8.3	4th	6.5	2nd	8.8	2nd
Canada	8.1	2nd	8.2	4th	7.5	2nd	8.8	1st
Denmark	7.7	2nd	8.8	2nd	8.6	1st	6.6	2nd
Kuwait	6.3	3rd	9.5	1st	4.9	4th	2.2	4th
Norway	8.6	1st	8.8	3rd	9.2	1st	8.8	1st
Qatar	5.9	4th	8.5	3rd	1.2	4th	0.0	4th
Saudi Arabia	5.6	4th	9.3	1st	6.2	3rd	3.6	3rd
United Arab Emirates	6.4	3rd	9.1	2nd	4.9	3rd	2.2	3rd

Cluster 5 – Building Blocks

	A1: Institutions and regulations		A2: Goods and factors markets		B1: Macro-economy		B2: Innovation	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Austria	9.3	1st	7.7	2nd	5.3	3rd	5.2	2nd
Belgium	7.1	3rd	7.2	3rd	5.0	3rd	5.2	2nd
Cyprus	7.4	3rd	6.4	4th	6.0	1st	2.7	4th
Czech Republic	5.8	4th	6.4	4th	5.5	2nd	3.6	3rd
Estonia	7.6	3rd	7.2	3rd	5.9	1st	3.0	4th
Finland	9.4	1st	8.3	2nd	5.6	2nd	7.3	1st
France	8.0	2nd	7.1	3rd	4.9	4th	5.4	2nd
Germany	9.0	2nd	7.6	2nd	4.9	4th	5.5	2nd
Greece	5.7	4th	4.6	4th	5.0	4th	3.1	4th
Hong Kong, China	9.1	2nd	8.7	1st	5.5	2nd	3.2	4th
Hungary	6.1	4th	5.0	4th	4.8	4th	3.4	4th
Iceland	9.3	1st	8.4	2nd	5.3	3rd	4.8	2nd
Ireland	9.1	2nd	8.6	1st	6.7	1st	4.1	3rd
Israel	6.7	3rd	7.2	3rd	4.8	4th	6.4	1st
Italy	5.0	4th	4.4	4th	4.8	4th	4.2	3rd
Japan	7.7	3rd	7.5	2nd	5.5	2nd	8.7	1st
Korea (Rep.)	6.4	4th	7.2	3rd	6.0	1st	6.8	1st
Luxembourg	9.2	2nd	7.5	2nd	6.0	1st	2.6	4th
Netherlands	9.3	1st	8.5	1st	5.1	3rd	5.6	2nd
New Zealand	9.5	1st	8.9	1st	5.5	2nd	4.0	3rd
Portugal	6.8	3rd	5.4	4th	4.8	4th	2.9	4th
Slovakia	5.4	4th	6.9	3rd	5.3	3rd	2.5	4th
Slovenia	6.3	4th	5.5	4th	5.5	2nd	3.9	3rd
Spain	6.9	3rd	5.8	4th	5.6	1st	3.6	3rd
Sweden	9.5	1st	8.5	2nd	5.2	3rd	6.8	1st
Switzerland	9.4	1st	9.0	1st	5.4	2nd	6.9	1st
Taiwan, China	6.4	4th	6.8	3rd	6.9	1st	4.6	3rd
United Kingdom	8.5	2nd	8.7	1st	4.9	4th	4.7	2nd
United States	8.2	2nd	9.6	1st	5.2	3rd	6.1	1st

	B3: Energy markets		B4: Infrastructure		B5: Energy security		C1: Education	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Austria	7.8	1st	8.6	2nd	5.8	3rd	5.9	2nd
Belgium	6.9	3rd	8.5	2nd	4.9	4th	5.1	4th
Cyprus	6.3	4th	8.1	3rd	3.0	4th	4.3	4th
Czech Republic	6.5	4th	7.4	4th	6.8	1st	5.2	4th
Estonia	6.7	4th	6.0	4th	4.9	4th	5.9	2nd
Finland	7.1	3rd	9.0	1st	8.2	1st	8.1	1st
France	7.1	3rd	9.1	1st	5.9	2nd	6.6	1st
Germany	7.4	2nd	9.6	1st	6.4	2nd	6.1	2nd
Greece	6.8	3rd	7.4	4th	5.4	3rd	5.8	3rd
Hong Kong, China	4.7	4th	8.2	3rd	1.0	4th	6.1	2nd
Hungary	6.8	4th	6.0	4th	5.7	3rd	4.3	4th
Iceland	5.3	4th	8.6	2nd	4.8	4th	5.6	3rd
Ireland	7.7	1st	6.8	4th	5.7	3rd	5.5	3rd
Israel	7.8	1st	7.7	3rd	4.7	4th	5.2	3rd
Italy	7.3	2nd	7.4	4th	5.4	3rd	5.8	2nd
Japan	6.9	3rd	8.8	1st	6.6	2nd	5.8	3rd
Korea (Rep.)	7.1	3rd	8.8	1st	6.4	2nd	8.8	1st
Luxembourg	9.4	1st	8.6	2nd	4.1	4th	7.5	1st
Netherlands	7.3	2nd	8.7	2nd	5.9	2nd	6.4	2nd
New Zealand	7.6	2nd	7.7	3rd	6.9	1st	6.5	1st
Portugal	7.4	2nd	7.7	3rd	5.7	3rd	5.5	4th
Slovakia	5.6	4th	7.5	4th	6.3	2nd	5.0	4th
Slovenia	6.9	3rd	7.2	4th	6.2	2nd	5.9	2nd
Spain	7.6	1st	8.1	3rd	5.0	4th	6.5	1st
Sweden	7.5	2nd	8.7	2nd	8.4	1st	7.4	1st
Switzerland	6.3	4th	9.1	1st	7.2	1st	5.7	3rd
Taiwan, China	7.9	1st	8.6	2nd	5.2	3rd	-	-
United Kingdom	7.9	1st	8.3	3rd	6.8	1st	6.0	2nd
United States	7.4	2nd	8.8	1st	6.9	1st	5.8	3rd

	C2: Health and safety		C3: Equity		D1: Climate change		D2: Environmental factors	
	Values	Divisions	Values	Divisions	Values	Divisions	Values	Divisions
Austria	8.2	1st	8.6	2nd	8.4	1st	8.1	1st
Belgium	8.0	2nd	8.6	3rd	8.1	3rd	-	-
Cyprus	6.9	4th	6.9	4th	7.3	4th	5.1	4th
Czech Republic	6.8	4th	7.5	4th	7.1	4th	4.5	4th
Estonia	6.0	4th	8.1	4th	6.9	4th	8.2	1st
Finland	7.5	3rd	8.7	1st	8.1	3rd	9.4	1st
France	8.1	1st	8.4	3rd	8.8	1st	6.8	3rd
Germany	8.1	1st	8.8	1st	8.2	2nd	7.4	2nd
Greece	7.5	3rd	8.6	2nd	7.8	3rd	6.7	3rd
Hong Kong, China	4.9	4th	8.3	3rd	-	-	-	-
Hungary	6.4	4th	8.4	3rd	8.4	1st	7.3	2nd
Iceland	8.4	1st	8.7	2nd	8.6	1st	7.3	2nd
Ireland	7.7	2nd	8.6	3rd	8.1	2nd	6.8	3rd
Israel	7.5	3rd	7.6	4th	7.5	4th	5.6	4th
Italy	7.7	2nd	8.3	4th	8.2	2nd	7.1	3rd
Japan	7.9	2nd	8.9	1st	7.9	3rd	7.3	2nd
Korea (Rep.)	6.8	4th	8.9	1st	7.8	3rd	6.4	4th
Luxembourg	9.1	1st	9.2	1st	6.8	4th	6.7	3rd
Netherlands	8.0	2nd	8.8	1st	7.6	3rd	4.9	4th
New Zealand	7.5	3rd	8.3	4th	8.3	1st	9.0	1st
Portugal	7.2	3rd	8.4	3rd	8.2	2nd	7.5	2nd
Slovakia	6.4	4th	8.0	4th	7.7	3rd	6.9	3rd
Slovenia	7.2	3rd	8.6	2nd	8.3	2nd	7.5	2nd
Spain	7.6	3rd	8.7	2nd	8.2	2nd	6.5	3rd
Sweden	8.0	2nd	8.6	2nd	9.1	1st	8.8	1st
Switzerland	8.7	1st	8.6	2nd	9.3	1st	9.1	1st
Taiwan, China	-	-	9.3	1st	7.5	4th	4.9	4th
United Kingdom	7.7	2nd	8.3	4th	8.2	2nd	8.2	1st
United States	9.5	1st	8.4	3rd	6.9	4th	7.9	2nd

Annex 3: Country Profiles

This annex presents one-page profiles of each of the 88 countries covered by the World Energy and Climate Policy: 2009 Assessment.

How to read the Country Profiles

Section A

Data included in section A consists of:

- Macroeconomic data: population, GDP (Gross Domestic Product), and GDP per capita are sourced from the April 2008 edition of the International Monetary Fund's World Economic Outlook.
- Energy data: TPES (Total Primary Energy Supply)/GDP, CO_2/GDP, and CO_2/capita is from International Energy Agency (2006)
- The chart on the upper left-hand side displays the evolution of GDP per capita, CO_2/GDP, and TPSE/GDP from 1999 through 2006 for the country under review.
- The chart on the upper right-hand side displays the TPES mix for the country under review; data is from IEA for 2006.

Section B

Data included in this section covers the overall Assessment Index classification and results for Building Blocks and Supports. These values were computed using the assessment methodology outlined in Annex 1.

Values are shown by division within each cluster. Note that the Assessment Index results for each cluster were sorted into four equal parts representing one fourth of the sampled population, four quarters. The first division contains the highest values and the fourth division the lowest values.

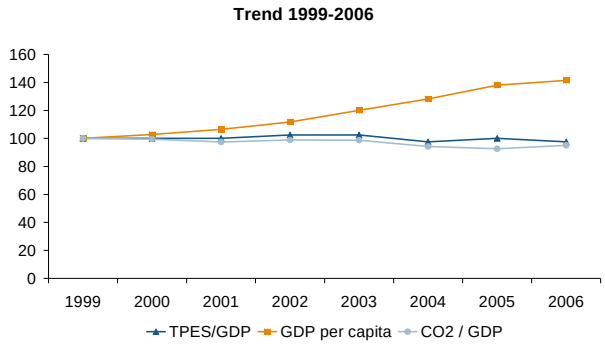
Section C

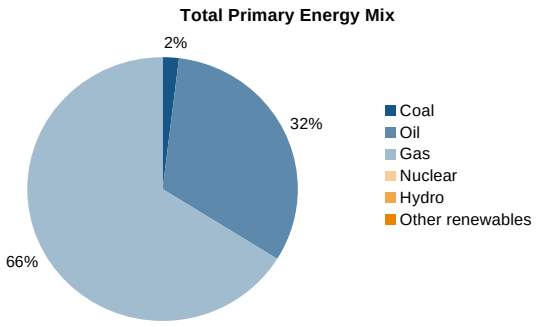
Examples of effective energy policies, provided by member committees, are included in this section.

Algeria

SECTION A: key indicators

Population (mn)	32.9	CO_2/GDP	0.41
GDP ($bn)	215	CO_2/capita	2.57
GDP/capita (US$)	6,539	TPES/GDP (toe per thousand 2000 US$ PPP)	0.17





Algeria has a minor share, less than 0.5%, of hydro and other renewables in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**2.0**	**4th**	**C: Equity**	**5.5**	**3rd**
A1: Institutions and regulations	1.9	4th	C1: Education	2.6	4th
A2: Goods and factors markets	2.2	4th	C2: Health and safety	4.9	4th
B: Economy	**4.4**	**2nd**	C3: Equity	8.8	1st
B1: Macro-economy	5.7	1st	**D: Environment**	**6.5**	**3rd**
B2: Innovation	1.1	4th	D1: Climate change	8.3	2nd
B3: Energy markets	6.0	3rd	D2: Environmental factors	4.7	4th
B4: Infrastructure	6.0	1st			
B5: Energy security	4.7	4th	**Assessment Index**	**4.6**	**4th**

Note: Division is by cluster

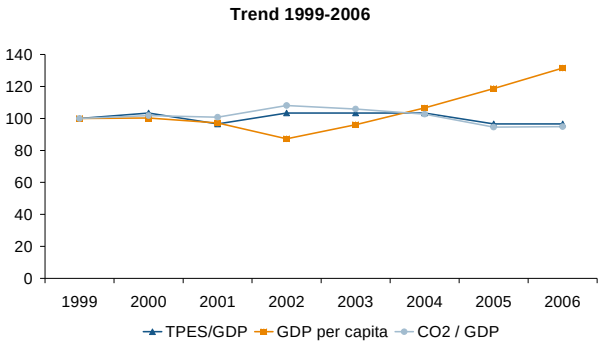
SECTION C: policy examples

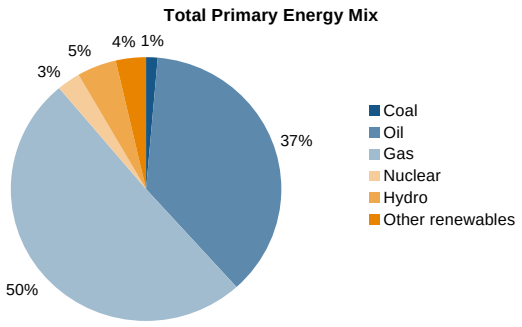
Not available

Argentina

SECTION A: key indicators

Population (mn)	38.6	CO_2/GDP	0.29
GDP ($bn)	465	CO_2/capita	3.64
GDP/capita (US$)	12,054	TPES/GDP (toe per thousand 2000 US$ PPP)	0.13





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**2.3**	**4th**	**C: Equity**	**5.8**	**2nd**
A1: Institutions and regulations	1.9	4th	C1: Education	3.9	3rd
A2: Goods and factors markets	2.7	4th	C2: Health and safety	6.3	1st
B: Economy	**4.6**	**2nd**	C3: Equity	7.3	3rd
B1: Macro-economy	3.5	3rd	**D: Environment**	**7.9**	**1st**
B2: Innovation	2.4	2nd	D1: Climate change	8.8	1st
B3: Energy markets	8.1	1st	D2: Environmental factors	6.9	1st
B4: Infrastructure	5.8	2nd			
B5: Energy security	6.7	2nd	**Assessment Index**	**5.1**	**3rd**

Note: Division is by cluster

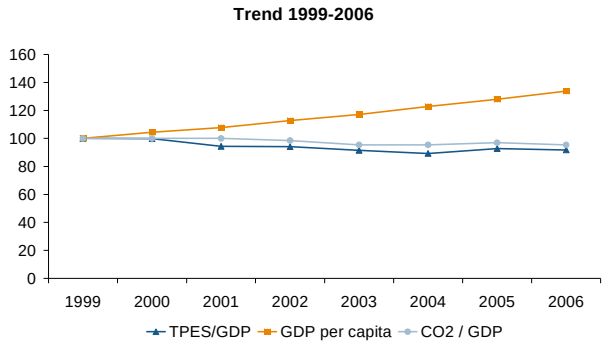
SECTION C: policy examples

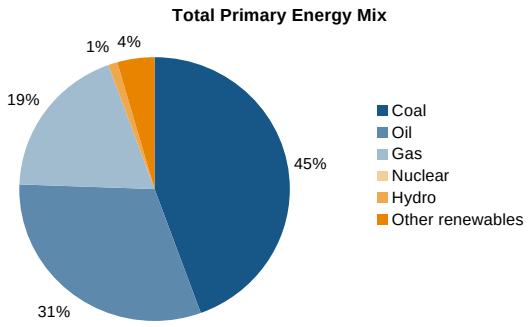
- Regulation and Promotion System for Biofuel Sustainable Production and Use specifies the mix of Biofuel with Fossil Fuel. The gas oil or diesel oil traded in Argentina should be mixed with 5% of “biodiesel” as from 2010. Liquid fuel considered as petrol traded in Argentina should be mixed with at least 5% of “bioethanol” as from 2010.
- GEF Project for Energy Efficiency in Argentina. The Energy Secretariat is submitting the Project for Energy Efficiency in Argentina to the GEF - Global Environmental Facility - through the World Bank, which acts as the GEF execution body. The project is aimed at reducing 800 MW in the 6th year and the emission of 6 million tons of CO_2.

Australia

SECTION A: key indicators

Population (mn)	20.4	CO_2/GDP	0.61
GDP ($bn)	740	CO_2/capita	18.40
GDP/capita (US$)	36,226	TPES/GDP (toe per thousand 2000 US$ PPP)	0.20





SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**9.2**	**1st**	**C: Equity**	**7.7**	**1st**
A1: Institutions and regulations	9.3	1st	C1: Education	6.5	1st
A2: Goods and factors markets	9.1	1st	C2: Health and safety	8.2	1st
B: Economy	**6.1**	**2nd**	C3: Equity	8.3	4th
B1: Macro-economy	5.5	3rd	**D: Environment**	**7.6**	**2nd**
B2: Innovation	4.9	2nd	D1: Climate change	6.5	2nd
B3: Energy markets	6.3	2nd	D2: Environmental factors	8.8	2nd
B4: Infrastructure	7.8	2nd			
B5: Energy security	6.3	2nd	**Assessment Index**	**7.7**	**2nd**

Note: Division is by cluster

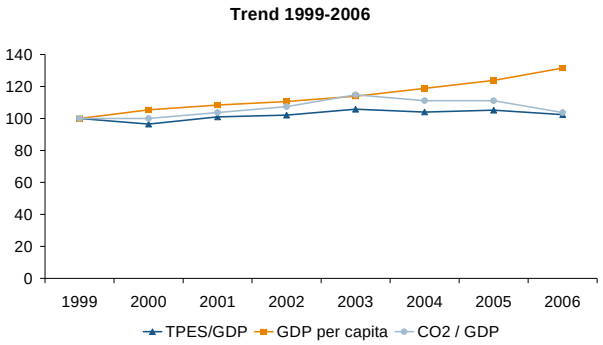
SECTION C: policy examples

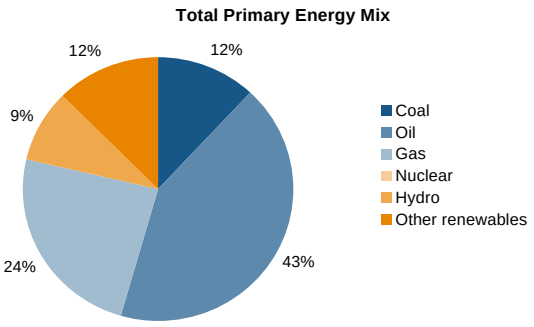
Not available

Austria

SECTION A: key indicators

Population (mn)	8.2	CO_2/GDP	0.31
GDP ($bn)	314	CO_2/capita	9.37
GDP/capita (US$)	38,181	TPES/GDP (toe per thousand 2000 US$ PPP)	0.14





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.5**	**2nd**	**C: Equity**	**7.6**	**2nd**
A1: Institutions and regulations	9.3	1st	C1: Education	5.9	2nd
A2: Goods and factors markets	7.7	2nd	C2: Health and safety	8.2	1st
B: Economy	**6.2**	**2nd**	C3: Equity	8.6	2nd
B1: Macro-economy	5.3	3rd	**D: Environment**	**8.2**	**1st**
B2: Innovation	5.2	2nd	D1: Climate change	8.4	1st
B3: Energy markets	7.8	1st	D2: Environmental factors	8.1	1st
B4: Infrastructure	8.6	2nd			
B5: Energy security	5.8	3rd	**Assessment Index**	**7.6**	**1st**

Note: Division is by cluster

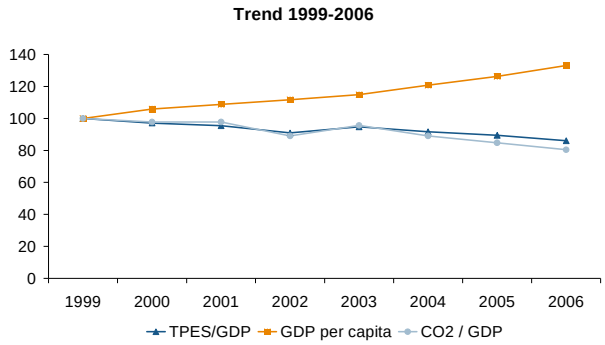
SECTION C: policy examples

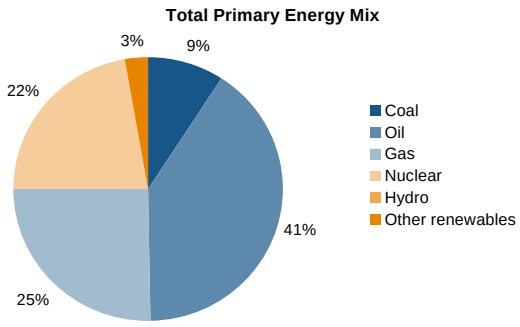
- Expansion of renewables – Masterplan Wasserkraft, (738/A(E)) (motion for a resolution for the expansion of hydropower)
- Energie 2050 is a strategic process to develop a long term vision for the Austrian energy future.
- Fabrik der Zukunft is a program focussed on minimisation of resources/environment pollution and maximisation of the cost value ratio.

Belgium

SECTION A: key indicators

Population (mn)	10.5	CO_2/GDP	0.38
GDP ($bn)	372	CO_2/capita	10.67
GDP/capita (US$)	35,388	TPES/GDP (toe per thousand 2000 US$ PPP)	0.19





Belgium has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**7.2**	**3rd**	**C: Equity**	**7.2**	**3rd**
A1: Institutions and regulations	7.1	3rd	C1: Education	5.1	4th
A2: Goods and factors markets	7.2	3rd	C2: Health and safety	8.0	2nd
B: Economy	**5.9**	**3rd**	C3: Equity	8.6	3rd
B1: Macro-economy	5.0	3rd	**D: Environment**	**-**	**-**
B2: Innovation	5.2	2nd	D1: Climate change	8.1	3rd
B3: Energy markets	6.9	3rd	D2: Environmental factors	-	-
B4: Infrastructure	8.5	2nd			
B5: Energy security	4.9	4th	**Assessment Index**	**6.8**	**3rd**

Note: Division is by cluster

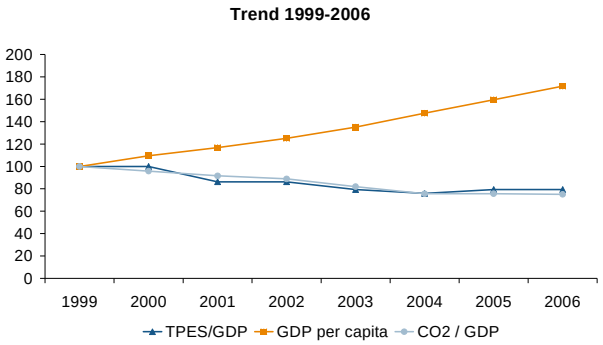
SECTION C: policy examples

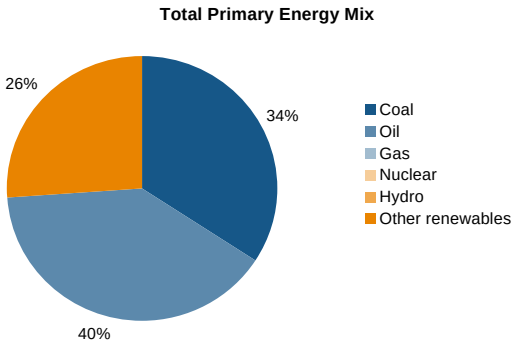
Not available

Botswana

SECTION A: key indicators

Population (mn)	1.6	CO_2/GDP	0.22
GDP ($bn)	24	CO_2/capita	2.44
GDP/capita (US$)	15,089	TPES/GDP (toe per thousand 2000 US$ PPP)	0.10





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**5.1**	**1st**	**C: Equity**	**2.8**	**4th**
A1: Institutions and regulations	6.0	1st	C1: Education	2.2	4th
A2: Goods and factors markets	4.1	3rd	C2: Health and safety	1.6	4th
B: Economy	**4.3**	**3rd**	C3: Equity	4.7	4th
B1: Macro-economy	5.7	1st	**D: Environment**	**6.5**	**3rd**
B2: Innovation	1.7	3rd	D1: Climate change	7.0	3rd
B3: Energy markets	5.0	3rd	D2: Environmental factors	6.0	2nd
B4: Infrastructure	4.9	3rd			
B5: Energy security	4.8	4th	**Assessment Index**	**4.7**	**4th**

Note: Division is by cluster

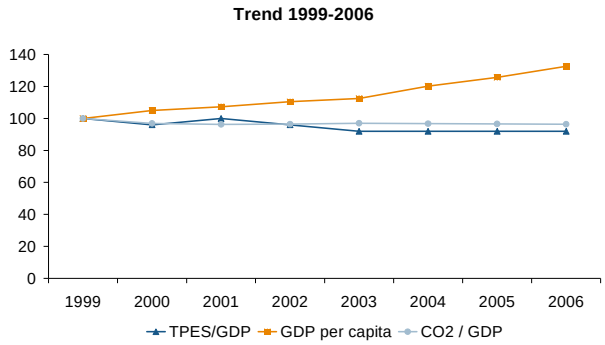
SECTION C: policy examples

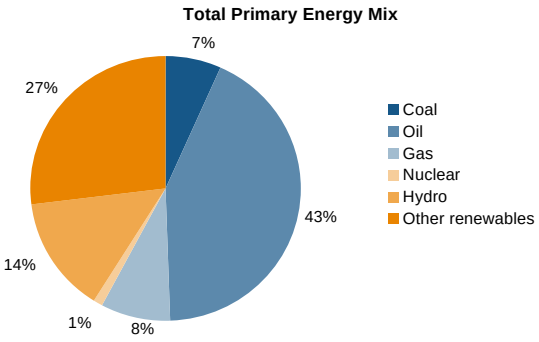
Not available

Brazil

SECTION A: key indicators

Population (mn)	184.2	CO_2/GDP	0.24
GDP ($bn)	1,585	CO_2/capita	1.77
GDP/capita (US$)	8,603	TPES/GDP (toe per thousand 2000 US$ PPP)	0.15





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**3.3**	**4th**	**C: Equity**	**5.4**	**3rd**
A1: Institutions and regulations	4.0	2nd	C1: Education	3.4	3rd
A2: Goods and factors markets	2.6	4th	C2: Health and safety	5.8	2nd
B: Economy	**4.3**	**2nd**	C3: Equity	7.1	3rd
B1: Macro-economy	3.4	3rd	**D: Environment**	**8.3**	**1st**
B2: Innovation	2.5	1st	D1: Climate change	9.0	1st
B3: Energy markets	7.2	1st	D2: Environmental factors	7.7	1st
B4: Infrastructure	5.5	2nd			
B5: Energy security	5.8	3rd	**Assessment Index**	**5.3**	**2nd**

Note: Division is by cluster

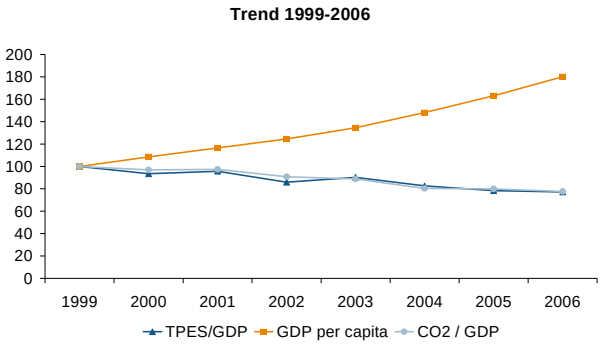
SECTION C: policy examples

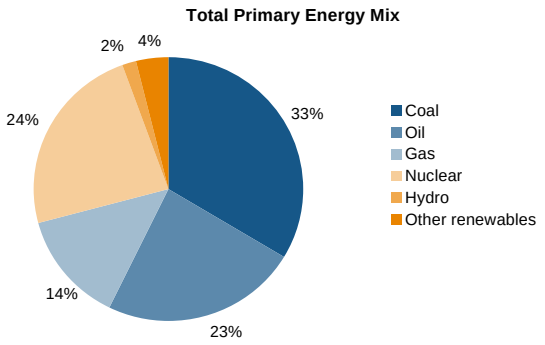
- PROCEL – Programa Nacional de Conservação de Energia Elétrica (National Electric Energy Saving Program). The principal goal of this program is to promote the energy production and consume savings. This is done avoiding waste of energy, reducing costs and investments on energy sector, establishing energy savings aims and dimensioning the energy expansion of generation and transmission.
- CCC – Conta Consumo de Combustíveis Fósseis dos Sistemas isolados (Sharing of Fossil Fuel Consumption used in the Isolated Electric Systems). The main goal of this program is to reimburse part of the fuel costs used to generate electricity in the Brazil´s isolated systems, promoting the electricity access in the remote areas of the North of Brazil, mainly in the Amazon forest at affordable prices.
- Luz para Todos (Electricity for everyone). The main objective of this program is to make electricity available for about 2.5 million families (approximately 12 million people) that live in the rural area of the country.
- PROINFA – Programa de Incentivo às Fontes Alternativas de Energia (Renewable Energy Incentive Program). The main goal of this program is to stimulate the implementation of projects for generating electricity from alternative sources of energy, providing financial and fiscal incentives to for the national industry and to diversify the energy matrix of the country.

Bulgaria

SECTION A: key indicators

Population (mn)	7.7	CO_2/GDP	0.74
GDP ($bn)	88	CO_2/capita	5.96
GDP/capita (US$)	11,311	TPES/GDP (toe per thousand 2000 US$ PPP)	0.32





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.3**	**2nd**	**C: Equity**	**6.2**	**1st**
A1: Institutions and regulations	3.7	3rd	C1: Education	4.6	1st
A2: Goods and factors markets	5.0	2nd	C2: Health and safety	5.9	1st
B: Economy	**4.4**	**2nd**	C3: Equity	8.0	2nd
B1: Macro-economy	4.5	2nd	**D: Environment**	**6.6**	**3rd**
B2: Innovation	2.3	2nd	D1: Climate change	7.1	3rd
B3: Energy markets	4.2	4th	D2: Environmental factors	6.0	2nd
B4: Infrastructure	5.6	2nd			
B5: Energy security	5.3	3rd	**Assessment Index**	**5.4**	**2nd**

Note: Division is by cluster

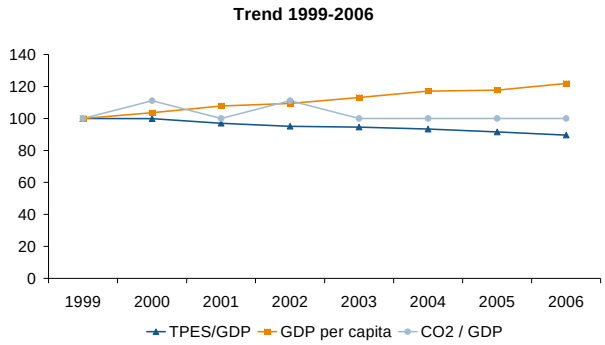
SECTION C: policy examples

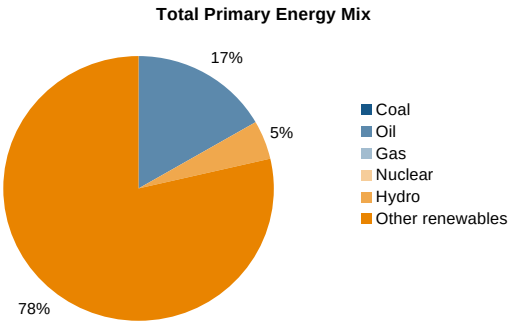
- Ordinance No 11 of 10 June 2004 on fuel reserves (amended, SG, No.75 of 27 August 2004.) imposes obligations on Thermal Power Plants to maintain reserves
- To improve efficiency of vehicles a change of tax structure regarding vehicles depending on the year of production, size of the car and motor efficiency was introduced.
- Establishment of favourable for RES-e environment using various mechanisms: Feed-in tariffs; Obligatory purchasing; Obligatory connection; Shallow connection pricing; Demand response.

Cameroon

SECTION A: key indicators

Population (mn)	17.8	CO_2/GDP	0.09
GDP ($bn)	35	CO_2/capita	0.18
GDP/capita (US$)	1,944	TPES/GDP (toe per thousand 2000 US$ PPP)	0.21





SECTION B: Assessment index results Cluster 2

	Value	Division		Value	Division
A: Institutions	**2.3**	**2nd**	**C: Equity**	**3.4**	**2nd**
A1: Institutions and regulations	**1.5**	2nd	C1: Education	2.5	1st
A2: Goods and factors markets	3.0	3rd	C2: Health and safety	1.5	2nd
B: Economy	**3.4**	**2nd**	C3: Equity	6.2	2nd
B1: Macro-economy	3.8	1st	**D: Environment**	**7.5**	**2nd**
B2: Innovation	0.6	3rd	D1: Climate change	9.9	1st
B3: Energy markets	6.9	1st	D2: Environmental factors	5.0	3rd
B4: Infrastructure	3.2	3rd			
B5: Energy security	6.1	1st	**Assessment Index**	**4.1**	**2nd**

Note: Division is by cluster

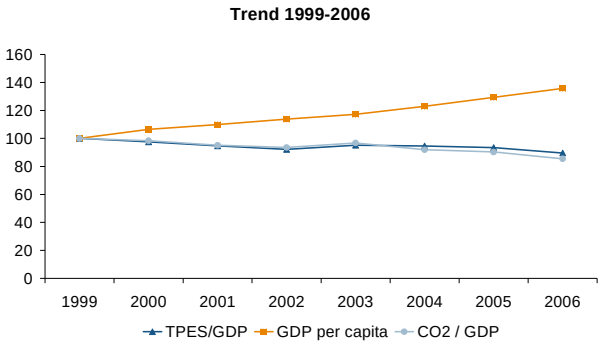
SECTION C: policy examples

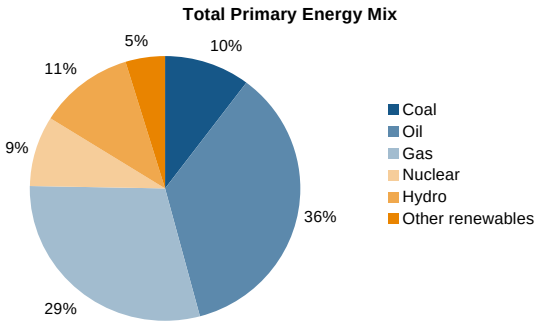
Not available

Canada

SECTION A: key indicators

Population (mn)	32.3	CO_2/GDP	0.55
GDP ($bn)	1,246	CO_2/capita	17.00
GDP/capita (US$)	38,614	TPES/GDP (toe per thousand 2000 US$ PPP)	0.27





SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**9.1**	**2nd**	**C: Equity**	**7.6**	**1st**
A1: Institutions and regulations	9.3	2nd	C1: Education	6.5	1st
A2: Goods and factors markets	9.0	2nd	C2: Health and safety	8.1	2nd
B: Economy	**7.0**	**1st**	C3: Equity	8.2	4th
B1: Macro-economy	5.9	2nd	**D: Environment**	**8.1**	**1st**
B2: Innovation	5.6	1st	D1: Climate change	7.5	2nd
B3: Energy markets	6.6	1st	D2: Environmental factors	8.8	1st
B4: Infrastructure	8.6	1st			
B5: Energy security	7.9	1st	**Assessment Index**	**8.0**	**1st**

Note: Division is by cluster

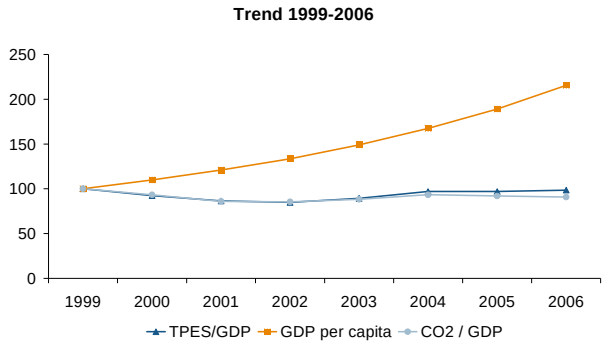
SECTION C: policy examples

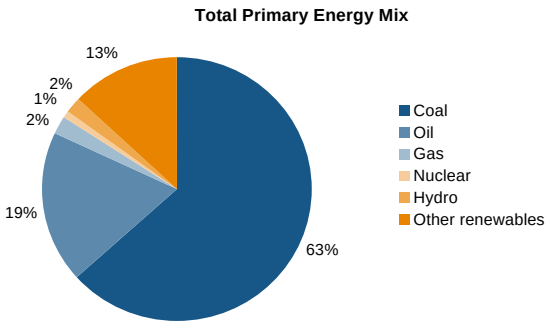
- Canada has built a diversified energy supply chain and is encouraging a number of provinces to increase the use of alternative energy sources (such as wind). Moreover, Canada is developing advanced Generation III+ nuclear technology in collaboration with the Advanced Candu Reactor to increase nuclear energy capacity.
- Canada has a long-term energy infrastructure investment policy to maintain its position as a global “energy superpower”. By making multi-billion dollar investments in further developing the Canadian oil sands and increasing wind and hydroelectric capacity, Canada seeks to achieve competitive and abundant energy supply with acceptable environmental footprints.
- Canada seeks to provide energy at low cost to promote the social and economic well-bring of all Canadians.

China

SECTION A: key indicators

Population (mn)	1,307.6	CO_2/GDP	0.65
GDP ($bn)	6,963	CO_2/capita	3.88
GDP/capita (US$)	5,325	TPES/GDP (toe per thousand 2000 US$ PPP)	0.22





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.3**	**3rd**	**C: Equity**	**5.3**	**4th**
A1: Institutions and regulations	3.7	3rd	C1: Education	2.7	4th
A2: Goods and factors markets	4.8	2nd	C2: Health and safety	5.4	3rd
B: Economy	**5.8**	**1st**	C3: Equity	7.8	2nd
B1: Macro-economy	7.1	1st	**D: Environment**	**6.2**	**3rd**
B2: Innovation	2.5	2nd	D1: Climate change	6.9	3rd
B3: Energy markets	6.3	2nd	D2: Environmental factors	5.6	3rd
B4: Infrastructure	7.1	1st			
B5: Energy security	6.4	2nd	**Assessment Index**	**5.4**	**2nd**

Note: Division is by cluster

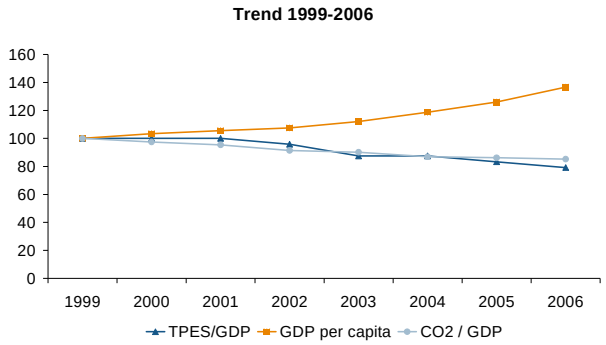
SECTION C: policy examples

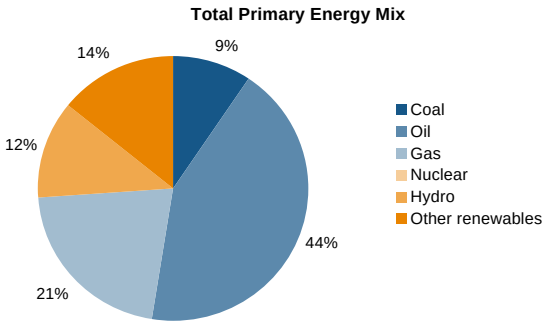
Not available

Colombia

SECTION A: key indicators

Population (mn)	46.0	CO_2/GDP	0.20
GDP ($bn)	337	CO_2/capita	1.31
GDP/capita (US$)	7,317	TPES/GDP (toe per thousand 2000 US$ PPP)	0.10





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.0**	**3rd**	**C: Equity**	**5.5**	**3rd**
A1: Institutions and regulations	3.6	3rd	C1: Education	4.7	1st
A2: Goods and factors markets	4.4	3rd	C2: Health and safety	5.7	2nd
B: Economy	**3.9**	**4th**	C3: Equity	6.2	4th
B1: Macro-economy	3.3	4th	**D: Environment**	**8.5**	**1st**
B2: Innovation	1.2	4th	D1: Climate change	9.1	1st
B3: Energy markets	4.9	4th	D2: Environmental factors	8.0	1st
B4: Infrastructure	3.3	4th			
B5: Energy security	7.8	1st	**Assessment Index**	**5.5**	**2nd**

Note: Division is by cluster

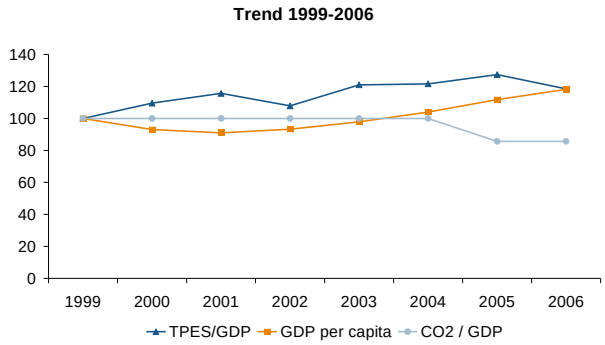
SECTION C: policy examples

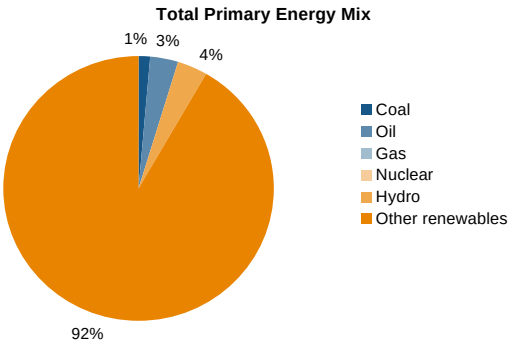
- A series of policies were identified as supporting and addressing issues related Energy security: National Constitution (1991); Public Services Law (142 of 1994); Electric Law (143 of 1994); PEN – National Energetic Plan 2003-2020; CONPES Documents from 1994; CREG resolutions. These policies aimed to: further the gas development plan; encourage development of regional and local energy solutions; secure availability of energy for domestic and exportations demand (electricity, oil, gas and coal); implement demand side management programs; develop renewable energy sources.

Congo (Dem. Rep.)

SECTION A: key indicators

Population (mn)	57.5	CO_2/GDP	0.06
GDP ($bn)	24	CO_2/capita	0.04
GDP/capita (US$)	416	TPES/GDP (toe per thousand 2000 US$ PPP)	0.46





SECTION B: Assessment index results Cluster 2

	Value	Division		Value	Division
A: Institutions	**0.1**	**4th**	**C: Equity**	**1.2**	**4th**
A1: Institutions and regulations	0.2	4th	C1: Education	0.0	4th
A2: Goods and factors markets	0.0	3rd	C2: Health and safety	0.0	4th
B: Economy	**5.3**	**1st**	C3: Equity	3.6	4th
B1: Macro-economy	1.0	4th	**D: Environment**	**7.7**	**1st**
B2: Innovation	0.0	4th	D1: Climate change	9.8	1st
B3: Energy markets	4.0	3rd	D2: Environmental factors	5.6	2nd
B4: Infrastructure	8.8	1st			
B5: Energy security	6.0	2nd	**Assessment Index**	**3.6**	**3rd**

Note: Division is by cluster

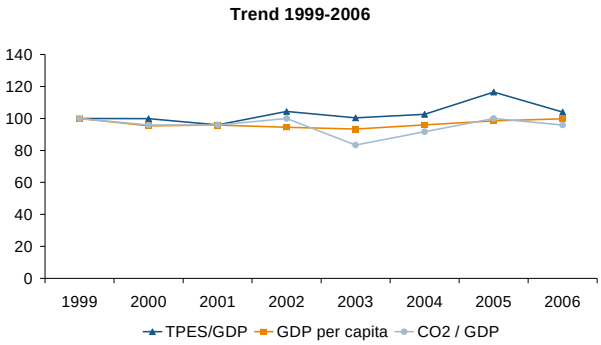
SECTION C: policy examples

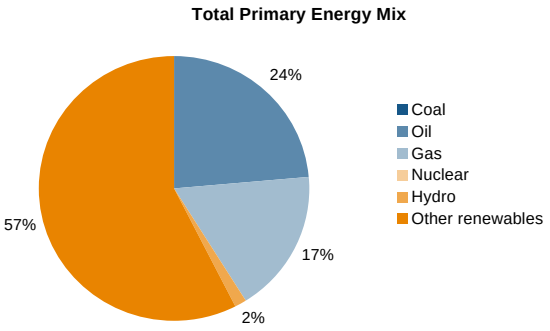
Not available

Cöte d'Ivoire

SECTION A: key indicators

Population (mn)	18.2	CO_2/GDP	0.24
GDP ($bn)	32	CO_2/capita	0.34
GDP/capita (US$)	1,737	TPES/GDP (toe per thousand 2000 US$ PPP)	0.29





SECTION B: Assessment index results Cluster 2

	Value	Division		Value	Division
A: Institutions	**2.2**	**2nd**	**C: Equity**	**2.3**	**3rd**
A1: Institutions and regulations	1.2	3rd	C1: Education	0.4	3rd
A2: Goods and factors markets	3.2	2nd	C2: Health and safety	0.5	3rd
B: Economy	**3.7**	**1st**	C3: Equity	6.0	3rd
B1: Macro-economy	2.5	2nd	**D: Environment**	**7.5**	**1st**
B2: Innovation	0.6	2nd	D1: Climate change	8.8	3rd
B3: Energy markets	5.8	2nd	D2: Environmental factors	6.2	1st
B4: Infrastructure	3.7	2nd			
B5: Energy security	8.0	1st	**Assessment Index**	**3.9**	**3rd**

Note: Division is by cluster

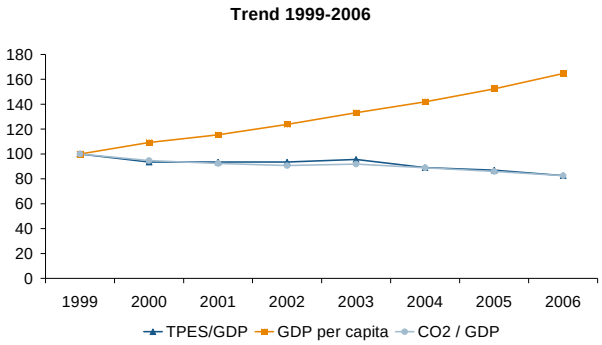
SECTION C: policy examples

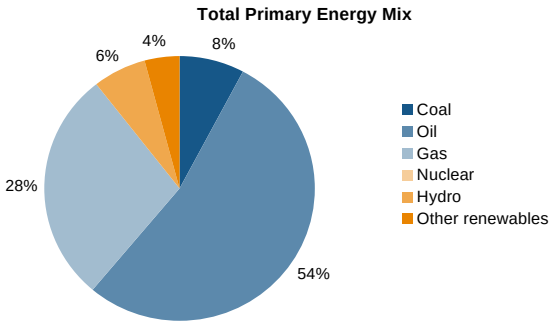
Not available

Croatia

SECTION A: key indicators

Population (mn)	4.4	CO_2/GDP	0.40
GDP ($bn)	69	CO_2/capita	4.67
GDP/capita (US$)	15,532	TPES/GDP (toe per thousand 2000 US$ PPP)	0.17





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.6**	**2nd**	**C: Equity**	**6.2**	**1st**
A1: Institutions and regulations	4.3	2nd	C1: Education	4.5	2nd
A2: Goods and factors markets	4.8	2nd	C2: Health and safety	6.4	1st
B: Economy	**4.9**	**1st**	C3: Equity	7.7	2nd
B1: Macro-economy	5.2	1st	**D: Environment**	**7.2**	**2nd**
B2: Innovation	3.2	1st	D1: Climate change	8.2	2nd
B3: Energy markets	7.3	1st	D2: Environmental factors	6.1	2nd
B4: Infrastructure	5.6	2nd			
B5: Energy security	5.6	3rd	**Assessment Index**	**5.7**	**1st**

Note: Division is by cluster

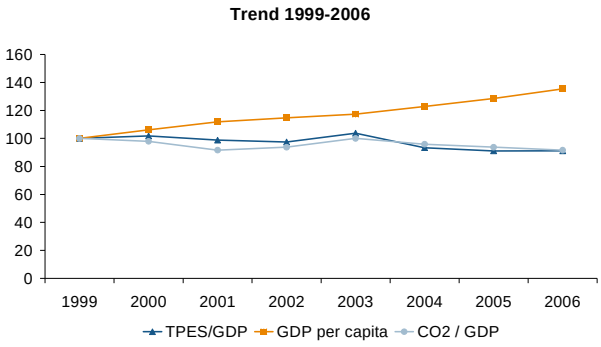
SECTION C: policy examples

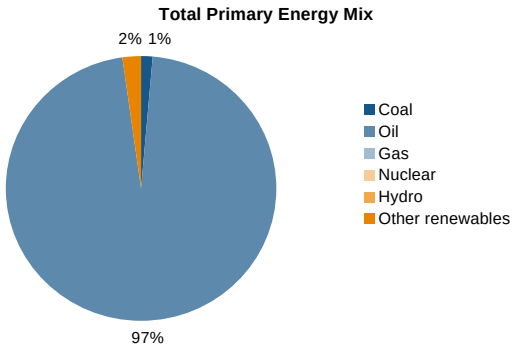
- The Ministry of Economy, Labour and Entrepreneurship, in the Regulation on a minimal share of incentivized electricity production from renewable energy sources and cogeneration, has set a goal to achieve 5.8% as the minimum share of electricity produced from RES in total consumption in Croatia by 31 December 2010.
- Act on Crude Oil and Petroleum Products Market (Official Gazette No. 57/2006) deals with questions related to the compulsory stocks of crude oil and petroleum products as a measure for safe and reliable supply of Republic of Croatia. Compulsory stocks of crude oil and petroleum products are being established based on 90 days average daily consumption in preceding year.

Cyprus

SECTION A: key indicators

Population (mn)	0.8	CO_2/GDP	0.44
GDP ($bn)	21	CO_2/capita	9.13
GDP/capita (US$)	27,171	TPES/GDP (toe per thousand 2000 US$ PPP)	0.20





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**6.9**	**3rd**	**C: Equity**	**6.0**	**4th**
A1: Institutions and regulations	7.4	3rd	C1: Education	4.3	4th
A2: Goods and factors markets	6.4	4th	C2: Health and safety	6.9	4th
B: Economy	**5.0**	**4th**	C3: Equity	6.9	4th
B1: Macro-economy	6.0	1st	**D: Environment**	**6.2**	**4th**
B2: Innovation	2.7	4th	D1: Climate change	7.3	4th
B3: Energy markets	6.3	4th	D2: Environmental factors	5.1	4th
B4: Infrastructure	8.1	3rd			
B5: Energy security	3.0	4th	**Assessment Index**	**6.0**	**4th**

Note: Division is by cluster

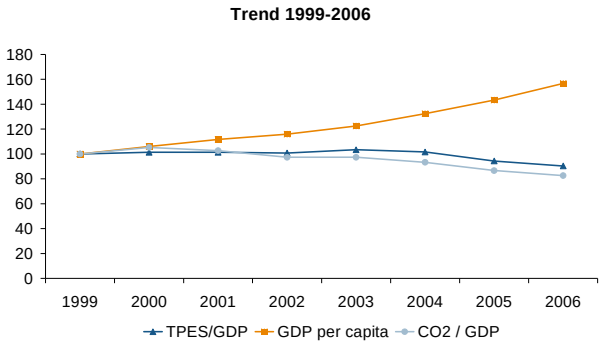
SECTION C: policy examples

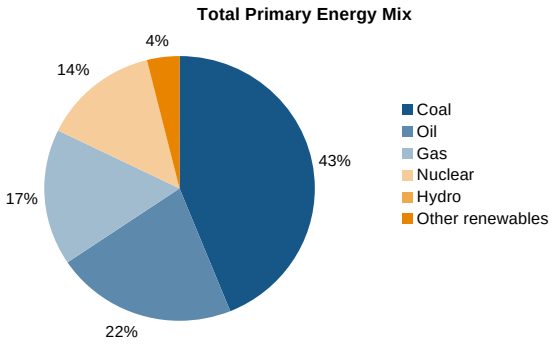
Not available

Czech Republic

SECTION A: key indicators

Population (mn)	10.2	CO_2/GDP	0.65
GDP ($bn)	248	CO_2/capita	11.54
GDP/capita (US$)	24,229	TPES/GDP (toe per thousand 2000 US$ PPP)	0.25





The Czech Republic has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**6.1**	**4th**	**C: Equity**	**6.5**	**4th**
A1: Institutions and regulations	5.8	4th	C1: Education	5.2	4th
A2: Goods and factors markets	6.4	4th	C2: Health and safety	6.8	4th
B: Economy	**5.8**	**3rd**	C3: Equity	7.5	4th
B1: Macro-economy	5.5	2nd	**D: Environment**	**5.8**	**4th**
B2: Innovation	3.6	3rd	D1: Climate change	7.1	4th
B3: Energy markets	6.5	4th	D2: Environmental factors	4.5	4th
B4: Infrastructure	7.4	4th			
B5: Energy security	6.8	1st	**Assessment Index**	**6.1**	**4th**

Note: Division is by cluster

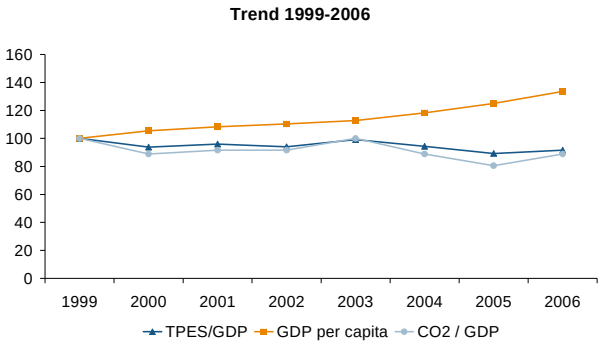
SECTION C: policy examples

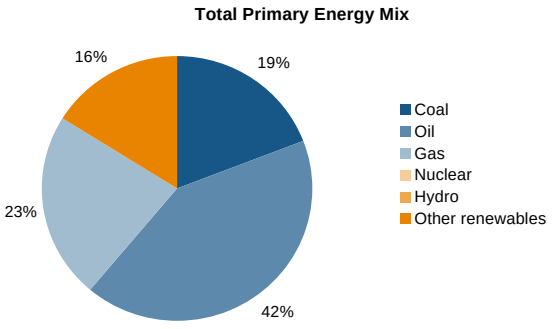
- The State Energy Policy (SEP) reflects the responsibility of the national government for the creation of conditions for reliable and permanently secure supplies of energy at acceptable prices and for creation of conditions for its efficient use that will not endanger the environment and will comply with the principles of sustainable development.
- The Sustainable Development Strategy of the Czech Republic (SDS) and the Social Policy of the Czech Republic, which aims to encourage economic development respecting the carrying capacity of the environment.

Denmark

SECTION A: key indicators

Population (mn)	5.4	CO_2/GDP	0.29
GDP ($bn)	202	CO_2/capita	8.77
GDP/capita (US$)	37,265	TPES/GDP (toe per thousand 2000 US$ PPP)	0.12





Denmark has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**9.7**	**1st**	**C: Equity**	**7.5**	**2nd**
A1: Institutions and regulations	9.7	1st	C1: Education	5.8	2nd
A2: Goods and factors markets	9.7	1st	C2: Health and safety	7.7	2nd
B: Economy	**7.2**	**1st**	C3: Equity	8.8	2nd
B1: Macro-economy	5.1	4th	**D: Environment**	**7.6**	**2nd**
B2: Innovation	6.3	1st	D1: Climate change	8.6	1st
B3: Energy markets	6.4	2nd	D2: Environmental factors	6.6	2nd
B4: Infrastructure	9.4	1st			
B5: Energy security	8.0	1st	**Assessment Index**	**8.0**	**1st**

Note: Division is by cluster

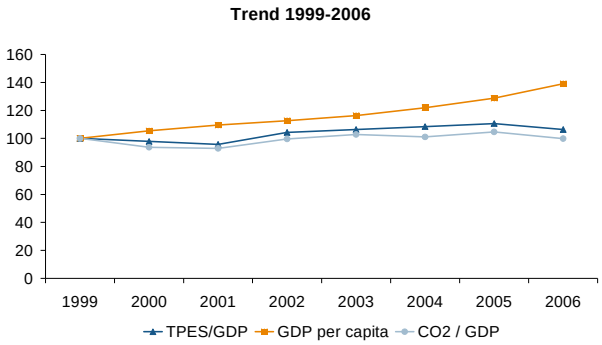
SECTION C: policy examples

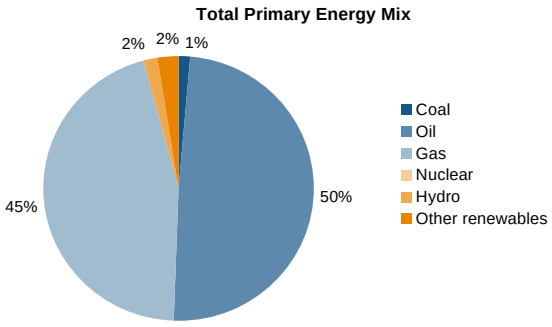
- The Danish energy generation market is a competitive one but its networks are regulated. The aim is to achieve high energy security at competitive prices whilst managing the impact on the environment and consumers.
- Denmark seeks to achieve energy security by integrating its existing and new electricity infrastructure with renewable energy sources using electricity interconnectors.
- Denmark encourages the use of renewable energy sources (e.g. wind and biomass) through taxation measures and subsidies.

Egypt (Arab Rep.)

SECTION A: key indicators

Population (mn)	70.7	CO_2/GDP	0.52
GDP ($bn)	360	CO_2/capita	1.99
GDP/capita (US$)	5,097	TPES/GDP (toe per thousand 2000 US$ PPP)	0.21





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**3.6**	**3rd**	**C: Equity**	**5.6**	**3rd**
A1: Institutions and regulations	3.8	2nd	C1: Education	3.1	3rd
A2: Goods and factors markets	3.4	4th	C2: Health and safety	5.1	4th
B: Economy	**4.4**	**2nd**	C3: Equity	8.7	1st
B1: Macro-economy	3.8	3rd	**D: Environment**	**6.2**	**3rd**
B2: Innovation	1.3	3rd	D1: Climate change	7.7	2nd
B3: Energy markets	7.3	1st	D2: Environmental factors	4.6	4th
B4: Infrastructure	4.6	3rd			
B5: Energy security	7.9	1st	**Assessment Index**	**5.0**	**3rd**

Note: Division is by cluster

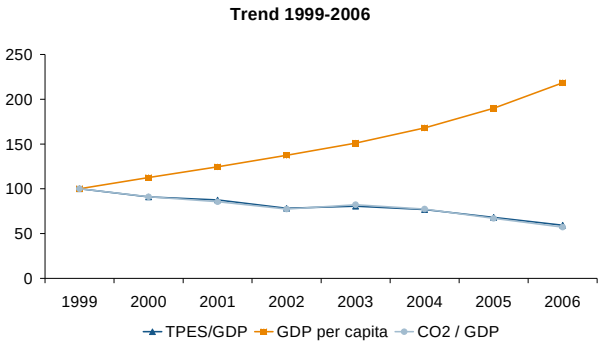
SECTION C: policy examples

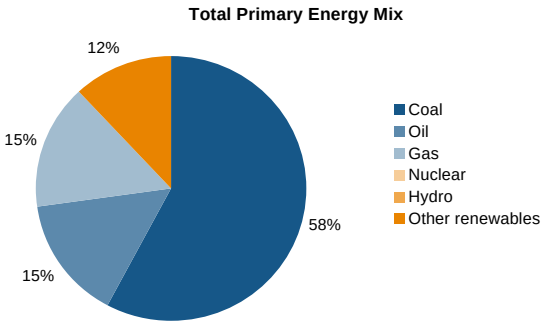
- Egypt has established a rural electrification authority to build transmission and distribution networks in rural areas, extending its energy infrastructure throughout the country. Moreover, subsidies are provided for the poor, ensuring access to energy at affordable prices.
- Egypt aims to increase its energy efficiency, security and use of renewable energy by encouraging investment in alternative energy sources, educating the end user on energy saving techniques and construction of efficient CCP plants.
- To further diversify its energy sources, Egypt is aiming to develop nuclear power plants.

Estonia

SECTION A: key indicators

Population (mn)	1.3	CO_2/GDP	0.86
GDP ($bn)	28	CO_2/capita	11.85
GDP/capita (US$)	20,584	TPES/GDP (toe per thousand 2000 US$ PPP)	0.27





Estonia has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**7.4**	**3rd**	**C: Equity**	**6.6**	**4th**
A1: Institutions and regulations	7.6	3rd	C1: Education	5.9	2nd
A2: Goods and factors markets	7.2	3rd	C2: Health and safety	6.0	4th
B: Economy	**5.0**	**4th**	C3: Equity	8.1	4th
B1: Macro-economy	5.9	1st	**D: Environment**	**7.5**	**3rd**
B2: Innovation	3.0	4th	D1: Climate change	6.9	4th
B3: Energy markets	6.7	4th	D2: Environmental factors	8.2	1st
B4: Infrastructure	6.0	4th			
B5: Energy security	4.9	4th	**Assessment Index**	**6.6**	**3rd**

Note: Division is by cluster

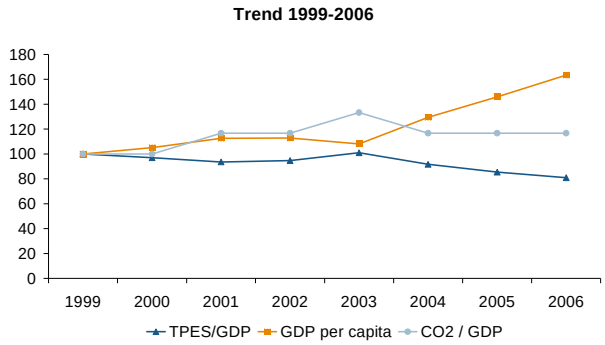
SECTION C: policy examples

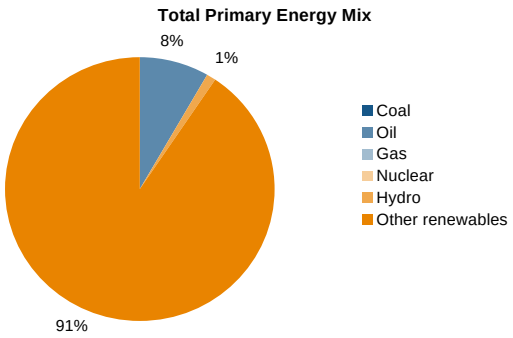
Not available

Ethiopia

SECTION A: key indicators

Population (mn)	73.0	CO_2/GDP	0.07
GDP ($bn)	53	CO_2/capita	0.07
GDP/capita (US$)	725	TPES/GDP (toe per thousand 2000 US$ PPP)	0.32





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**2.8**	**4th**	**C: Equity**	**2.7**	**4th**
A1: Institutions and regulations	2.2	4th	C1: Education	1.4	4th
A2: Goods and factors markets	3.4	4th	C2: Health and safety	1.1	4th
B: Economy	**3.3**	**4th**	C3: Equity	5.5	4th
B1: Macro-economy	3.1	3rd	**D: Environment**	**7.5**	**3rd**
B2: Innovation	0.0	4th	D1: Climate change	9.7	1st
B3: Energy markets	4.8	4th	D2: Environmental factors	5.3	4th
B4: Infrastructure	4.4	1st			
B5: Energy security	5.5	4th	**Assessment Index**	**4.0**	**4th**

Note: Division is by cluster

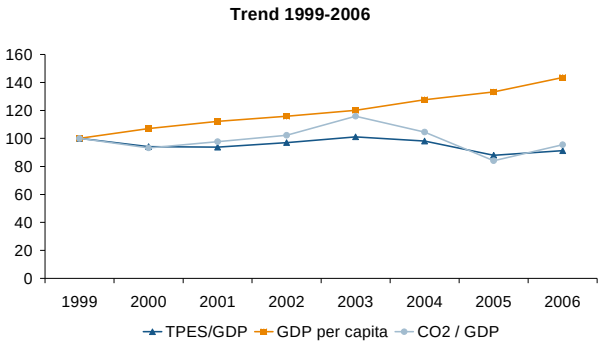
SECTION C: policy examples

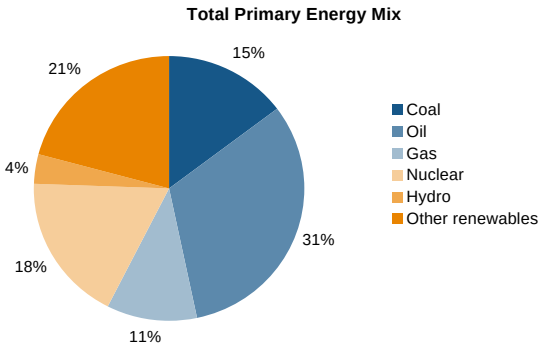
Not available

Finland

SECTION A: key indicators

Population (mn)	5.2	CO_2/GDP	0.36
GDP ($bn)	185	CO_2/capita	10.57
GDP/capita (US$)	35,349	TPES/GDP (toe per thousand 2000 US$ PPP)	0.23





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.9**	**1st**	**C: Equity**	**8.1**	**1st**
A1: Institutions and regulations	9.4	1st	C1: Education	8.1	1st
A2: Goods and factors markets	8.3	2nd	C2: Health and safety	7.5	3rd
B: Economy	**7.5**	**1st**	C3: Equity	8.7	1st
B1: Macro-economy	5.6	2nd	**D: Environment**	**8.8**	**1st**
B2: Innovation	7.3	1st	D1: Climate change	8.1	3rd
B3: Energy markets	7.1	3rd	D2: Environmental factors	9.4	1st
B4: Infrastructure	9.0	1st			
B5: Energy security	8.2	1st	**Assessment Index**	**8.3**	**1st**

Note: Division is by cluster

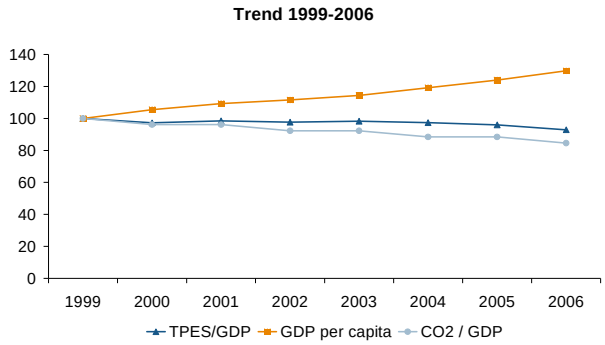
SECTION C: policy examples

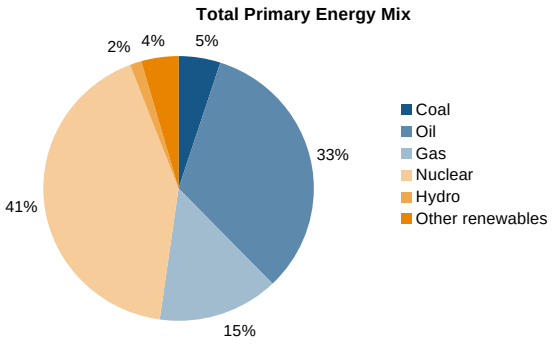
- High level of taxes on fuels and taxes on the price of car depending on the level of cars CO_2 emissions are measures intended to promote efficiency in the transportation sector.
- In addition to taxes on fuels other measures put in place in order to promote low-carbon technologies are incentives for renewables and voluntary agreements on energy savings in building.

France

SECTION A: key indicators

Population (mn)	61.0	CO_2/GDP	0.23
GDP ($bn)	2,044	CO_2/capita	6.19
GDP/capita (US$)	33,509	TPES/GDP (toe per thousand 2000 US$ PPP)	0.16





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**7.5**	**3rd**	**C: Equity**	**7.7**	**1st**
A1: Institutions and regulations	8.0	2nd	C1: Education	6.6	1st
A2: Goods and factors markets	7.1	3rd	C2: Health and safety	8.1	1st
B: Economy	**6.3**	**2nd**	C3: Equity	8.4	3rd
B1: Macro-economy	4.9	4th	**D: Environment**	**7.8**	**2nd**
B2: Innovation	5.4	2nd	D1: Climate change	8.8	1st
B3: Energy markets	7.1	3rd	D2: Environmental factors	6.8	3rd
B4: Infrastructure	9.1	1st			
B5: Energy security	5.9	2nd	**Assessment Index**	**7.3**	**2nd**

Note: Division is by cluster

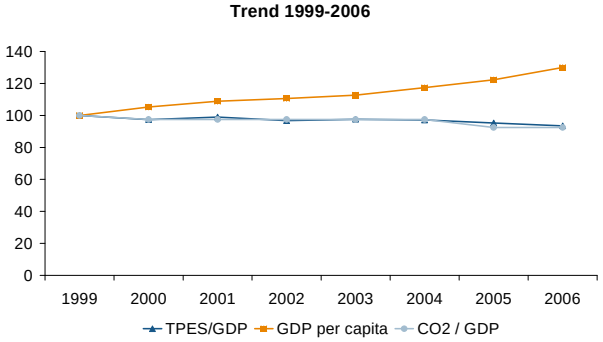
SECTION C: policy examples

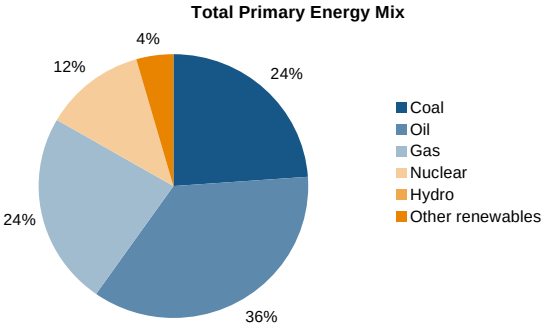
- Acts 2000-108 (Modernisation and the Development of Public Service) which was modified through Act 2006-1537 (Relating to the Energy Sector) and Act 2004-803 (Electricity and Gas Supply Companies) ensure that there is single pricing throughout the country and that electricity is made available to low-income customers.
- France seeks to diversify its energy sources by promoting renewable energy through purchasing tariffs.
- France has a €400 million New Energy Technologies Demonstration Fund, part of which will be used to fund carbon capture and storage.

Germany

SECTION A: key indicators

Population (mn)	82.4	CO_2/GDP	0.37
GDP ($bn)	2,820	CO_2/capita	9.86
GDP/capita (US$)	34,212	TPES/GDP (toe per thousand 2000 US$ PPP)	0.16





Germany has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.3**	**2nd**	**C: Equity**	**7.6**	**2nd**
A1: Institutions and regulations	9.0	2nd	C1: Education	6.1	2nd
A2: Goods and factors markets	7.6	2nd	C2: Health and safety	8.1	1st
B: Economy	**6.6**	**1st**	C3: Equity	8.8	1st
B1: Macro-economy	4.9	4th	**D: Environment**	**7.8**	**2nd**
B2: Innovation	5.5	2nd	D1: Climate change	8.2	2nd
B3: Energy markets	7.4	2nd	D2: Environmental factors	7.4	2nd
B4: Infrastructure	9.6	1st			
B5: Energy security	6.4	2nd	**Assessment Index**	**7.6**	**2nd**

Note: Division is by cluster

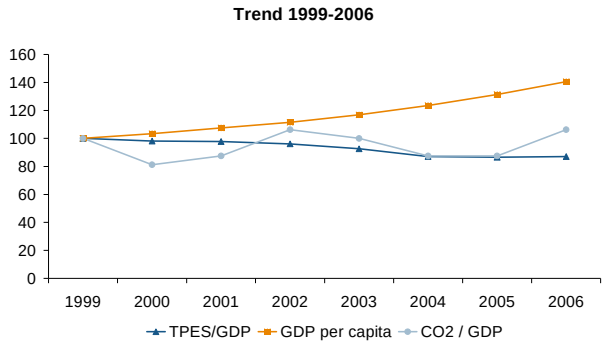
SECTION C: policy examples

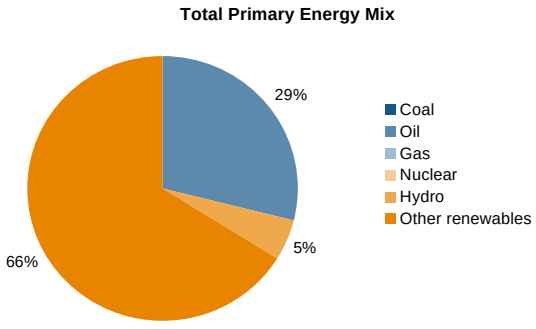
- Germany has introduced several policies in order to maintain their energy diversification. For example the “Renewables Feed-In Act” introduces subsidies for renewable fuels.
- The Combined Heat and Power (CHP) Act also promotes energy efficiency in electricity generation.
- The up-and-coming Carbon Capture and Storage (CCS) legislation also aims to ensure that 30% of Germany’s energy is low-carbon.

Ghana

SECTION A: key indicators

Population (mn)	20.9	CO_2/GDP	0.14
GDP ($bn)	26	CO_2/capita	0.32
GDP/capita (US$)	1,251	TPES/GDP (toe per thousand 2000 US$ PPP)	0.18





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**3.8**	**2nd**	**C: Equity**	**3.8**	**3rd**
A1: Institutions and regulations	3.9	1st	C1: Education	2.4	3rd
A2: Goods and factors markets	3.6	4th	C2: Health and safety	2.9	4th
B: Economy	**3.4**	**3rd**	C3: Equity	6.1	3rd
B1: Macro-economy	3.1	3rd	**D: Environment**	**7.8**	**2nd**
B2: Innovation	0.3	4th	D1: Climate change	9.4	1st
B3: Energy markets	6.3	2nd	D2: Environmental factors	6.1	2nd
B4: Infrastructure	4.1	2nd			
B5: Energy security	5.9	2nd	**Assessment Index**	**4.7**	**2nd**

Note: Division is by cluster

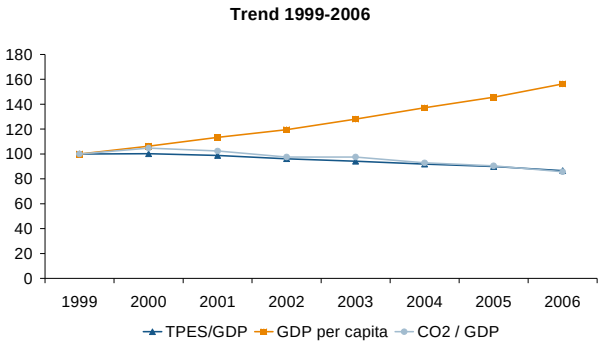
SECTION C: policy examples

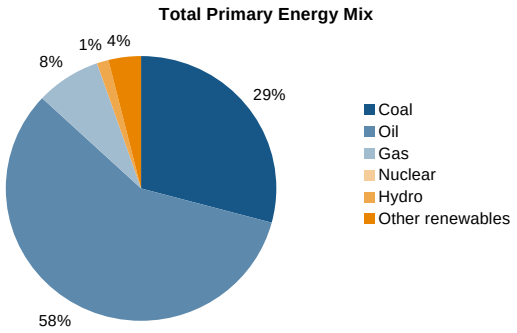
Not available

Greece

SECTION A: key indicators

Population (mn)	11.1	CO_2/GDP	0.34
GDP ($bn)	324	CO_2/capita	8.62
GDP/capita (US$)	29,146	TPES/GDP (toe per thousand 2000 US$ PPP)	0.11





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**5.1**	**4th**	**C: Equity**	**7.3**	**3rd**
A1: Institutions and regulations	5.7	4th	C1: Education	5.8	3rd
A2: Goods and factors markets	4.6	4th	C2: Health and safety	7.5	3rd
B: Economy	**5.2**	**4th**	C3: Equity	8.6	2nd
B1: Macro-economy	5.0	4th	**D: Environment**	**7.2**	**3rd**
B2: Innovation	3.1	4th	D1: Climate change	7.8	3rd
B3: Energy markets	6.8	3rd	D2: Environmental factors	6.7	3rd
B4: Infrastructure	7.4	4th			
B5: Energy security	5.4	3rd	**Assessment Index**	**6.2**	**4th**

Note: Division is by cluster

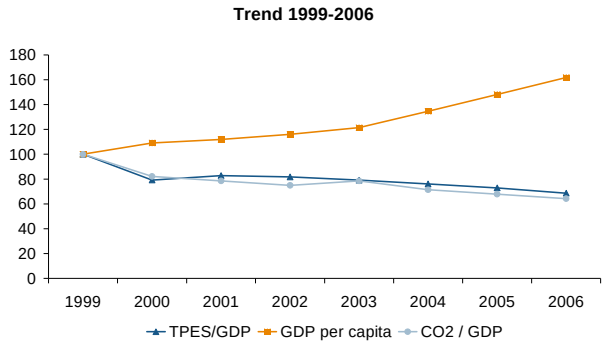
SECTION C: policy examples

Not available

Hong Kong, China

SECTION A: key indicators

Population (mn)	6.8	CO_2/GDP	-
GDP ($bn)	288	CO_2/capita	-
GDP/capita (US$)	42,124	TPES/GDP (toe per thousand 2000 US$ PPP)	-



SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.9**	**1st**	**C: Equity**	**6.4**	**4th**
A1: Institutions and regulations	9.1	2nd	C1: Education	6.1	2nd
A2: Goods and factors markets	8.7	1st	C2: Health and safety	4.9	4th
B: Economy	**4.5**	**4th**	C3: Equity	8.3	3rd
B1: Macro-economy	5.5	2nd	**D: Environment**	**-**	**-**
B2: Innovation	3.2	4th	D1: Climate change	-	-
B3: Energy markets	4.7	4th	D2: Environmental factors	-	-
B4: Infrastructure	8.2	3rd			
B5: Energy security	1.0	4th	**Assessment Index**	**6.6**	**3rd**

Note: Division is by cluster

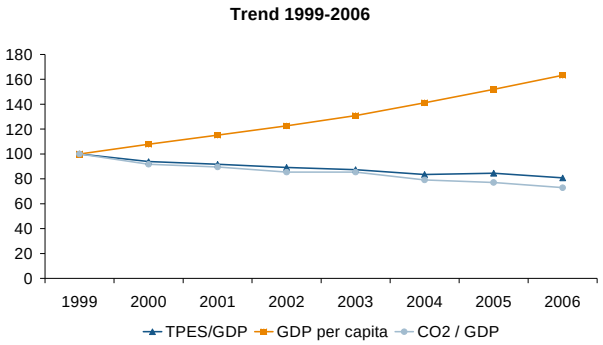
SECTION C: policy examples

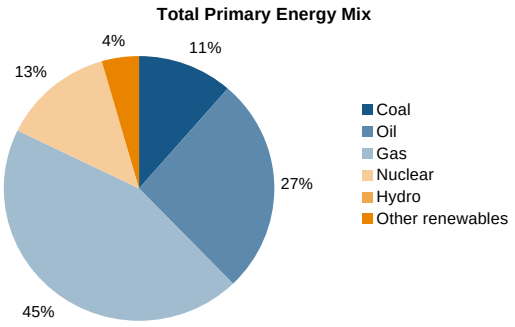
- Hong Kong, China, aims to diversify its energy sources. The target is for renewable energies to provide 1-2% of electricity consumption by 2012 (First Sustainable Development Strategy for Hong Kong).
- In August 2008, the HKSAR Government and National Energy Administration signed a Memorandum of Understanding on Energy Cooperation which guarantees the long-term supply of natural gas and nuclear power for the next two decades, alleviating Hong Kong's dependence on conventional oil products.
- Hong Kong, China, has allocated HKD450 million to an Environment and Conservation Fund, which subsidises energy-cum-carbon audits and energy efficiency projects.

Hungary

SECTION A: key indicators

Population (mn)	10.1	CO_2/GDP	0.37
GDP ($bn)	192	CO_2/capita	5.72
GDP/capita (US$)	19,020	TPES/GDP (toe per thousand 2000 US$ PPP)	0.18





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**5.6**	**4th**	**C: Equity**	**6.4**	**4th**
A1: Institutions and regulations	6.1	4th	C1: Education	4.3	4th
A2: Goods and factors markets	5.0	4th	C2: Health and safety	6.4	4th
B: Economy	**5.0**	**4th**	C3: Equity	8.4	3rd
B1: Macro-economy	4.8	4th	**D: Environment**	**7.8**	**2nd**
B2: Innovation	3.4	4th	D1: Climate change	8.4	1st
B3: Energy markets	6.8	4th	D2: Environmental factors	7.3	2nd
B4: Infrastructure	6.0	4th			
B5: Energy security	5.7	3rd	**Assessment Index**	**6.2**	**4th**

Note: Division is by cluster

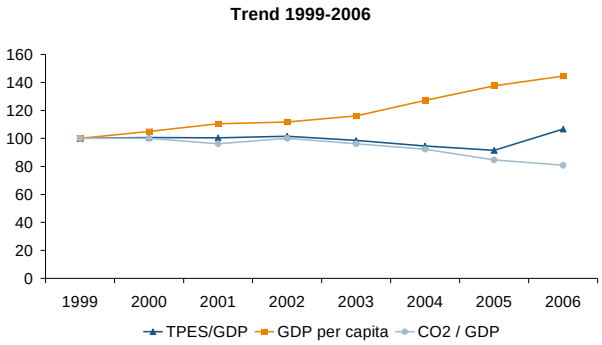
SECTION C: policy examples

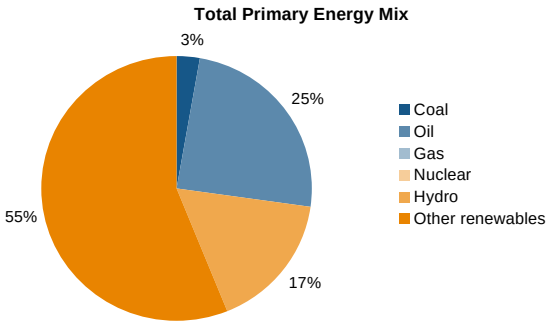
Not available

Iceland

SECTION A: key indicators

Population (mn)	0.3	CO2/GDP	0.22
GDP ($bn)	12	CO2/capita	7.46
GDP/capita	39,168	TPES/GDP (toe per thousand 2000 US$ PPP)	0.36





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.9**	**2nd**	**C: Equity**	**7.6**	**2nd**
A1: Institutions and regulations	9.3	1st	C1: Education	5.6	3rd
A2: Goods and factors markets	8.4	2nd	C2: Health and safety	8.4	1st
B: Economy	**5.9**	**3rd**	C3: Equity	8.7	2nd
B1: Macro-economy	5.3	3rd	**D: Environment**	**8.0**	**2nd**
B2: Innovation	4.8	2nd	D1: Climate change	8.6	1st
B3: Energy markets	5.3	4th	D2: Environmental factors	7.3	2nd
B4: Infrastructure	8.6	2nd			
B5: Energy security	4.8	4th	**Assessment Index**	**7.6**	**2nd**

Note: Division is by cluster

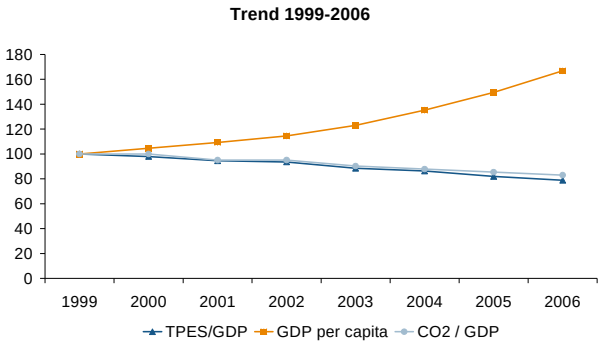
SECTION C: policy examples

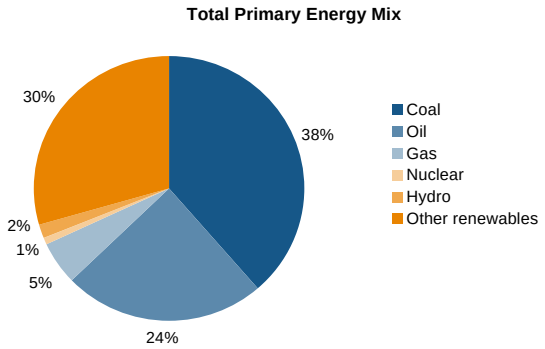
Not available

India

SECTION A: key indicators

Population (mn)	1,091.8	CO_2/GDP	0.34
GDP ($bn)	2,530	CO_2/capita	1.05
GDP/capita (US$)	2,317	TPES/GDP (toe per thousand 2000 US$ PPP)	0.16





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**5.1**	**1st**	**C: Equity**	**4.4**	**2nd**
A1: Institutions and regulations	4.8	1st	C1: Education	2.6	2nd
A2: Goods and factors markets	5.3	1st	C2: Health and safety	3.6	2nd
B: Economy	**4.2**	**1st**	C3: Equity	7.1	2nd
B1: Macro-economy	5.2	1st	**D: Environment**	**6.1**	**4th**
B2: Innovation	1.6	1st	D1: Climate change	7.6	4th
B3: Energy markets	5.9	3rd	D2: Environmental factors	4.6	4th
B4: Infrastructure	2.3	4th			
B5: Energy security	7.8	1st	**Assessment Index**	**5.0**	**1st**

Note: Division is by cluster

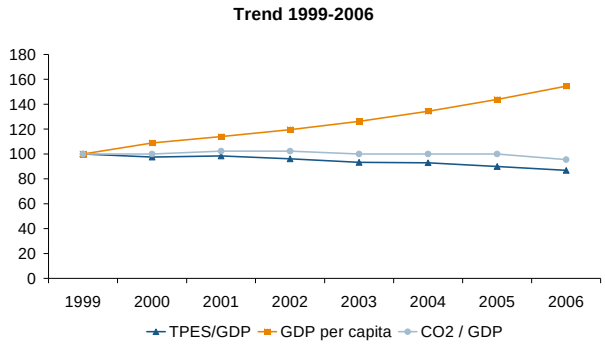
SECTION C: policy examples

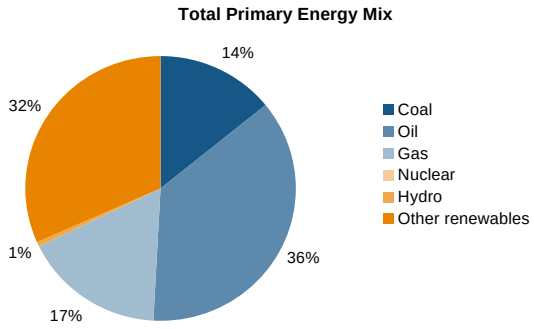
- National Action Plan on Climate Change has been prepared by the government to take action for mitigation of and adaptation to effects of climate change.
- The Integrated Energy Policy states that many of the initiatives recommended as part of the Energy Policy would have the effect of reducing the green house gas intensity of the economy by as much as one third. The objectives of the Integrated Energy Policy are to reliably meet the energy demand of all sectors in an economically rational manner while also meeting lifeline energy needs of poorer households.
- The Integrated Energy Policy defines 'strategic reserves': a reserve, equivalent to 90 days of oil imports should be maintained; a strategic stockpile of nuclear fuel should be built.

Indonesia

SECTION A: key indicators

Population (mn)	219.2	CO_2/GDP	0.45
GDP ($bn)	817	CO_2/capita	1.55
GDP/capita (US$)	3,728	TPES/GDP (toe per thousand 2000 US$ PPP)	0.24





SECTION B: Assessment index results Cluster 2

	Value	Division		Value	Division
A: Institutions	**3.4**	**1st**	**C: Equity**	**4.7**	**1st**
A1: Institutions and regulations	2.6	1st	C1: Education	2.4	1st
A2: Goods and factors markets	4.2	1st	C2: Health and safety	4.9	1st
B: Economy	**3.5**	**2nd**	C3: Equity	6.9	1st
B1: Macro-economy	3.7	1st	**D: Environment**	**6.8**	**3rd**
B2: Innovation	0.7	1st	D1: Climate change	7.7	3rd
B3: Energy markets	6.2	2nd	D2: Environmental factors	6.0	1st
B4: Infrastructure	4.3	2nd			
B5: Energy security	5.2	3rd	**Assessment Index**	**4.6**	**1st**

Note: Division is by cluster

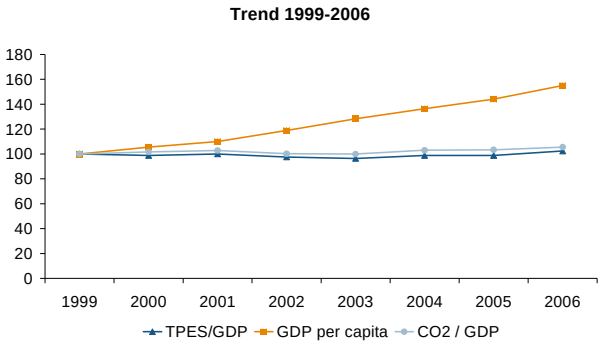
SECTION C: policy examples

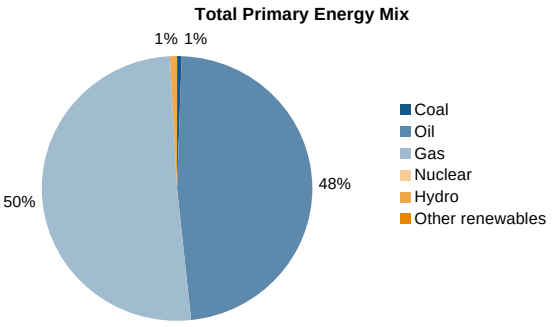
- Whilst, there is no specific policy, PLN (the national electric utility) has efficiency improvement programs, including replacing older less-efficient plants, retrofitting more modern control system, and component upgrades both on thermal and hydro power plants.
- Presidential decree no.10/2006 on National team for biofuel development sets roadmap of biofuel development 2006-2025 to achieve biofuel consumption 5% of energy mix.
- Oil & Gas Law No.22 of 2001 eliminates petroleum products subsidies and promotes competitive downstream oil market.
- Presidential Decree no 5 of 2006 on National Energy Policy and its Blueprint of National Energy Management 2005-2025 sets energy policy objectives as follows: reduce significantly the use of oil to below 20%; reduce energy elasticity below 1; improve energy infrastructure; increase use of coal, natural gas and renewables.

Iran (Islamic Rep.)

SECTION A: key indicators

Population (mn)	68.5	CO_2/GDP	0.84
GDP ($bn)	724	CO_2/capita	5.96
GDP/capita (US$)	10,570	TPES/GDP (toe per thousand 2000 US$ PPP)	0.34





Iran (Islamic Rep.) has a minor share, less than 0.5%, of renewables in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.0**	**3rd**	**C: Equity**	**6.1**	**2nd**
A1: Institutions and regulations	1.0	4th	C1: Education	5.7	1st
A2: Goods and factors markets	7.1	1st	C2: Health and safety	5.1	3rd
B: Economy	**4.5**	**2nd**	C3: Equity	7.4	3rd
B1: Macro-economy	4.0	2nd	**D: Environment**	**6.2**	**3rd**
B2: Innovation	1.0	4th	D1: Climate change	7.1	3rd
B3: Energy markets	6.2	3rd	D2: Environmental factors	5.4	3rd
B4: Infrastructure	6.4	1st			
B5: Energy security	6.5	2nd	**Assessment Index**	**5.2**	**3rd**

Note: Division is by cluster

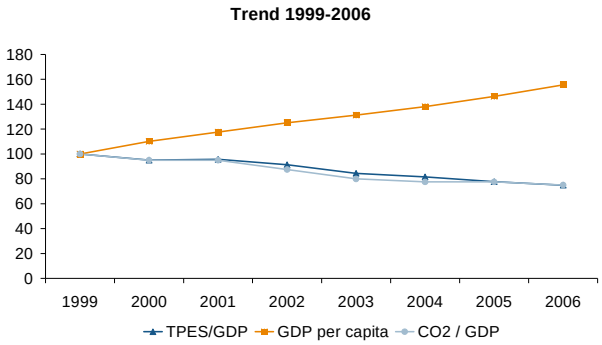
SECTION C: policy examples

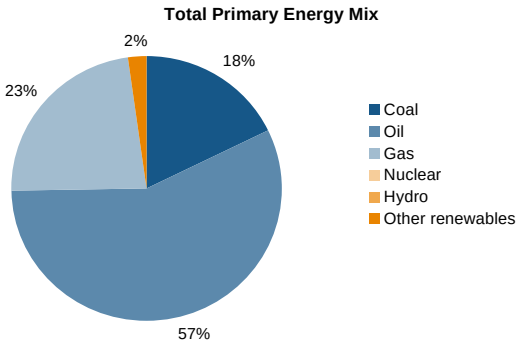
Not available

Ireland

SECTION A: key indicators

Population (mn)	4.1	CO_2/GDP	0.31
GDP ($bn)	179	CO_2/capita	10.55
GDP/capita (US$)	43,414	TPES/GDP (toe per thousand 2000 US$ PPP)	0.11





Ireland has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.9**	**2nd**	**C: Equity**	**7.2**	**3rd**
A1: Institutions and regulations	9.1	2nd	C1: Education	5.5	3rd
A2: Goods and factors markets	8.6	1st	C2: Health and safety	7.7	2nd
B: Economy	**5.8**	**3rd**	C3: Equity	8.6	3rd
B1: Macro-economy	6.7	1st	**D: Environment**	**7.5**	**3rd**
B2: Innovation	4.1	3rd	D1: Climate change	8.1	2nd
B3: Energy markets	7.7	1st	D2: Environmental factors	6.8	3rd
B4: Infrastructure	6.8	4th			
B5: Energy security	5.7	3rd	**Assessment Index**	**7.4**	**2nd**

Note: Division is by cluster

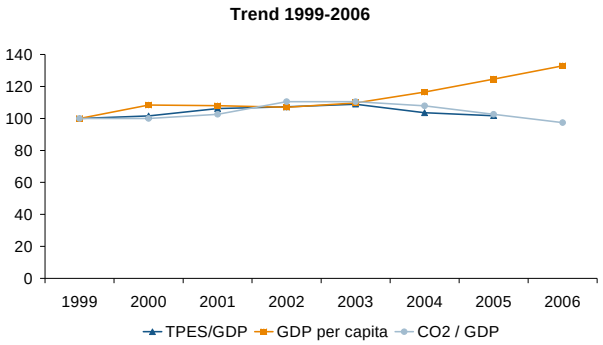
SECTION C: policy examples

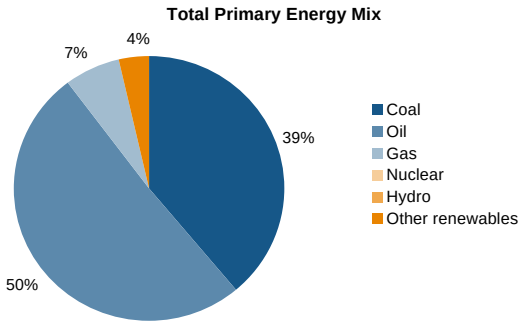
Not available

Israel

SECTION A: key indicators

Population (mn)	6.9	CO_2/GDP	0.38
GDP ($bn)	188	CO_2/capita	8.65
GDP/capita (US$)	27,147	TPES/GDP (toe per thousand 2000 US$ PPP)	0.12





Israel has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**7.0**	**3rd**	**C: Equity**	**6.8**	**4th**
A1: Institutions and regulations	6.7	3rd	C1: Education	5.2	4th
A2: Goods and factors markets	7.2	3rd	C2: Health and safety	7.5	3rd
B: Economy	**5.9**	**2nd**	C3: Equity	7.6	4th
B1: Macro-economy	4.8	4th	**D: Environment**	**6.6**	**4th**
B2: Innovation	6.4	1st	D1: Climate change	7.5	4th
B3: Energy markets	7.8	1st	D2: Environmental factors	5.6	4th
B4: Infrastructure	7.7	3rd			
B5: Energy security	4.7	4th	**Assessment Index**	**6.6**	**4th**

Note: Division is by cluster

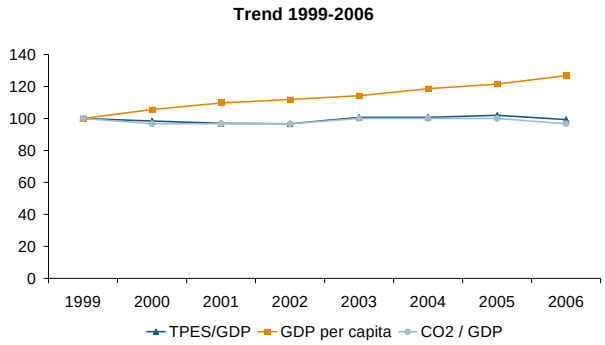
SECTION C: policy examples

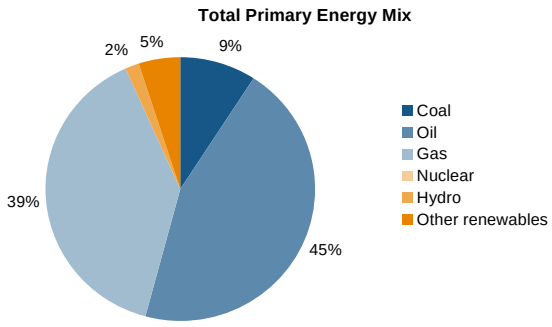
Not available

Italy

SECTION A: key indicators

Population (mn)	58.1	CO_2/GDP	0.30
GDP ($bn)	1,764	CO_2/capita	7.76
GDP/capita (US$)	30,365	TPES/GDP (toe per thousand 2000 US$ PPP)	0.12





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**5.4**	**3rd**	**C: Equity**	**7.3**	**3rd**
A1: Institutions and regulations	4.8	4th	C1: Education	5.8	3rd
A2: Goods and factors markets	4.2	3rd	C2: Health and safety	7.7	2nd
B: Economy	**7.3**	**2nd**	C3: Equity	8.3	4th
B1: Macro-economy	7.4	4th	**D: Environment**	**7.6**	**2nd**
B2: Innovation	5.4	3rd	D1: Climate change	8.2	2nd
B3: Energy markets	7.3	3rd	D2: Environmental factors	7.1	3rd
B4: Infrastructure	5.8	3rd			
B5: Energy security	7.7	2nd	**Assessment Index**	**6.3**	**4th**

Note: Division is by cluster

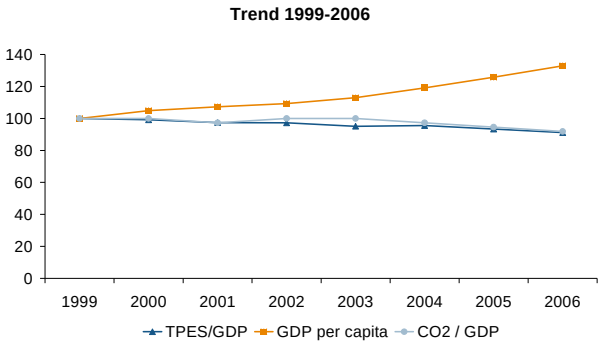
SECTION C: policy examples

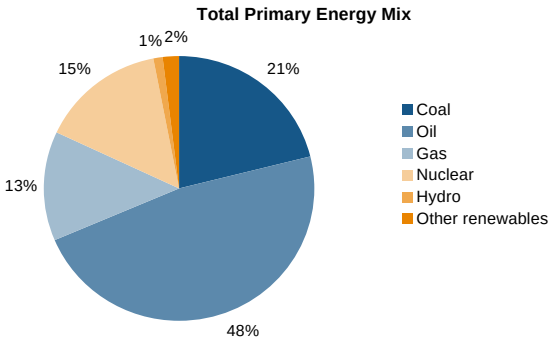
- A “Vulnerable Customer Regime” was introduced by the Energy Authority to standardise the reference price, quality standards and contractual conditions for domestic and small industrial customers after full electricity market liberalisation. Moreover, social subsidies are provided for low-income individuals to ensure fair electricity supply for all.
- Italy aims to increase the efficiency of its power plants to 58% by investing in renewable energy sources and substituting inefficient thermoelectric plants with more efficient types of power plants.
- Legislation was passed (Decree No 79) that sets mandatory targets for the production/import of electricity from renewable sources that producers/importers of non-renewable electricity have to comply with.

Japan

SECTION A: key indicators

Population (mn)	127.8	CO_2/GDP	0.35
GDP ($bn)	3,873	CO_2/capita	9.50
GDP/capita (US$)	30,315	TPES/GDP (toe per thousand 2000 US$ PPP)	0.15





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**7.6**	**2nd**	**C: Equity**	**7.5**	**2nd**
A1: Institutions and regulations	7.7	3rd	C1: Education	5.8	3rd
A2: Goods and factors markets	7.5	2nd	C2: Health and safety	7.9	2nd
B: Economy	**7.4**	**1st**	C3: Equity	8.9	1st
B1: Macro-economy	5.5	2nd	**D: Environment**	**7.6**	**3rd**
B2: Innovation	8.7	1st	D1: Climate change	7.9	3rd
B3: Energy markets	6.9	3rd	D2: Environmental factors	7.3	2nd
B4: Infrastructure	8.8	1st			
B5: Energy security	6.6	2nd	**Assessment Index**	**7.5**	**2nd**

Note: Division is by cluster

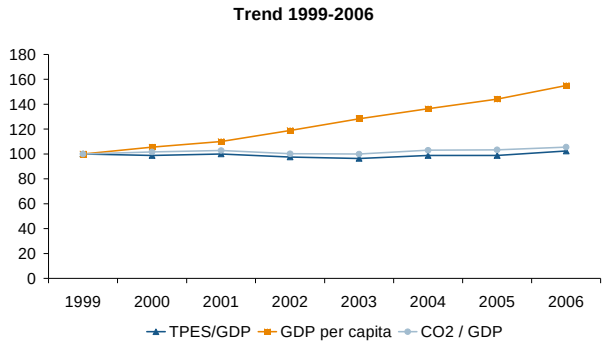
SECTION C: policy examples

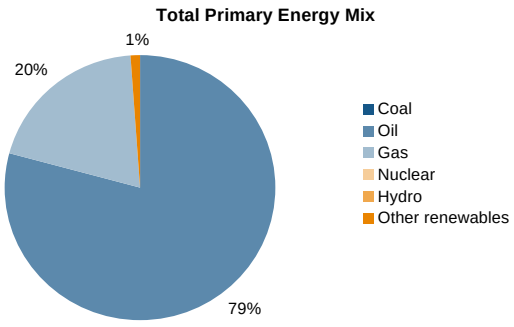
- To promote renewable energy Japan introduced the Act on the Promotion of New Energy Usage and Act on Special Measures concerning New Energy Use by Electric Utilities (RPS Act).
- With regard to energy security some policies were identified: Act on the Promotion of Development and introduction of Alternative Energy, Act on concerning the Rational Use of Energy and Act on Promotion of New Energy Usage.
- Action Plan for Low Carbon Society stipulates to produce 50% or more of Zero Emission Electric Power (such as renewables and nuclear power) in 2020. For transport in 2020, it stipulates to introduce 50% of the new sold cars to be the next generation cars such as hybrid and plug-in hybrid cars, electric vehicles.

Jordan

SECTION A: key indicators

Population (mn)	5.5	CO_2/GDP	0.66
GDP ($bn)	27	CO_2/capita	3.27
GDP/capita (US$)	4,906	TPES/GDP (toe per thousand 2000 US$ PPP)	0.26





Jordan has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**6.0**	**1st**	**C: Equity**	**5.9**	**2nd**
A1: Institutions and regulations	6.1	1st	C1: Education	3.6	3rd
A2: Goods and factors markets	5.9	1st	C2: Health and safety	5.5	3rd
B: Economy	**4.0**	**3rd**	C3: Equity	8.8	1st
B1: Macro-economy	4.0	2nd	**D: Environment**	**6.0**	**3rd**
B2: Innovation	2.5	2nd	D1: Climate change	7.2	3rd
B3: Energy markets	6.4	2nd	D2: Environmental factors	4.7	4th
B4: Infrastructure	5.4	3rd			
B5: Energy security	4.1	4th	**Assessment Index**	**5.5**	**1st**

Note: Division is by cluster

SECTION C: policy examples

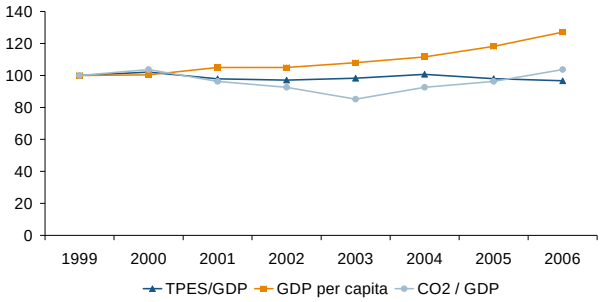
Not available

Kenya

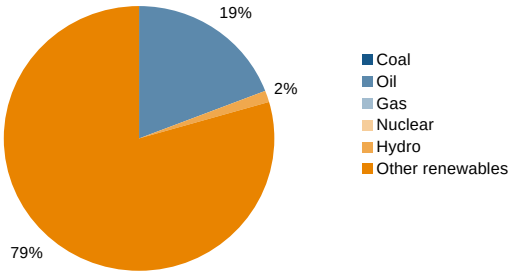
SECTION A: key indicators

Population (mn)	33.4	CO_2/GDP	0.26
GDP ($bn)	45	CO_2/capita	0.29
GDP/capita (US$)	1,337	TPES/GDP (toe per thousand 2000 US$ PPP)	0.46

Trend 1999-2006



Total Primary Energy Mix



Kenya has a minor share, less than 0.5%, of coal in its total primary energy mix.

SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**4.0**	**2nd**	**C: Equity**	**3.4**	**4th**
A1: Institutions and regulations	2.7	3rd	C1: Education	3.2	2nd
A2: Goods and factors markets	5.3	1st	C2: Health and safety	1.9	4th
B: Economy	**3.4**	**3rd**	C3: Equity	5.0	4th
B1: Macro-economy	1.9	4th	**D: Environment**	**8.2**	**1st**
B2: Innovation	1.4	1st	D1: Climate change	8.9	2nd
B3: Energy markets	3.5	4th	D2: Environmental factors	7.4	1st
B4: Infrastructure	3.4	3rd			
B5: Energy security	6.8	1st	**Assessment Index**	**4.7**	**2nd**

Note: Division is by cluster

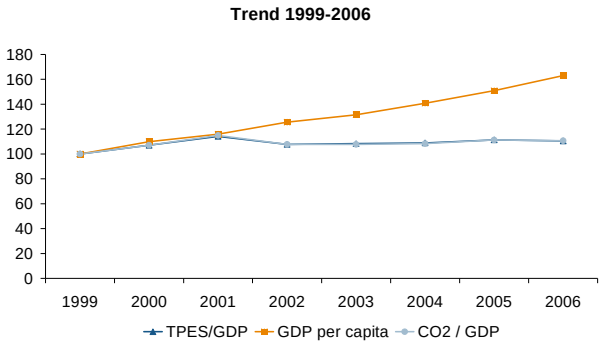
SECTION C: policy examples

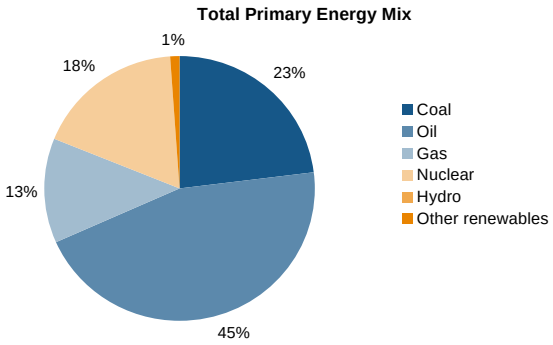
Not available

Korea (Rep.)

SECTION A: key indicators

Population (mn)	48.1	CO_2/GDP	0.47
GDP ($bn)	1,194	CO_2/capita	9.30
GDP/capita (US$)	24,803	TPES/GDP (toe per thousand 2000 US$ PPP)	0.22





Korea (Rep.) has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**6.8**	**3rd**	**C: Equity**	**8.2**	**1st**
A1: Institutions and regulations	6.4	4th	C1: Education	8.8	1st
A2: Goods and factors markets	7.2	3rd	C2: Health and safety	6.8	4th
B: Economy	**7.0**	**1st**	C3: Equity	8.9	1st
B1: Macro-economy	6.0	1st	**D: Environment**	**7.1**	**4th**
B2: Innovation	6.8	1st	D1: Climate change	7.8	3rd
B3: Energy markets	7.1	3rd	D2: Environmental factors	6.4	4th
B4: Infrastructure	8.8	1st			
B5: Energy security	6.4	2nd	**Assessment Index**	**7.3**	**2nd**

Note: Division is by cluster

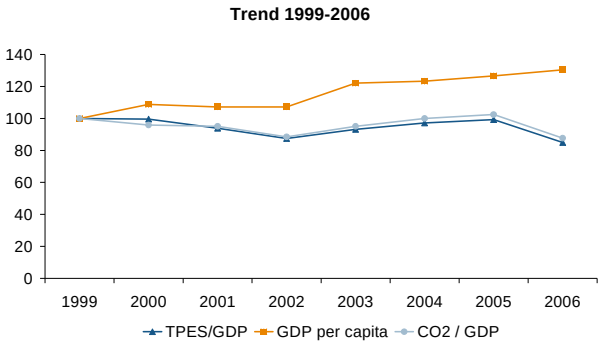
SECTION C: policy examples

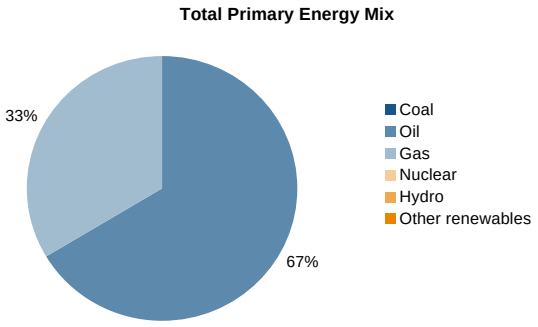
- In order to decrease oil dependency, renewable energy and nuclear power are promoted by the government (renewables are currently promoted through a feed in tariff policy, though in the future (by 2012), RPS (Renewable Portfolio Standard) system will be introduced.)
- Key policies to promote 'low carbon green growth' in the transportation sector are fuel efficiency regulation and Renewable Fuel Standards system.

Kuwait

SECTION A: key indicators

Population (mn)	3.0	CO_2/GDP	1.26
GDP ($bn)	114	CO_2/capita	29.44
GDP/capita (US$)	38,096	TPES/GDP (toe per thousand 2000 US$ PPP)	0.47





SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**6.0**	**4th**	**C: Equity**	**6.7**	**3rd**
A1: Institutions and regulations	5.8	4th	C1: Education	4.3	3rd
A2: Goods and factors markets	6.1	4th	C2: Health and safety	6.3	3rd
B: Economy	**4.0**	**4th**	C3: Equity	9.5	1st
B1: Macro-economy	5.4	4th	**D: Environment**	**3.5**	**4th**
B2: Innovation	1.5	4th	D1: Climate change	4.9	4th
B3: Energy markets	6.2	3rd	D2: Environmental factors	2.2	4th
B4: Infrastructure	5.2	4th			
B5: Energy security	3.8	4th	**Assessment Index**	**5.0**	**4th**

Note: Division is by cluster

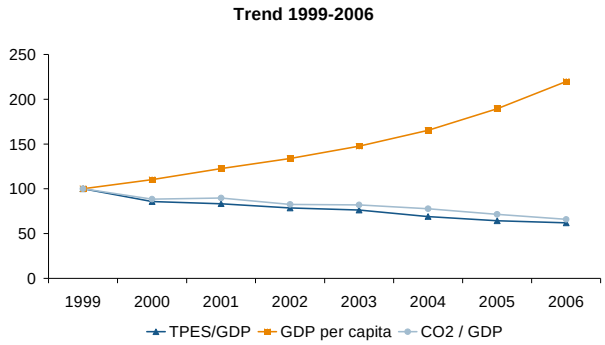
SECTION C: policy examples

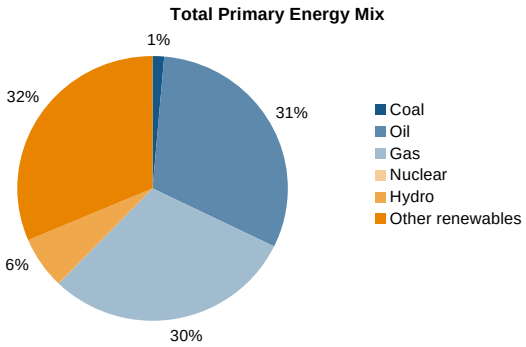
Not available

Latvia

SECTION A: key indicators

Population (mn)	2.3	CO_2/GDP	0.26
GDP ($bn)	40	CO_2/capita	3.19
GDP/capita (US$)	17,488	TPES/GDP (toe per thousand 2000 US$ PPP)	0.17





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**6.3**	**1st**	**C: Equity**	**6.1**	**2nd**
A1: Institutions and regulations	6.0	1st	C1: Education	4.6	2nd
A2: Goods and factors markets	6.5	1st	C2: Health and safety	6.0	1st
B: Economy	**4.0**	**3rd**	C3: Equity	7.7	3rd
B1: Macro-economy	4.0	2nd	**D: Environment**	**8.6**	**1st**
B2: Innovation	2.5	2nd	D1: Climate change	8.9	1st
B3: Energy markets	6.4	2nd	D2: Environmental factors	8.4	1st
B4: Infrastructure	5.4	3rd			
B5: Energy security	4.1	4th	**Assessment Index**	**6.2**	**1st**

Note: Division is by cluster

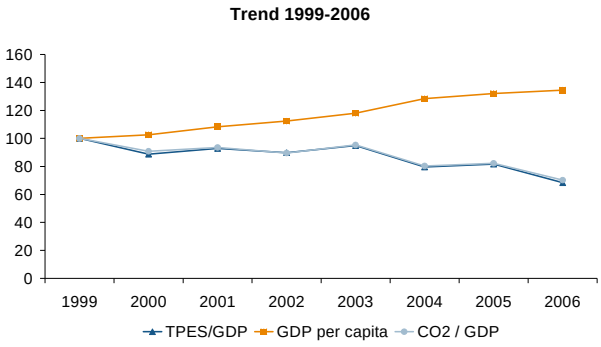
SECTION C: policy examples

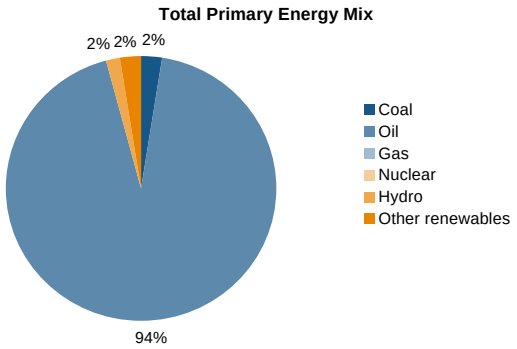
- In conformity with the Directive, an Energy Efficiency (EE) action plan is being worked out in Latvia for the years 2008-2010. According to this planning document the EE development is calculated as the average annual amount of energy in Latvia in a 5-year period against the planned 9% target economy.
- Guidelines for Energy Sector Development 2007-2016. The policy objective with respect to the structure of the consumption of primary energy resources is to maintain the local renewable energy at the level of 36-37% (2020-2025).

Lebanon

SECTION A: key indicators

Population (mn)	3.7	CO_2/GDP	0.89
GDP ($bn)	38	CO_2/capita	4.42
GDP/capita (US$)	10,499	TPES/GDP (toe per thousand 2000 US$ PPP)	0.31





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**5.0**	**1st**	**C: Equity**	**6.4**	**1st**
A1: Institutions and regulations	2.8	3rd	C1: Education	4.2	3rd
A2: Goods and factors markets	7.1	1st	C2: Health and safety	5.5	2nd
B: Economy	**3.6**	**4th**	C3: Equity	9.5	1st
B1: Macro-economy	3.4	3rd	**D: Environment**	**4.9**	**4th**
B2: Innovation	1.9	3rd	D1: Climate change	5.7	4th
B3: Energy markets	6.0	3rd	D2: Environmental factors	4.1	4th
B4: Infrastructure	5.4	2nd			
B5: Energy security	3.7	4th	**Assessment Index**	**5.0**	**3rd**

Note: Division is by cluster

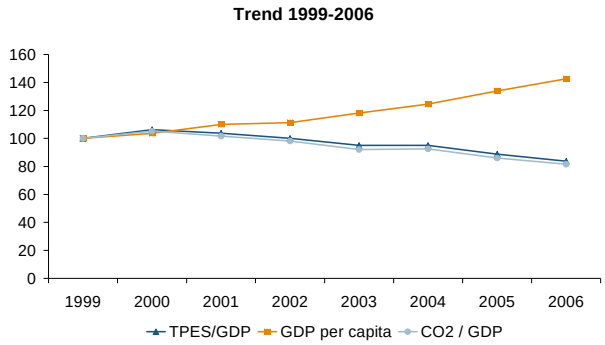
SECTION C: policy examples

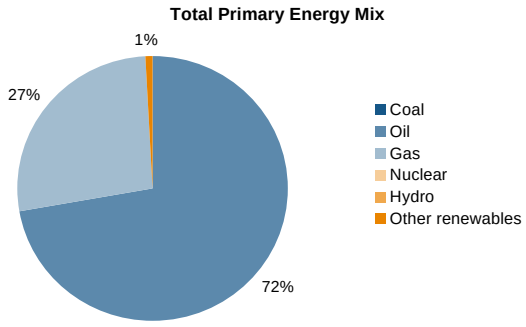
Not available

Libya

SECTION A: key indicators

Population (mn)	5.9	CO_2/GDP	1.10
GDP ($bn)	74	CO_2/capita	7.76
GDP/capita (US$)	12,640	TPES/GDP (toe per thousand 2000 US$ PPP)	0.46





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**0.9**	**4th**	**C: Equity**	**6.7**	**1st**
A1: Institutions and regulations	1.7	4th	C1: Education	4.9	1st
A2: Goods and factors markets	0.1	4th	C2: Health and safety	5.6	2nd
B: Economy	**4.2**	**3rd**	C3: Equity	9.7	1st
B1: Macro-economy	4.6	2nd	**D: Environment**	**3.3**	**4th**
B2: Innovation	3.0	1st	D1: Climate change	6.5	4th
B3: Energy markets	3.8	4th	D2: Environmental factors	0.0	4th
B4: Infrastructure	3.5	4th			
B5: Energy security	5.6	3rd	**Assessment Index**	**3.8**	**4th**

Note: Division is by cluster

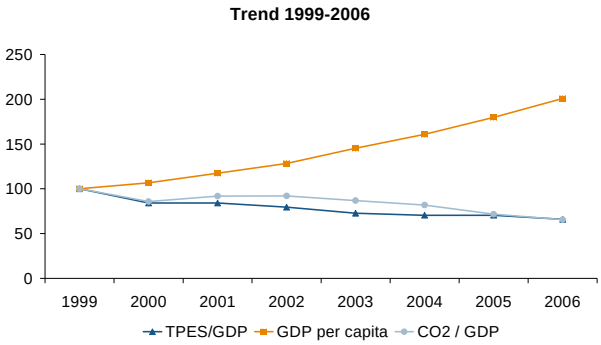
SECTION C: policy examples

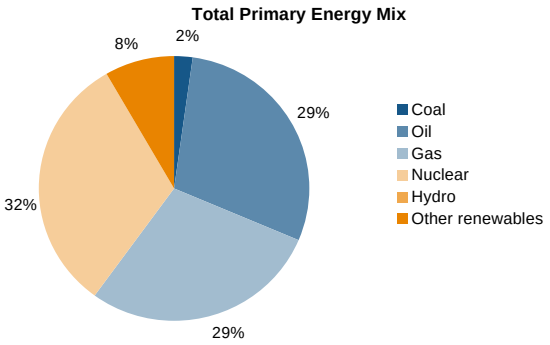
Not available

Lithuania

SECTION A: key indicators

Population (mn)	3.4	CO_2/GDP	0.30
GDP ($bn)	61	CO_2/capita	3.92
GDP/capita (US$)	17,733	TPES/GDP (toe per thousand 2000 US$ PPP)	0.20





Lithuania has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**5.9**	**1st**	**C: Equity**	**6.4**	**1st**
A1: Institutions and regulations	5.7	1st	C1: Education	5.0	1st
A2: Goods and factors markets	6.0	1st	C2: Health and safety	6.1	1st
B: Economy	**5.7**	**1st**	C3: Equity	8.2	2nd
B1: Macro-economy	5.5	1st	**D: Environment**	**8.3**	**1st**
B2: Innovation	3.5	1st	D1: Climate change	8.9	1st
B3: Energy markets	6.9	2nd	D2: Environmental factors	7.7	1st
B4: Infrastructure	7.4	1st			
B5: Energy security	6.3	2nd	**Assessment Index**	**6.6**	**1st**

Note: Division is by cluster

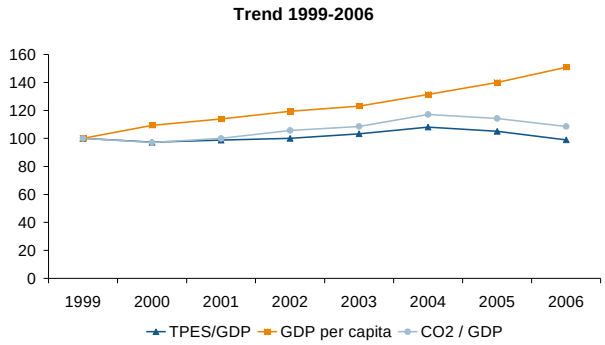
SECTION C: policy examples

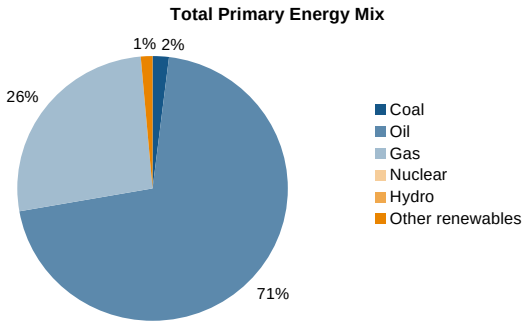
Not available

Luxembourg

SECTION A: key indicators

Population (mn)	0.5	CO_2/GDP	0.44
GDP ($bn)	37	CO_2/capita	24.83
GDP/capita (US$)	80,457	TPES/GDP (toe per thousand 2000 US$ PPP)	0.18





Luxembourg has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.3**	**2nd**	**C: Equity**	**8.6**	**1st**
A1: Institutions and regulations	9.2	2nd	C1: Education	7.5	1st
A2: Goods and factors markets	7.5	2nd	C2: Health and safety	9.1	1st
B: Economy	**5.3**	**4th**	C3: Equity	9.2	1st
B1: Macro-economy	6.0	1st	**D: Environment**	**6.8**	**4th**
B2: Innovation	2.6	4th	D1: Climate change	6.8	4th
B3: Energy markets	9.4	1st	D2: Environmental factors	6.7	3rd
B4: Infrastructure	8.6	2nd			
B5: Energy security	4.1	4th	**Assessment Index**	**7.2**	**3rd**

Note: Division is by cluster

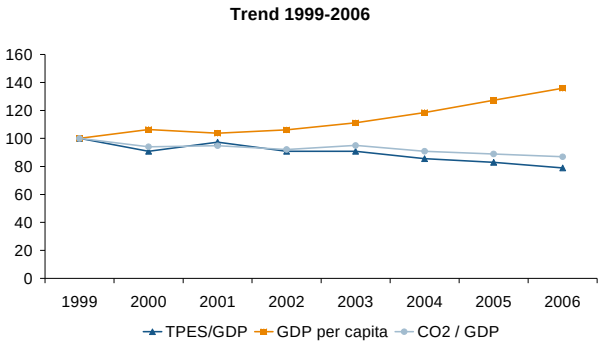
SECTION C: policy examples

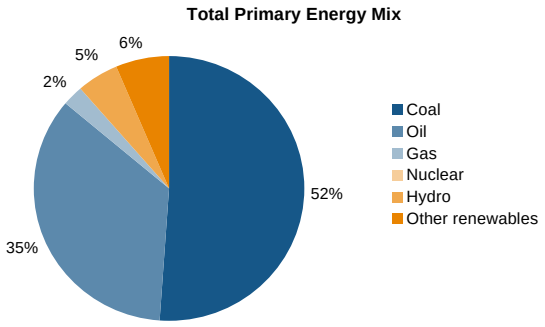
Not available

Macedonia (Rep.)

SECTION A: key indicators

Population (mn)	2.0	CO_2/GDP	0.64
GDP ($bn)	16	CO_2/capita	4.07
GDP/capita (US$)	7,899	TPES/GDP (toe per thousand 2000 US$ PPP)	0.21





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**3.5**	**3rd**	**C: Equity**	**5.0**	**4th**
A1: Institutions and regulations	3.1	3rd	C1: Education	3.5	3rd
A2: Goods and factors markets	3.9	4th	C2: Health and safety	5.8	2nd
B: Economy	**3.4**	**4th**	C3: Equity	5.8	4th
B1: Macro-economy	3.8	3rd	**D: Environment**	**6.1**	**4th**
B2: Innovation	0.5	4th	D1: Climate change	7.5	3rd
B3: Energy markets	7.1	1st	D2: Environmental factors	4.7	3rd
B4: Infrastructure	2.0	4th			
B5: Energy security	7.5	1st	**Assessment Index**	**4.5**	**4th**

Note: Division is by cluster

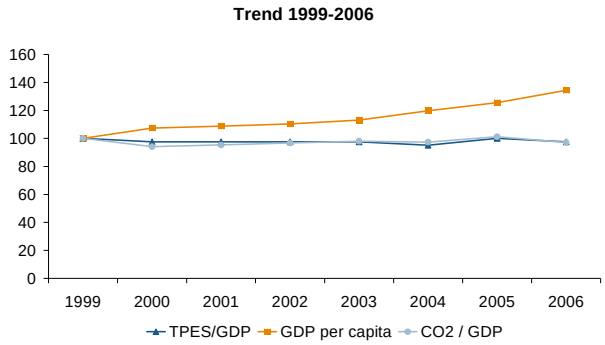
SECTION C: policy examples

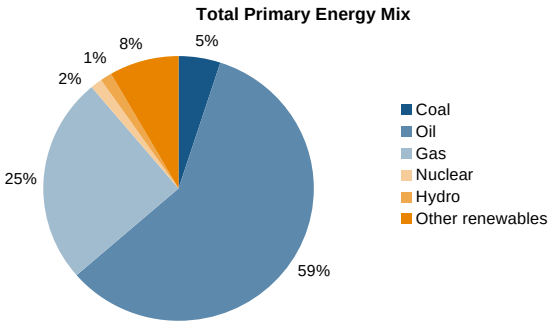
Not available

Mexico

SECTION A: key indicators

Population (mn)	103.1	CO_2/GDP	0.40
GDP ($bn)	1,387	CO_2/capita	3.70
GDP/capita (US$)	13,457	TPES/GDP (toe per thousand 2000 US$ PPP)	0.18





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.0**	**3rd**	**C: Equity**	**5.9**	**2nd**
A1: Institutions and regulations	3.7	3rd	C1: Education	4.7	1st
A2: Goods and factors markets	4.3	3rd	C2: Health and safety	5.9	1st
B: Economy	**3.9**	**3rd**	C3: Equity	7.2	3rd
B1: Macro-economy	3.7	3rd	**D: Environment**	**7.3**	**2nd**
B2: Innovation	2.0	2nd	D1: Climate change	8.1	2nd
B3: Energy markets	7.8	1st	D2: Environmental factors	6.6	1st
B4: Infrastructure	4.1	3rd			
B5: Energy security	5.8	3rd	**Assessment Index**	**5.3**	**2nd**

Note: Division is by cluster

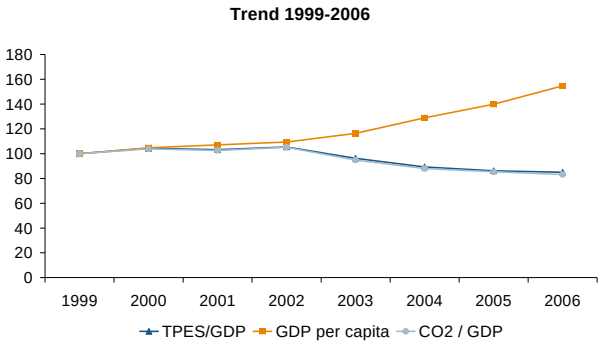
SECTION C: policy examples

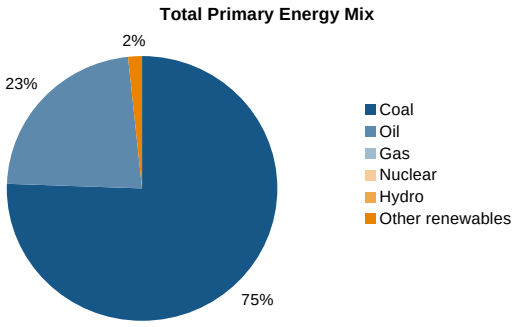
- Energy Sector Program and the Renewable Energy Act establish renewable energy share of national power generation to be at least 26% by 2012
- The main drivers considered for biofuels within the Mexican policy and regulations are: energy security; rural development; and reduction of the of green house gases emission. The Law enacted in 2008 on biofuels (ley de Promoción y Desarrollo de Bioenergeticos) obliges PEMEX to have 2% ethanol in gasoline by 2012 to replace MTBE.
- In October 2007, Congress passed a law where 0.65% of the production (by PEMEX) value of oil and gas are to be dedicated to fund not only oil and gas but also sustainability R&D programs.

Mongolia

SECTION A: key indicators

Population (mn)	2.6	CO_2/GDP	2.01
GDP ($bn)	8	CO_2/capita	3.44
GDP/capita (US$)	3,222	TPES/GDP (toe per thousand 2000 US$ PPP)	0.53





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**3.2**	**4th**	**C: Equity**	**5.2**	**1st**
A1: Institutions and regulations	2.3	4th	C1: Education	3.6	1st
A2: Goods and factors markets	4.2	2nd	C2: Health and safety	4.3	2nd
B: Economy	**3.6**	**2nd**	C3: Equity	7.6	1st
B1: Macro-economy	4.4	2nd	**D: Environment**	**6.3**	**4th**
B2: Innovation	0.4	4th	D1: Climate change	5.6	4th
B3: Energy markets	2.9	4th	D2: Environmental factors	7.0	1st
B4: Infrastructure	2.9	3rd			
B5: Energy security	6.7	2nd	**Assessment Index**	**4.6**	**3rd**

Note: Division is by cluster

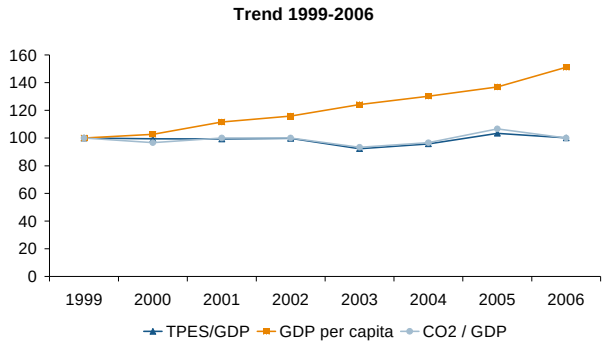
SECTION C: policy examples

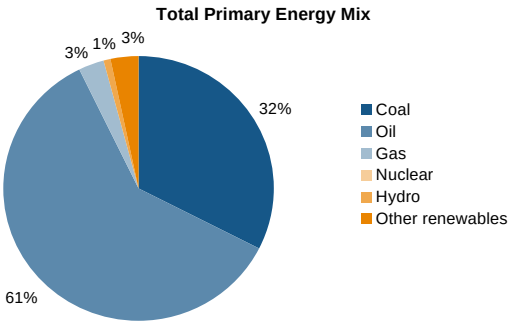
Not available

Morocco

SECTION A: key indicators

Population (mn)	30.1	CO_2/GDP	0.34
GDP ($bn)	103	CO_2/capita	1.37
GDP/capita (US$)	3,409	TPES/GDP (toe per thousand 2000 US$ PPP)	0.11





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**4.1**	**1st**	**C: Equity**	**4.9**	**2nd**
A1: Institutions and regulations	3.7	2nd	C1: Education	2.7	2nd
A2: Goods and factors markets	4.5	2nd	C2: Health and safety	4.8	1st
B: Economy	**3.8**	**1st**	C3: Equity	7.1	2nd
B1: Macro-economy	5.2	1st	**D: Environment**	**6.7**	**3rd**
B2: Innovation	1.3	1st	D1: Climate change	8.0	4th
B3: Energy markets	7.9	1st	D2: Environmental factors	5.4	3rd
B4: Infrastructure	3.7	2nd			
B5: Energy security	4.8	4th	**Assessment Index**	**4.9**	**2nd**

Note: Division is by cluster

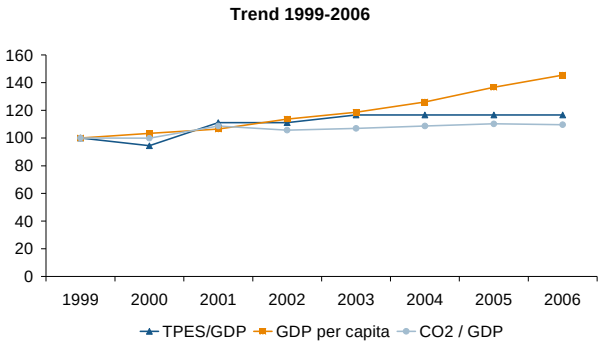
SECTION C: policy examples

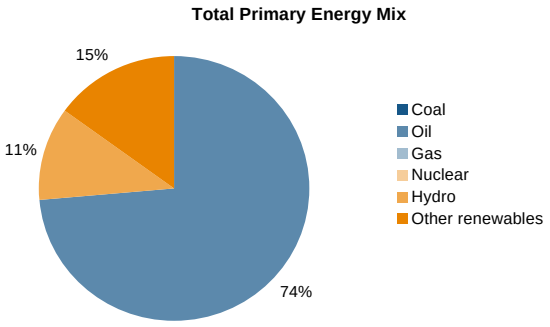
Not available

Namibia

SECTION A: key indicators

Population (mn)	2.0	CO_2/GDP	0.20
GDP ($bn)	6	CO_2/capita	1.36
GDP/capita (US$)	2,994	TPES/GDP (toe per thousand 2000 US$ PPP)	0.10





Namibia has a minor share, less than 0.5%, of coal in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.9**	**2nd**	**C: Equity**	**2.6**	**4th**
A1: Institutions and regulations	5.7	1st	C1: Education	1.4	4th
A2: Goods and factors markets	4.1	3rd	C2: Health and safety	2.9	4th
B: Economy	**4.1**	**3rd**	C3: Equity	3.5	4th
B1: Macro-economy	4.2	2nd	**D: Environment**	**7.6**	**1st**
B2: Innovation	1.0	4th	D1: Climate change	9.6	1st
B3: Energy markets	6.0	3rd	D2: Environmental factors	5.7	3rd
B4: Infrastructure	5.0	3rd			
B5: Energy security	6.1	2nd	**Assessment Index**	**4.8**	**3rd**

Note: Division is by cluster

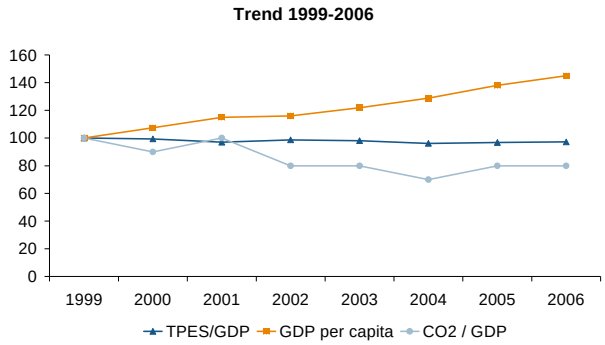
SECTION C: policy examples

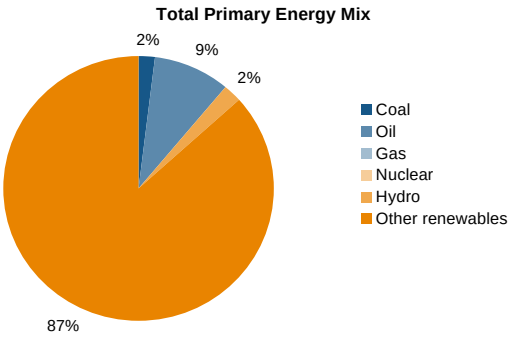
- To encourage a move towards more sustainable use of its natural resources, Namibia commissioned a white paper on energy policy detailing energy efficiency and conservation measures and other fuel saving measures, including the use of clearer fuels in transportation.
- Namibia seeks to diversify its energy sources and achieve energy security by encouraging the use of solar water heaters and replacing existing electricity geysers with solar-powered ones.
- Namibia is promoting solar and hydroelectric power in a bid to increase energy efficiency.

Nepal

SECTION A: key indicators

Population (mn)	23.4	CO_2/GDP	0.08
GDP ($bn)	26	CO_2/capita	0.11
GDP/capita (US$)	1,113	TPES/GDP (toe per thousand 2000 US$ PPP)	0.25





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**2.6**	**4th**	**C: Equity**	**3.6**	**3rd**
A1: Institutions and regulations	1.8	4th	C1: Education	1.5	4th
A2: Goods and factors markets	3.3	4th	C2: Health and safety	3.5	3rd
B: Economy	**3.3**	**3rd**	C3: Equity	5.7	3rd
B1: Macro-economy	4.8	1st	**D: Environment**	**7.9**	**1st**
B2: Innovation	0.7	3rd	D1: Climate change	9.7	1st
B3: Energy markets	5.2	3rd	D2: Environmental factors	6.0	2nd
B4: Infrastructure	1.8	4th			
B5: Energy security	5.8	3rd	**Assessment Index**	**4.3**	**3rd**

Note: Division is by cluster

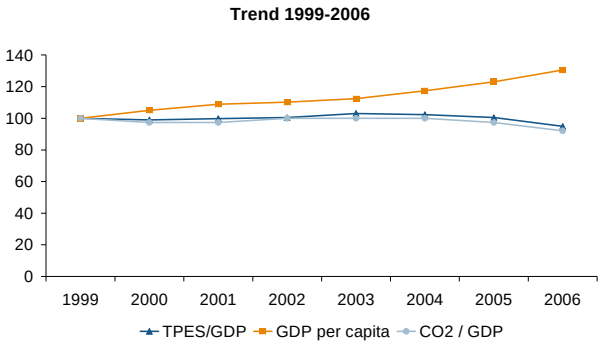
SECTION C: policy examples

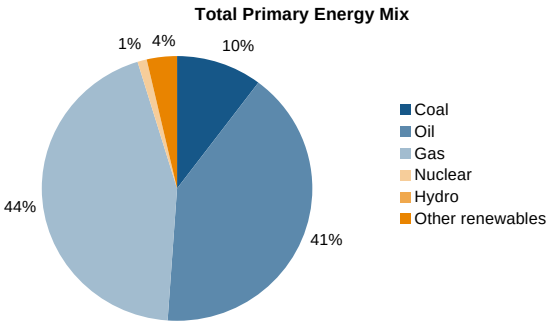
Not available

Netherlands

SECTION A: key indicators

Population (mn)	16.3	CO_2/GDP	0.38
GDP ($bn)	636	CO_2/capita	11.21
GDP/capita (US$)	38,995	TPES/GDP (toe per thousand 2000 US$ PPP)	0.17





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.9**	**1st**	**C: Equity**	**7.7**	**1st**
A1: Institutions and regulations	9.3	1st	C1: Education	6.4	2nd
A2: Goods and factors markets	8.5	1st	C2: Health and safety	8.0	2nd
B: Economy	**6.3**	**2nd**	C3: Equity	8.8	1st
B1: Macro-economy	5.1	3rd	**D: Environment**	**6.2**	**4th**
B2: Innovation	5.6	2nd	D1: Climate change	7.6	3rd
B3: Energy markets	7.3	2nd	D2: Environmental factors	4.9	4th
B4: Infrastructure	8.7	2nd			
B5: Energy security	5.9	2nd	**Assessment Index**	**7.3**	**2nd**

Note: Division is by cluster

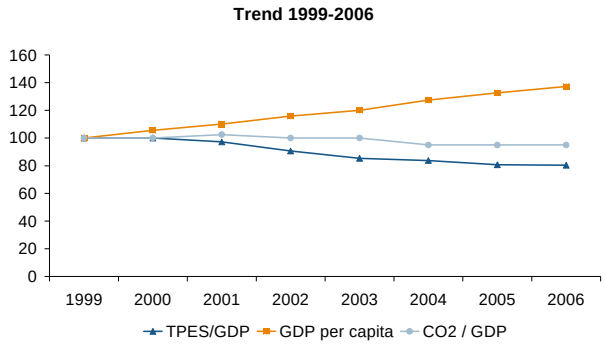
SECTION C: policy examples

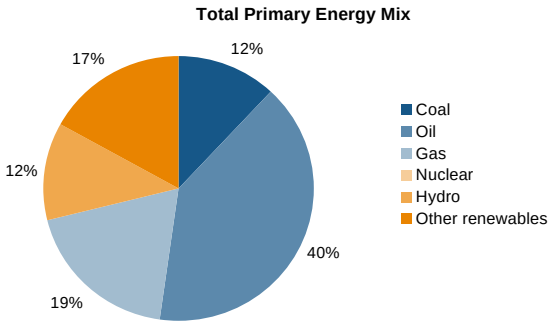
Not available

New Zealand

SECTION A: key indicators

Population (mn)	4.1	CO_2/GDP	0.37
GDP ($bn)	105	CO_2/capita	8.51
GDP/capita (US$)	25,364	TPES/GDP (toe per thousand 2000 US$ PPP)	0.18





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**9.2**	**1st**	**C: Equity**	**7.4**	**2nd**
A1: Institutions and regulations	9.5	1st	C1: Education	6.5	1st
A2: Goods and factors markets	8.9	1st	C2: Health and safety	7.5	3rd
B: Economy	**6.0**	**2nd**	C3: Equity	8.3	4th
B1: Macro-economy	5.5	2nd	**D: Environment**	**8.7**	**1st**
B2: Innovation	4.0	3rd	D1: Climate change	8.3	1st
B3: Energy markets	7.6	2nd	D2: Environmental factors	9.0	1st
B4: Infrastructure	7.7	3rd			
B5: Energy security	6.9	1st	**Assessment Index**	**7.8**	**1st**

Note: Division is by cluster

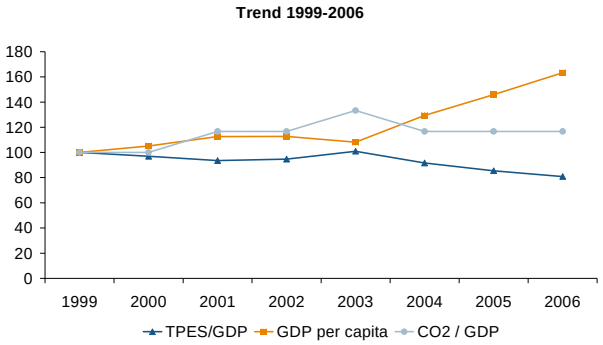
SECTION C: policy examples

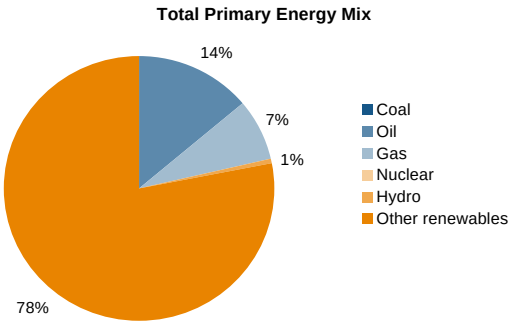
Not available

Nigeria

SECTION A: key indicators

Population (mn)	136.3	CO_2/GDP	0.42
GDP ($bn)	218	CO_2/capita	0.42
GDP/capita (US$)	1,598	TPES/GDP (toe per thousand 2000 US$ PPP)	0.79





Nigeria has a minor share, less than 0.5%, of coal in its total primary energy mix.

SECTION B: Assessment index results Cluster 2

	Value	Division		Value	Division
A: Institutions	**3.9**	**1st**	**C: Equity**	**2.7**	**3rd**
A1: Institutions and regulations	2.3	1st	C1: Education	1.6	2nd
A2: Goods and factors markets	5.5	1st	C2: Health and safety	0.8	3rd
B: Economy	**2.9**	**3rd**	C3: Equity	5.6	3rd
B1: Macro-economy	3.6	2nd	**D: Environment**	**7.1**	**3rd**
B2: Innovation	0.7	2nd	D1: Climate change	8.9	2nd
B3: Energy markets	2.7	4th	D2: Environmental factors	5.4	3rd
B4: Infrastructure	1.3	4th			
B5: Energy security	5.9	2nd	**Assessment Index**	**4.1**	**2nd**

Note: Division is by cluster

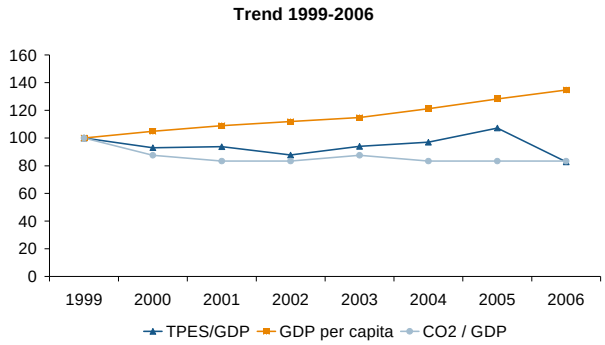
SECTION C: policy examples

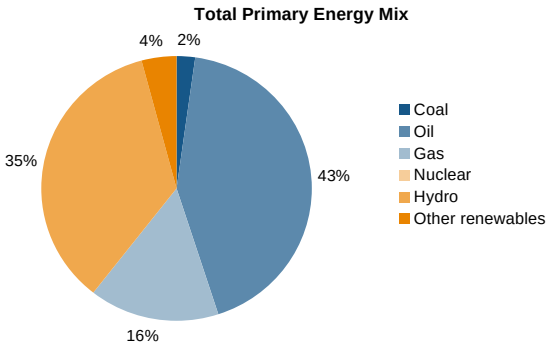
- The Electric Power Sector Reform Act was introduced in 2005 and has led to considerable reforms in the sector including the unbundling of the National Electric Power Authority (NEPA), and the establishment of National Independent Power Projects (NIPP) and licenses given to some Independent Power Projects (IPP).
- There is currently a bill for an Act sent to the National Assembly to establish the Climate Change Commission which when enacted, will empower the Commission to monitor and enforce the procedures and policies.
- One of the main policy strategies to address climate change is to encourage a shift towards more energy-efficient transportation systems through policies such as strengthening the relevant government agencies for effective enforcement and monitoring of motor vehicles in relation to pollution abatement; developing a modern urban transportation plan to phase out environmentally unfriendly motorcycles; and introducing fuel efficiency labelling program in the transportation sector for various vehicle types.

Norway

SECTION A: key indicators

Population (mn)	4.6	CO_2/GDP	0.20
GDP ($bn)	231	CO_2/capita	7.91
GDP/capita (US$)	50,235	TPES/GDP (toe per thousand 2000 US$ PPP)	0.18





SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**8.6**	**2nd**	**C: Equity**	**7.4**	**2nd**
A1: Institutions and regulations	9.0	2nd	C1: Education	4.8	2nd
A2: Goods and factors markets	8.1	2nd	C2: Health and safety	8.6	1st
B: Economy	**6.3**	**2nd**	C3: Equity	8.8	3rd
B1: Macro-economy	6.1	1st	**D: Environment**	**9.0**	**1st**
B2: Innovation	5.5	2nd	D1: Climate change	9.2	1st
B3: Energy markets	6.8	1st	D2: Environmental factors	8.8	1st
B4: Infrastructure	7.5	3rd			
B5: Energy security	6.3	2nd	**Assessment Index**	**7.8**	**2nd**

Note: Division is by cluster

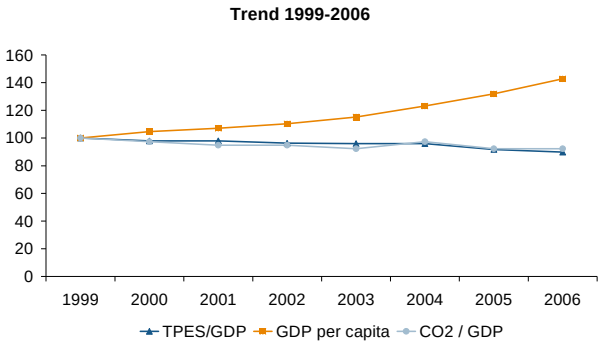
SECTION C: policy examples

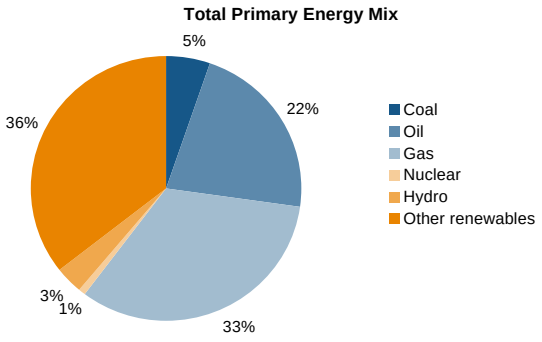
Not available

Pakistan

SECTION A: key indicators

Population (mn)	152.5	CO_2/GDP	0.36
GDP ($bn)	396	CO_2/capita	0.76
GDP/capita (US$)	2,594	TPES/GDP (toe per thousand 2000 US$ PPP)	0.23





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**3.5**	**3rd**	**C: Equity**	**4.0**	**2nd**
A1: Institutions and regulations	2.7	3rd	C1: Education	1.9	3rd
A2: Goods and factors markets	4.3	2nd	C2: Health and safety	3.0	3rd
B: Economy	**4.0**	**1st**	C3: Equity	7.0	2nd
B1: Macro-economy	3.1	4th	**D: Environment**	**5.3**	**4th**
B2: Innovation	0.6	3rd	D1: Climate change	7.8	4th
B3: Energy markets	6.7	2nd	D2: Environmental factors	2.8	4th
B4: Infrastructure	4.5	1st			
B5: Energy security	7.8	1st	**Assessment Index**	**4.2**	**4th**

Note: Division is by cluster

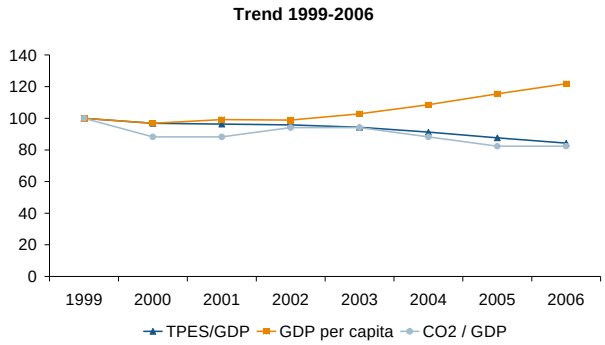
SECTION C: policy examples

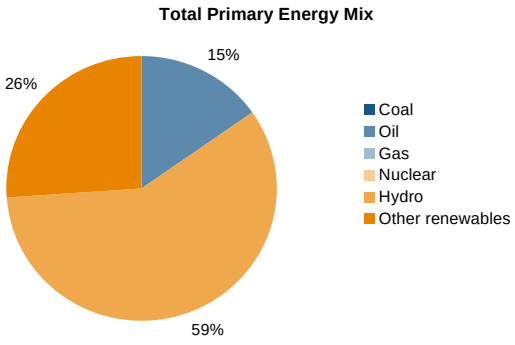
Not available

Paraguay

SECTION A: key indicators

Population (mn)	5.8	CO_2/GDP	0.42
GDP ($bn)	20	CO_2/capita	3.42
GDP/capita (US$)	3,403	TPES/GDP (toe per thousand 2000 US$ PPP)	0.15





SECTION B: Assessment index results Cluster 2

	Value	Division		Value	Division
A: Institutions	**2.2**	**3rd**	**C: Equity**	**4.7**	**1st**
A1: Institutions and regulations	1.2	3rd	C1: Education	2.4	2nd
A2: Goods and factors markets	3.1	2nd	C2: Health and safety	5.4	1st
B: Economy	**2.9**	**3rd**	C3: Equity	6.4	2nd
B1: Macro-economy	2.1	3rd	**D: Environment**	**7.2**	**2nd**
B2: Innovation	0.8	1st	D1: Climate change	9.0	2nd
B3: Energy markets	6.8	1st	D2: Environmental factors	5.4	2nd
B4: Infrastructure	4.7	1st			
B5: Energy security	4.0	4th	**Assessment Index**	**4.3**	**1st**

Note: Division is by cluster

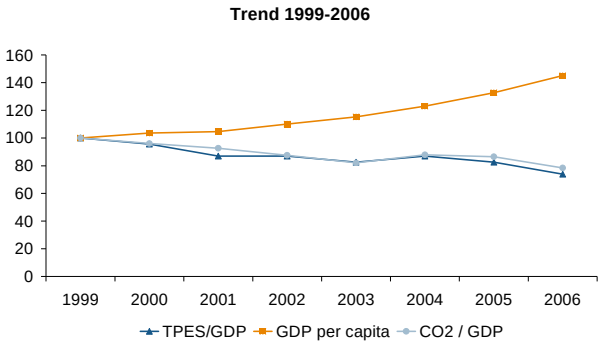
SECTION C: policy examples

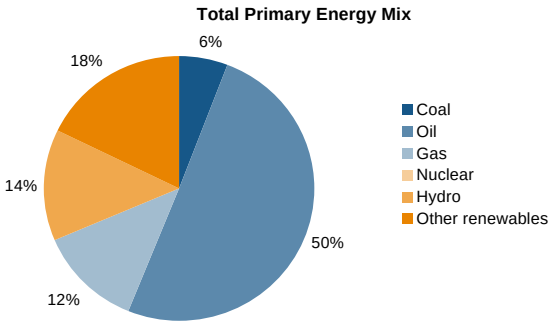
Not available

Peru

SECTION A: key indicators

Population (mn)	27.2	CO_2/GDP	0.17
GDP ($bn)	193	CO_2/capita	1.01
GDP/capita (US$)	7,094	TPES/GDP (toe per thousand 2000 US$ PPP)	0.19





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**3.8**	**3rd**	**C: Equity**	**5.4**	**3rd**
A1: Institutions and regulations	3.4	3rd	C1: Education	4.3	2nd
A2: Goods and factors markets	4.3	3rd	C2: Health and safety	5.2	3rd
B: Economy	**3.8**	**4th**	C3: Equity	6.8	3rd
B1: Macro-economy	3.9	3rd	**D: Environment**	**7.7**	**1st**
B2: Innovation	1.0	4th	D1: Climate change	9.2	1st
B3: Energy markets	5.8	3rd	D2: Environmental factors	6.3	2nd
B4: Infrastructure	4.5	3rd			
B5: Energy security	5.8	3rd	**Assessment Index**	**5.2**	**3rd**

Note: Division is by cluster

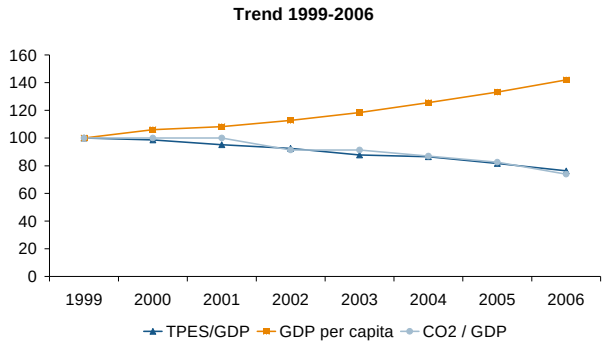
SECTION C: policy examples

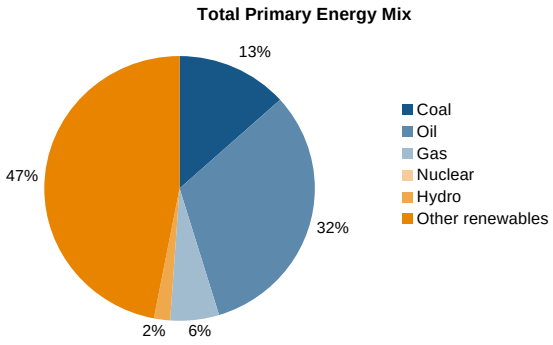
- Peru seeks to improve power access in rural areas through the Rural Electrification Mayor Law (Law No28749 and DS No025-2007).
- Peru seeks to encourage the development and use of alternative energy sources in its markets by passing various laws such as Commission to Develop the Geothermal Potential (RM No191-2007) and Bylaw of the Law for the Promotion of the Use of Renewable Energy (DS No050-2008).
- Peru aims to diversify its energy sources. The target is for renewable energies to provide 5% of all energy consumed in 5 years times (DL No1002 and DS No050-2008).

Philippines

SECTION A: key indicators

Population (mn)	85.3	CO_2/GDP	0.17
GDP ($bn)	288	CO_2/capita	0.77
GDP/capita (US$)	3,383	TPES/GDP (toe per thousand 2000 US$ PPP)	0.11





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**3.7**	**2nd**	**C: Equity**	**5.5**	**1st**
A1: Institutions and regulations	3.3	2nd	C1: Education	3.9	1st
A2: Goods and factors markets	4.1	3rd	C2: Health and safety	5.1	1st
B: Economy	**3.6**	**2nd**	C3: Equity	7.5	1st
B1: Macro-economy	3.2	2nd	**D: Environment**	**7.6**	**2nd**
B2: Innovation	0.9	2nd	D1: Climate change	9.0	2nd
B3: Energy markets	8.1	1st	D2: Environmental factors	6.3	2nd
B4: Infrastructure	4.2	2nd			
B5: Energy security	6.2	2nd	**Assessment Index**	**5.1**	**1st**

Note: Division is by cluster

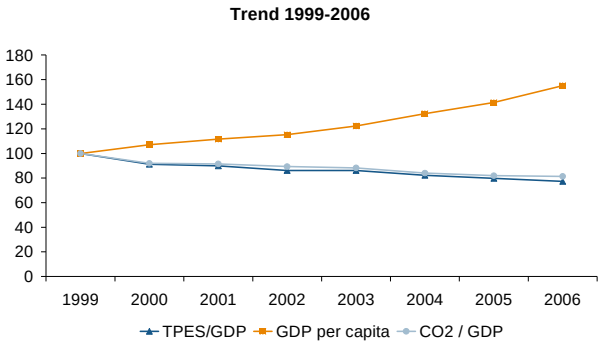
SECTION C: policy examples

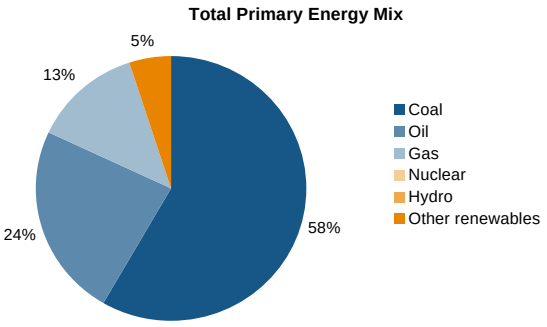
Not available

Poland

SECTION A: key indicators

Population (mn)	38.2	CO_2/GDP	0.62
GDP ($bn)	623	CO_2/capita	7.75
GDP/capita (US$)	16,316	TPES/GDP (toe per thousand 2000 US$ PPP)	0.20





Poland has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.9**	**2nd**	**C: Equity**	**6.1**	**1st**
A1: Institutions and regulations	4.5	2nd	C1: Education	4.6	2nd
A2: Goods and factors markets	5.2	2nd	C2: Health and safety	6.4	1st
B: Economy	**5.1**	**1st**	C3: Equity	7.5	3rd
B1: Macro-economy	4.9	2nd	**D: Environment**	**7.2**	**2nd**
B2: Innovation	2.5	1st	D1: Climate change	7.3	3rd
B3: Energy markets	6.9	2nd	D2: Environmental factors	7.1	1st
B4: Infrastructure	5.9	2nd			
B5: Energy security	6.9	2nd	**Assessment Index**	**5.8**	**1st**

Note: Division is by cluster

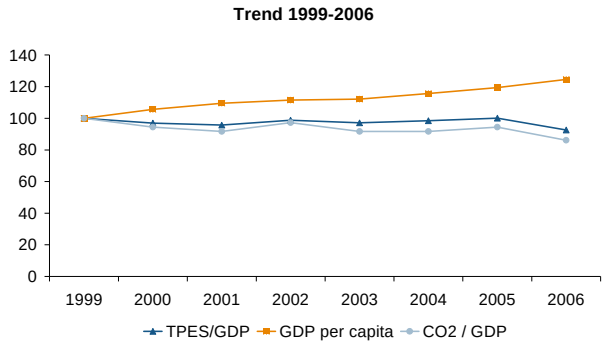
SECTION C: policy examples

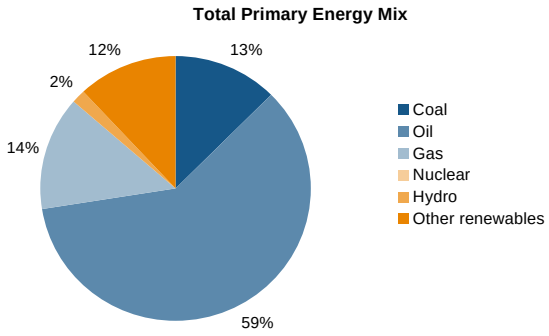
- Poland seeks to limit CO_2 emissions by investing in new and efficient coal generating plants and nuclear power stations. For example, the construction of two new CCS installations at Belchatow and Kedzierzyn-Kozle.
- Poland has a long term policy to develop its energy industry. This will increase its energy security by diversifying its energy supply, improve energy efficiency and reduce the impact of energy consumption on the environment.

Portugal

SECTION A: key indicators

Population (mn)	10.6	CO_2/GDP	0.32
GDP ($bn)	230	CO_2/capita	5.97
GDP/capita (US$)	21,779	TPES/GDP (toe per thousand 2000 US$ PPP)	0.14





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**6.1**	**4th**	**C: Equity**	**7.0**	**3rd**
A1: Institutions and regulations	6.8	3rd	C1: Education	5.5	4th
A2: Goods and factors markets	5.4	4th	C2: Health and safety	7.2	3rd
B: Economy	**5.3**	**4th**	C3: Equity	8.4	3rd
B1: Macro-economy	4.8	4th	**D: Environment**	**8.7**	**1st**
B2: Innovation	2.9	4th	D1: Climate change	8.3	1st
B3: Energy markets	7.4	2nd	D2: Environmental factors	9.0	1st
B4: Infrastructure	7.7	3rd			
B5: Energy security	5.7	3rd	**Assessment Index**	**7.8**	**1st**

Note: Division is by cluster

SECTION C: policy examples

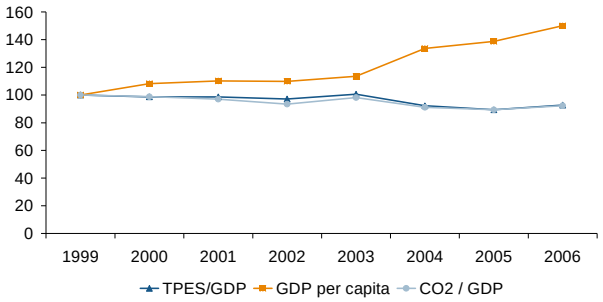
Not available

Qatar

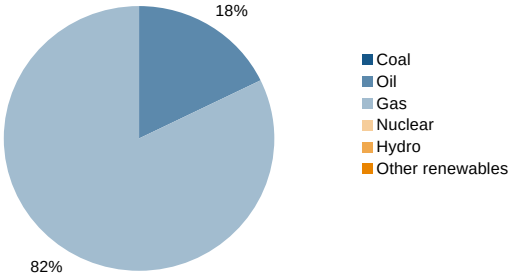
SECTION A: key indicators

Population (mn)	0.8	CO_2/GDP	1.56
GDP ($bn)	64	CO_2/capita	48.32
GDP/capita (US$)	80,870	TPES/GDP (toe per thousand 2000 US$ PPP)	0.71

Trend 1999-2006



Total Primary Energy Mix



Qatar has a minor share, less than 0.5%, of renewables in its total primary energy mix.

SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**6.6**	**3rd**	**C: Equity**	**6.1**	**4th**
A1: Institutions and regulations	6.7	3rd	C1: Education	3.8	3rd
A2: Goods and factors markets	6.6	3rd	C2: Health and safety	5.9	4th
B: Economy	**5.3**	**3rd**	C3: Equity	8.5	3rd
B1: Macro-economy	7.9	1st	**D: Environment**	**0.6**	**4th**
B2: Innovation	2.5	3rd	D1: Climate change	1.2	4th
B3: Energy markets	2.6	4th	D2: Environmental factors	0.0	4th
B4: Infrastructure	6.8	3rd			
B5: Energy security	4.0	4th	**Assessment Index**	**4.6**	**4th**

Note: Division is by cluster

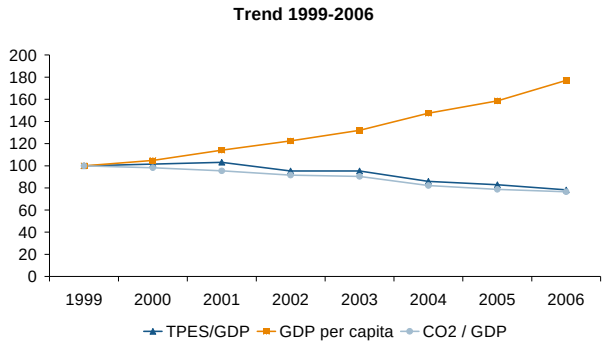
SECTION C: policy examples

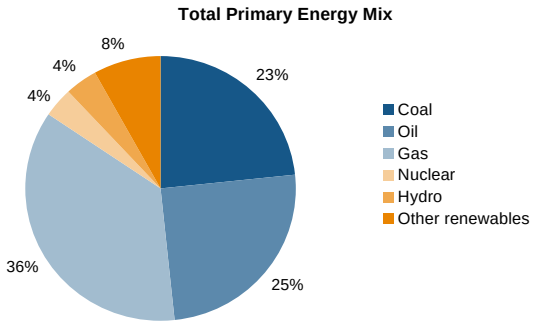
Not available

Romania

SECTION A: key indicators

Population (mn)	21.7	CO_2/GDP	0.50
GDP ($bn)	227	CO_2/capita	4.39
GDP/capita (US$)	10,433	TPES/GDP (toe per thousand 2000 US$ PPP)	0.21





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.6**	**2nd**	**C: Equity**	**6.0**	**2nd**
A1: Institutions and regulations	4.0	2nd	C1: Education	4.2	2nd
A2: Goods and factors markets	5.3	2nd	C2: Health and safety	5.6	2nd
B: Economy	**4.0**	**3rd**	C3: Equity	8.1	2nd
B1: Macro-economy	3.1	4th	**D: Environment**	**7.2**	**2nd**
B2: Innovation	1.9	3rd	D1: Climate change	7.8	2nd
B3: Energy markets	6.4	2nd	D2: Environmental factors	6.5	2nd
B4: Infrastructure	4.1	4th			
B5: Energy security	7.1	1st	**Assessment Index**	**5.5**	**2nd**

Note: Division is by cluster

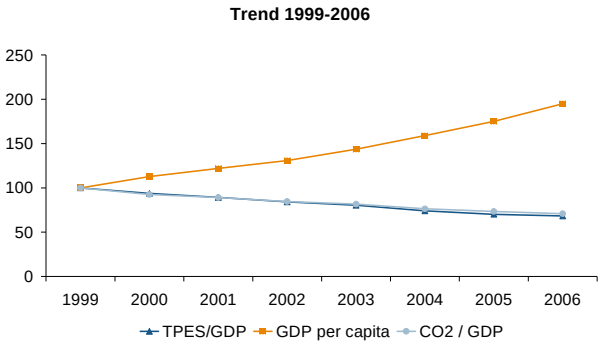
SECTION C: policy examples

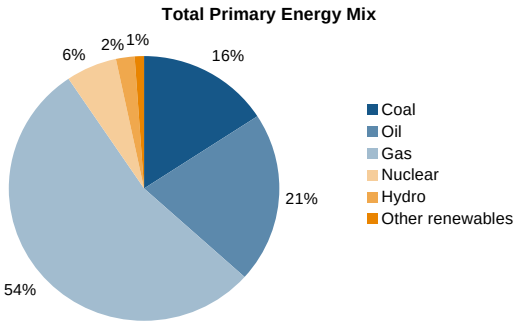
- As part of being compliant with the Kyoto Protocol, Romania has introduced Green certificates for the use of renewable sources of energy and increasing energy efficiency by industrial reconversion. The Green Certificates are tradable either bilaterally or through the centralized market (auction based market, administered by OPCOM), around 83% of the certificates issued for 2008 being traded through the auctions
- Romania is diversifying its energy sources by partnering in various European energy projects (Nabucco) and has passed a law to promote renewable energy (L 220/2008).
- Romania seeks to reduce its CO_2 emissions by applying new burning technologies and providing carbon capture incentives.
- Related to the electricity wholesale market, 25.1% out of the electricity consumption was traded in 2008 in the auction sessions of the centralized markets (day ahead and forward) administered by the Romanian Power Exchange - OPCOM which is by Government Decision the electricity market operator in Romania since 2000, in early liberalization stage. The results accounted in the first six months of 2009 are showing a continuous strengthening of the centralized electricity markets' liquidity (almost 40% out of the electricity forecasted consumption for July 2009 traded through the platforms operated by the Exchange).

Russian Federation

SECTION A: key indicators

Population (mn)	143.5	CO_2/GDP	1.12
GDP ($bn)	1,892	CO_2/capita	10.79
GDP/capita (US$)	13,182	TPES/GDP (toe per thousand 2000 US$ PPP)	0.47





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**3.1**	**4th**	**C: Equity**	**5.8**	**3rd**
A1: Institutions and regulations	1.6	4th	C1: Education	4.4	2nd
A2: Goods and factors markets	4.5	2nd	C2: Health and safety	5.1	4th
B: Economy	**5.0**	**1st**	C3: Equity	7.9	2nd
B1: Macro-economy	4.0	3rd	**D: Environment**	**7.3**	**2nd**
B2: Innovation	3.0	1st	D1: Climate change	6.5	4th
B3: Energy markets	3.0	4th	D2: Environmental factors	8.1	1st
B4: Infrastructure	6.2	1st			
B5: Energy security	7.1	1st	**Assessment Index**	**5.3**	**2nd**

Note: Division is by cluster

SECTION C: policy examples

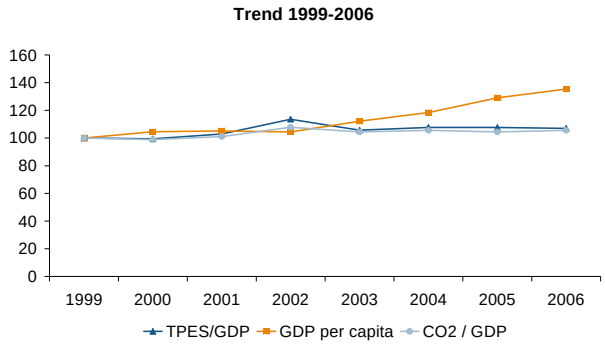
Russia has developed a robust energy strategy for the years up to 2020. The various objectives include:

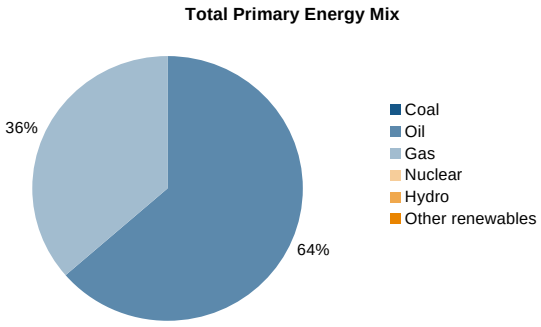
- Substitution of exhaustible resources with renewable resources and diversification of fuels used in power generation.
- Prioritise domestic consumption over exports and optimising the export structure by shifting from the production of primary goods to the production of high value-added products.
- Ensure that energy supply is sufficient to meet the needs of its population in normal circumstances and at a reduced level in emergencies.

Saudi Arabia

SECTION A: key indicators

Population (mn)	23.1	CO_2/GDP	0.99
GDP ($bn)	528	CO_2/capita	13.83
GDP/capita (US$)	22,852	TPES/GDP (toe per thousand 2000 US$ PPP)	0.43





Saudi Arabia has a minor share, less than 0.5%, of renewables in its total primary energy mix.

SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**5.0**	**4th**	**C: Equity**	**5.9**	**4th**
A1: Institutions and regulations	4.7	4th	C1: Education	2.9	4th
A2: Goods and factors markets	5.3	4th	C2: Health and safety	5.6	4th
B: Economy	**4.6**	**4th**	C3: Equity	9.3	1st
B1: Macro-economy	5.5	3rd	**D: Environment**	**4.9**	**3rd**
B2: Innovation	1.5	4th	D1: Climate change	6.2	3rd
B3: Energy markets	5.1	3rd	D2: Environmental factors	3.6	3rd
B4: Infrastructure	6.0	4th			
B5: Energy security	5.4	3rd	**Assessment Index**	**5.1**	**3rd**

Note: Division is by cluster

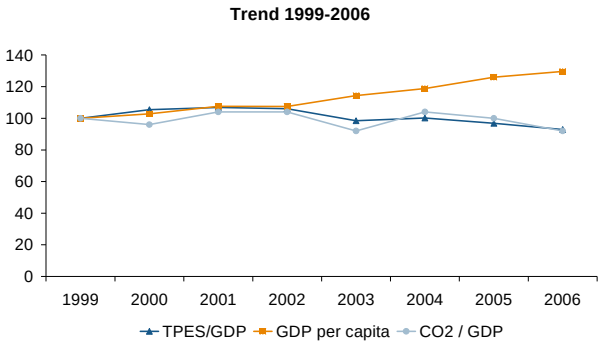
SECTION C: policy examples

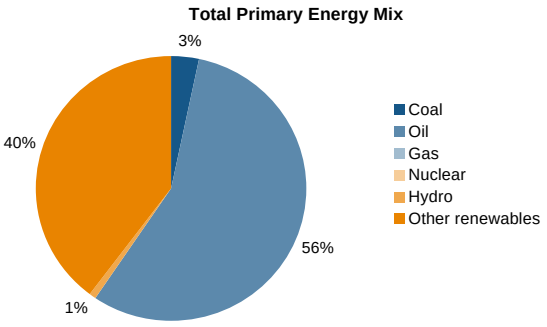
Not available

Senegal

SECTION A: key indicators

Population (mn)	11.7	CO_2/GDP	0.23
GDP ($bn)	20	CO_2/capita	0.37
GDP/capita (US$)	1,692	TPES/GDP (toe per thousand 2000 US$ PPP)	0.16





Senegal has a minor share, less than 0.5%, of gas in its total primary energy mix.

SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**3.3**	**3rd**	**C: Equity**	**3.1**	**4th**
A1: Institutions and regulations	3.0	2nd	C1: Education	0.6	4th
A2: Goods and factors markets	3.7	3rd	C2: Health and safety	2.9	3rd
B: Economy	**2.8**	**4th**	C3: Equity	5.6	4th
B1: Macro-economy	4.2	2nd	**D: Environment**	**6.9**	**3rd**
B2: Innovation	0.7	2nd	D1: Climate change	8.4	3rd
B3: Energy markets	6.4	2nd	D2: Environmental factors	5.4	3rd
B4: Infrastructure	1.9	4th			
B5: Energy security	4.5	4th	**Assessment Index**	**4.0**	**4th**

Note: Division is by cluster

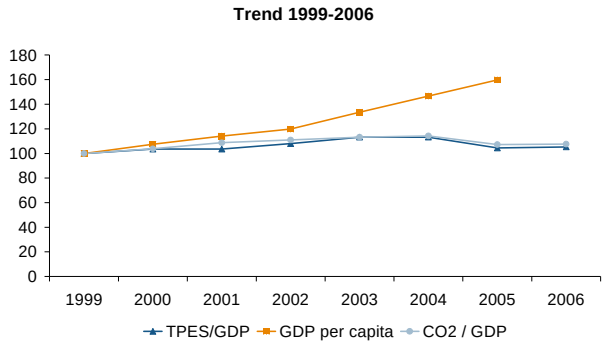
SECTION C: policy examples

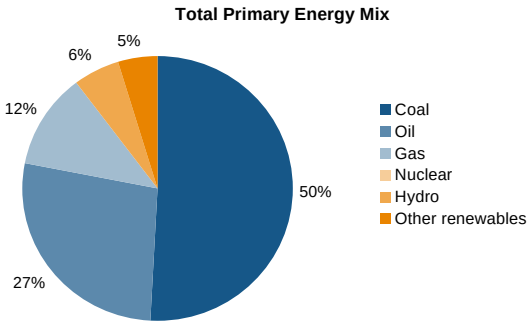
Not available

Serbia

SECTION A: key indicators

Population (mn)	7.4	CO_2/GDP	1.19
GDP ($bn)	68	CO_2/capita	7.18
GDP/capita (US$)	9,141	TPES/GDP (toe per thousand 2000 US$ PPP)	0.38





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**3.4**	**3rd**	**C: Equity**	**-**	**-**
A1: Institutions and regulations	2.6	3rd	C1: Education	-	-
A2: Goods and factors markets	4.3	3rd	C2: Health and safety	-	-
B: Economy	**3.8**	**4th**	C3: Equity	6.7	4th
B1: Macro-economy	2.2	4th	**D: Environment**	**-**	**-**
B2: Innovation	2.0	2nd	D1: Climate change	6.4	4th
B3: Energy markets	4.8	4th	D2: Environmental factors	-	-
B4: Infrastructure	3.2	4th			
B5: Energy security	7.6	1st	**Assessment Index**	**3.6**	**4th**

Note: Division is by cluster

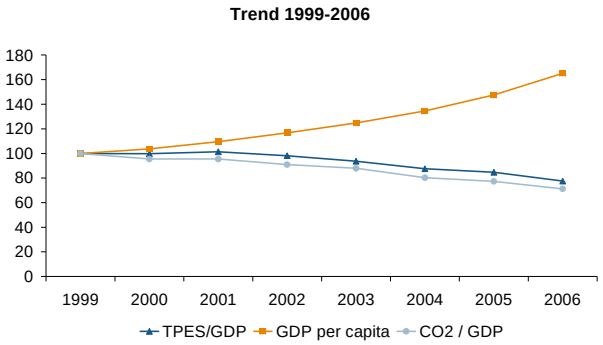
SECTION C: policy examples

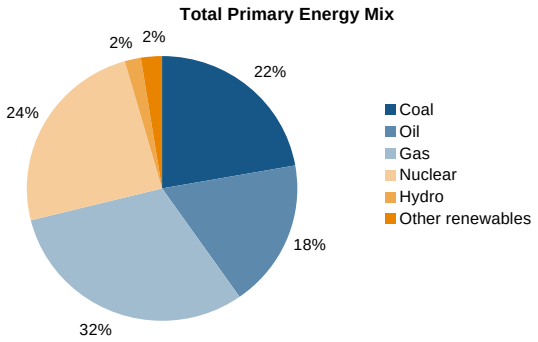
Not available

Slovakia

SECTION A: key indicators

Population (mn)	5.4	CO_2/GDP	0.52
GDP ($bn)	110	CO_2/capita	7.11
GDP/capita (US$)	20,268	TPES/GDP (toe per thousand 2000 US$ PPP)	0.26





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**6.2**	**4th**	**C: Equity**	**6.4**	**4th**
A1: Institutions and regulations	5.4	4th	C1: Education	5.0	4th
A2: Goods and factors markets	6.9	3rd	C2: Health and safety	6.4	4th
B: Economy	**5.4**	**4th**	C3: Equity	8.0	4th
B1: Macro-economy	5.3	3rd	**D: Environment**	**7.3**	**3rd**
B2: Innovation	2.5	4th	D1: Climate change	7.7	3rd
B3: Energy markets	5.6	4th	D2: Environmental factors	6.9	3rd
B4: Infrastructure	7.5	4th			
B5: Energy security	6.3	2nd	**Assessment Index**	**6.3**	**4th**

Note: Division is by cluster

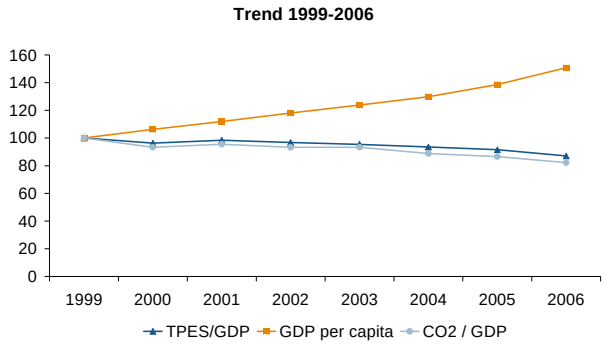
SECTION C: policy examples

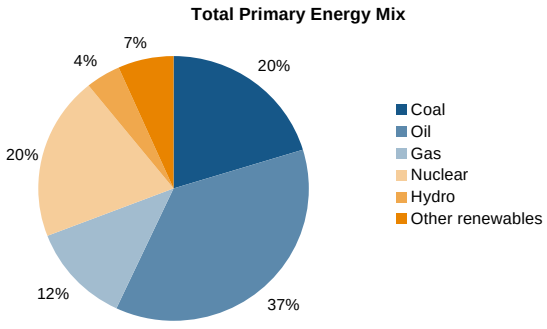
Not available

Slovenia

SECTION A: key indicators

Population (mn)	2.0	CO_2/GDP	0.37
GDP ($bn)	55	CO_2/capita	7.72
GDP/capita (US$)	27,227	TPES/GDP (toe per thousand 2000 US$ PPP)	0.17





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**5.9**	**4th**	**C: Equity**	**7.2**	**3rd**
A1: Institutions and regulations	6.3	4th	C1: Education	5.9	2nd
A2: Goods and factors markets	5.5	4th	C2: Health and safety	7.2	3rd
B: Economy	**5.7**	**3rd**	C3: Equity	8.6	2nd
B1: Macro-economy	5.5	2nd	**D: Environment**	**7.9**	**2nd**
B2: Innovation	3.9	3rd	D1: Climate change	8.3	2nd
B3: Energy markets	6.9	3rd	D2: Environmental factors	7.5	2nd
B4: Infrastructure	7.2	4th			
B5: Energy security	6.2	2nd	**Assessment Index**	**6.7**	**3rd**

Note: Division is by cluster

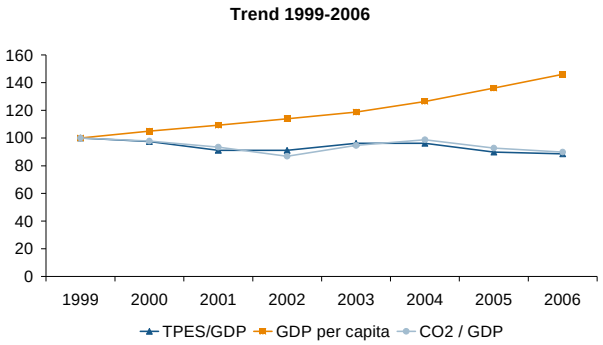
SECTION C: policy examples

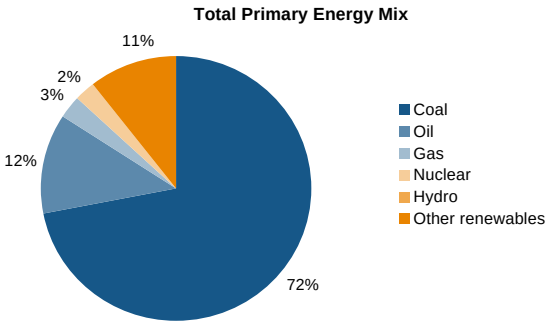
- Slovenia liberalised its gas and electricity markets in 2007.
- A green public procurement plan (National Action Plan to follow) and a feed-in system for supporting electricity production from renewable energy sources will enable Slovenia to increase the share of renewable energy in total energy consumption, lower carbon emissions and increase energy efficiency.
- Slovenia is promoting the use of biofuels or other renewable fuels in the transportation industry (EC Directive 2003/30).

South Africa

SECTION A: key indicators

Population (mn)	46.9	CO_2/GDP	0.71
GDP ($bn)	458	CO_2/capita	7.05
GDP/capita (US$)	9,767	TPES/GDP (toe per thousand 2000 US$ PPP)	0.28





South Africa has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**6.5**	**1st**	**C: Equity**	**4.0**	**4th**
A1: Institutions and regulations	6.6	1st	C1: Education	3.1	3rd
A2: Goods and factors markets	6.5	1st	C2: Health and safety	2.8	4th
B: Economy	**5.1**	**1st**	C3: Equity	6.0	4th
B1: Macro-economy	4.1	2nd	**D: Environment**	**6.5**	**3rd**
B2: Innovation	2.7	1st	D1: Climate change	6.7	4th
B3: Energy markets	6.0	3rd	D2: Environmental factors	6.4	2nd
B4: Infrastructure	6.7	1st			
B5: Energy security	7.1	1st	**Assessment Index**	**5.5**	**1st**

Note: Division is by cluster

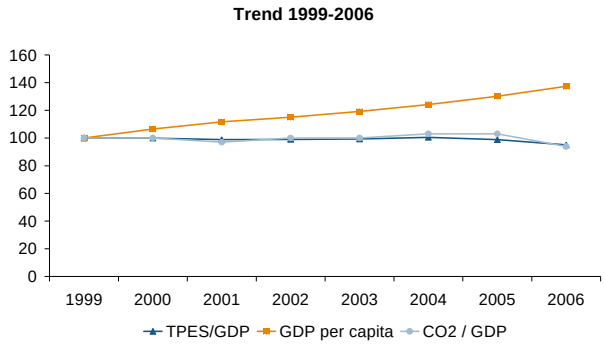
SECTION C: policy examples

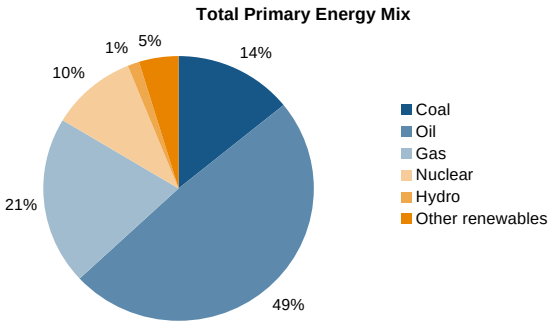
- South Africa developed its energy infrastructure policies as part of their objective to become independent and withstand political and economic isolation.
- The National Energy Regulator of South Africa has approved renewable feed-in tariffs that should encourage the use of renewable energy sources and increase energy security.
- To reduce its CO_2 emissions, South Africa has introduced carbon emission reduction credits and is developing a carbon storage atlas..

Spain

SECTION A: key indicators

Population (mn)	43.4	CO_2/GDP	0.34
GDP ($bn)	1,307	CO_2/capita	7.87
GDP/capita (US$)	30,118	TPES/GDP (toe per thousand 2000 US$ PPP)	0.15





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**6.4**	**4th**	**C: Equity**	**7.6**	**2nd**
A1: Institutions and regulations	6.9	3rd	C1: Education	6.5	1st
A2: Goods and factors markets	5.8	4th	C2: Health and safety	7.6	3rd
B: Economy	**5.6**	**3rd**	C3: Equity	8.7	2nd
B1: Macro-economy	5.6	1st	**D: Environment**	**7.3**	**3rd**
B2: Innovation	3.6	3rd	D1: Climate change	8.2	2nd
B3: Energy markets	7.6	1st	D2: Environmental factors	6.5	3rd
B4: Infrastructure	8.1	3rd			
B5: Energy security	5.0	4th	**Assessment Index**	**6.7**	**3rd**

Note: Division is by cluster

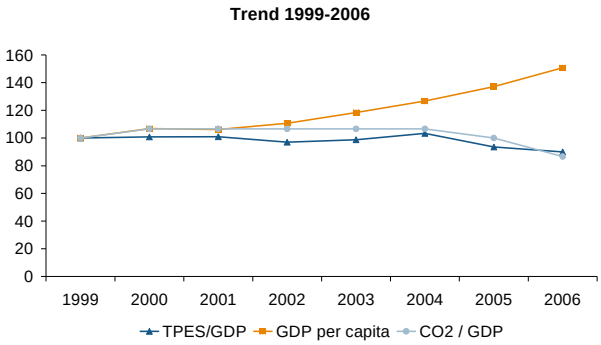
SECTION C: policy examples

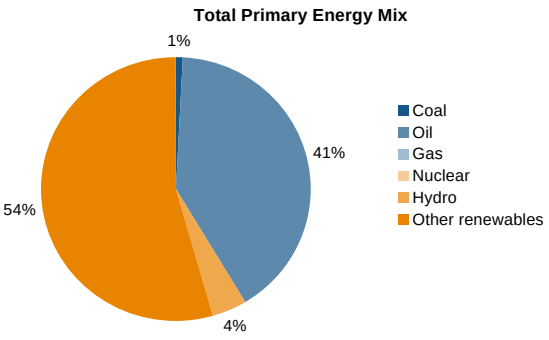
Not available

Sri Lanka

SECTION A: key indicators

Population (mn)	19.6	CO_2/GDP	0.13
GDP ($bn)	77	CO_2/capita	0.57
GDP/capita (US$)	3,920	TPES/GDP (toe per thousand 2000 US$ PPP)	0.11





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**4.7**	**1st**	**C: Equity**	**4.9**	**1st**
A1: Institutions and regulations	4.5	1st	C1: Education	1.9	4th
A2: Goods and factors markets	5.0	1st	C2: Health and safety	5.5	1st
B: Economy	**3.6**	**2nd**	C3: Equity	7.3	1st
B1: Macro-economy	3.2	3rd	**D: Environment**	**7.5**	**2nd**
B2: Innovation	1.2	2nd	D1: Climate change	9.2	2nd
B3: Energy markets	8.5	1st	D2: Environmental factors	5.9	3rd
B4: Infrastructure	4.5	1st			
B5: Energy security	5.4	4th	**Assessment Index**	**5.2**	**1st**

Note: Division is by cluster

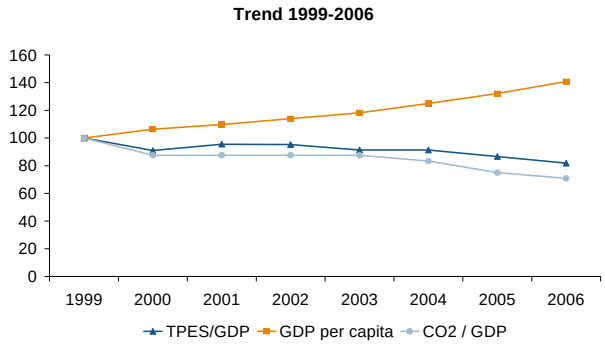
SECTION C: policy examples

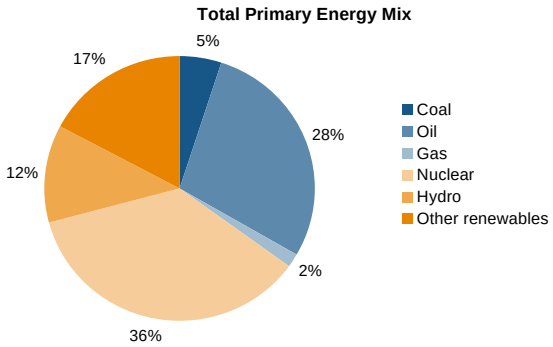
Not available

Sweden

SECTION A: key indicators

Population (mn)	9.0	CO_2/GDP	0.19
GDP ($bn)	331	CO_2/capita	5.64
GDP/capita (US$)	36,578	TPES/GDP (toe per thousand 2000 US$ PPP)	0.19





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**9.0**	**1st**	**C: Equity**	**8.0**	**1st**
A1: Institutions and regulations	9.5	1st	C1: Education	7.4	1st
A2: Goods and factors markets	8.5	2nd	C2: Health and safety	8.0	2nd
B: Economy	**7.2**	**1st**	C3: Equity	8.6	2nd
B1: Macro-economy	5.2	3rd	**D: Environment**	**9.0**	**1st**
B2: Innovation	6.8	1st	D1: Climate change	9.1	1st
B3: Energy markets	7.5	2nd	D2: Environmental factors	8.8	1st
B4: Infrastructure	8.7	2nd			
B5: Energy security	8.4	1st	**Assessment Index**	**8.3**	**1st**

Note: Division is by cluster

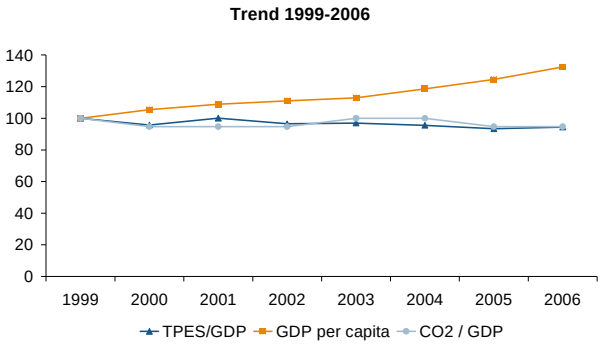
SECTION C: policy examples

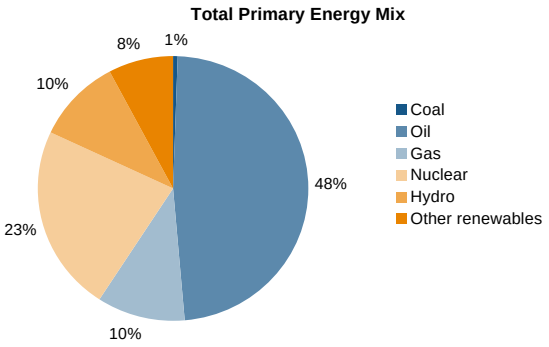
- To lower carbon dioxide emissions and to lower its dependence of oil, Sweden introduced the carbon dioxide tax in the beginning of the 1990s.
- Sweden seeks to raise the share of new renewable power generation and introduced in 2003 a green certificate scheme to encourage the use of renewable energy sources in electricity generation.
- A wide variety of measures has been introduced to promote energy efficiency in buildings, including isolation and ventilation but also increased district heating for houses has laid a solid ground. Now this is complemented with for examples, publically supported schemes for transformation of heating system for buildings from oil and electricity to heat pumps and bio fuels (expiring), or publically funded local energy and climate advisers for the public and SMEs.

Switzerland

SECTION A: key indicators

Population (mn)	7.3	CO_2/GDP	0.19
GDP ($bn)	283	CO_2/capita	6.00
GDP/capita (US$)	38,953	TPES/GDP (toe per thousand 2000 US$ PPP)	0.12





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**9.2**	**1st**	**C: Equity**	**7.7**	**2nd**
A1: Institutions and regulations	9.4	1st	C1: Education	5.7	3rd
A2: Goods and factors markets	9.0	1st	C2: Health and safety	8.7	1st
B: Economy	**7.2**	**1st**	C3: Equity	8.6	2nd
B1: Macro-economy	5.4	2nd	**D: Environment**	**9.2**	**1st**
B2: Innovation	6.9	1st	D1: Climate change	9.3	1st
B3: Energy markets	6.3	4th	D2: Environmental factors	9.1	1st
B4: Infrastructure	9.1	1st			
B5: Energy security	7.2	1st	**Assessment Index**	**8.3**	**1st**

Note: Division is by cluster

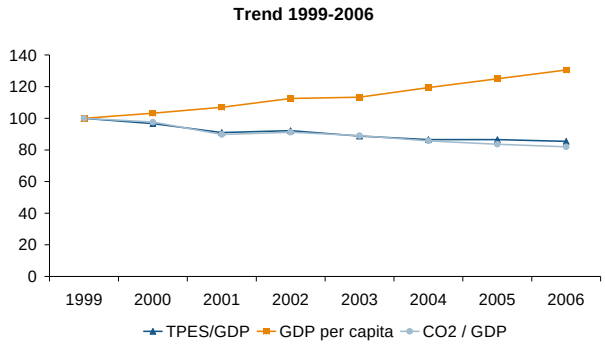
SECTION C: policy examples

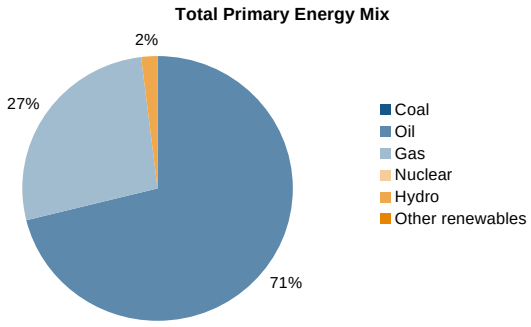
- Climate act hinders building combined cycle gas turbine power plants (obligation to compensate 100% of emissions, maximum of 30% outside of Switzerland).
- Tax-exemption for biofuels.

Syria (Arab Rep.)

SECTION A: key indicators

Population (mn)	18.4	CO_2/GDP	0.76
GDP ($bn)	79	CO_2/capita	2.65
GDP/capita (US$)	4,314	TPES/GDP (toe per thousand 2000 US$ PPP)	0.28





Syria (Arab Rep.) has a minor share, less than 0.5%, of coal and renewables in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**2.8**	**4th**	**C: Equity**	**5.4**	**3rd**
A1: Institutions and regulations	2.5	4th	C1: Education	2.3	4th
A2: Goods and factors markets	3.1	4th	C2: Health and safety	5.6	2nd
B: Economy	**2.8**	**4th**	C3: Equity	8.2	1st
B1: Macro-economy	3.0	4th	**D: Environment**	**4.8**	**4th**
B2: Innovation	1.1	4th	D1: Climate change	7.0	3rd
B3: Energy markets	6.2	2nd	D2: Environmental factors	2.6	4th
B4: Infrastructure	2.2	4th			
B5: Energy security	4.9	3rd	**Assessment Index**	**3.9**	**4th**

Note: Division is by cluster

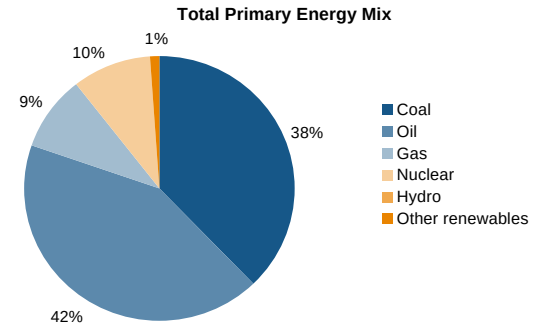
SECTION C: policy examples

Not available

Taiwan, China

SECTION A: key indicators

Population (mn)	22.8	CO_2/GDP	0.45
GDP ($bn)	690	CO_2/capita	11.87
GDP/capita (US$)	30,322	TPES/GDP (toe per thousand 2000 US$ PPP)	0.18



Taiwan, China, has a minor share, less than 0.5%, of hydro in its total primary energy mix.

SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**6.6**	**3rd**	**C: Equity**	**-**	**-**
A1: Institutions and regulations	6.4	4th	C1: Education	-	-
A2: Goods and factors markets	6.8	3rd	C2: Health and safety	-	-
B: Economy	**6.3**	**2nd**	C3: Equity	9.3	1st
B1: Macro-economy	6.9	1st	**D: Environment**	**6.2**	**4th**
B2: Innovation	4.6	3rd	D1: Climate change	7.5	4th
B3: Energy markets	7.9	1st	D2: Environmental factors	4.9	4th
B4: Infrastructure	8.6	2nd			
B5: Energy security	5.2	3rd	**Assessment Index**	**6.4**	**4th**

Note: Division is by cluster

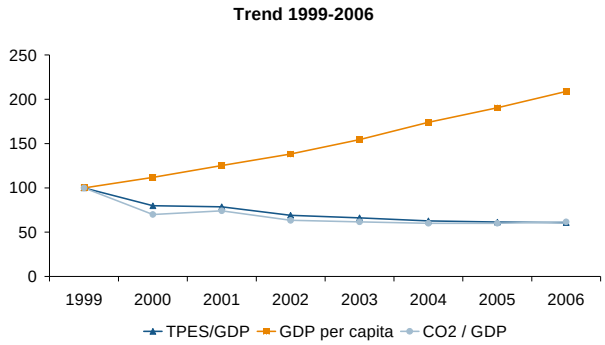
SECTION C: policy examples

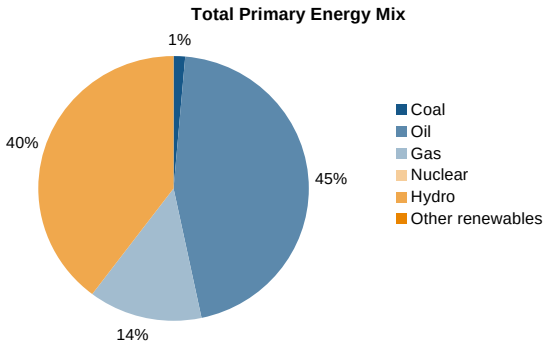
Not available

Tajikistan

SECTION A: key indicators

Population (mn)	6.3	CO_2/GDP	0.74
GDP ($bn)	10	CO_2/capita	0.93
GDP/capita (US$)	1,525	TPES/GDP (toe per thousand 2000 US$ PPP)	0.43





SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**1.6**	**4th**	**C: Equity**	**3.8**	**3rd**
A1: Institutions and regulations	1.3	4th	C1: Education	3.4	1st
A2: Goods and factors markets	1.9	4th	C2: Health and safety	3.7	2nd
B: Economy	**3.1**	**4th**	C3: Equity	4.2	4th
B1: Macro-economy	2.8	4th	**D: Environment**	**6.1**	**4th**
B2: Innovation	0.5	4th	D1: Climate change	8.7	3rd
B3: Energy markets	5.4	3rd	D2: Environmental factors	3.5	4th
B4: Infrastructure	3.5	3rd			
B5: Energy security	5.5	3rd	**Assessment Index**	**3.6**	**4th**

Note: Division is by cluster

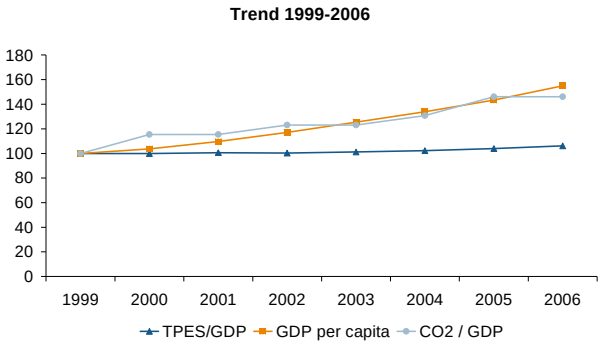
SECTION C: policy examples

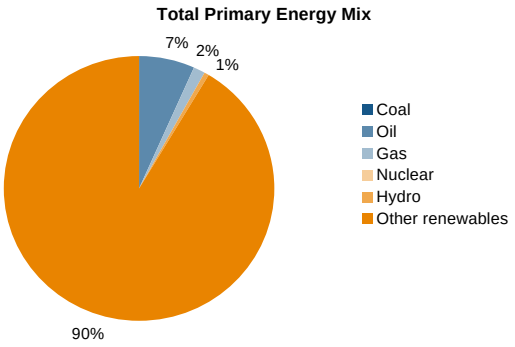
Not available

Tanzania

SECTION A: key indicators

Population (mn)	37.5	CO_2/GDP	0.19
GDP ($bn)	31	CO_2/capita	0.12
GDP/capita (US$)	823	TPES/GDP (toe per thousand 2000 US$ PPP)	0.81





Tanzania has a minor share, less than 0.5%, of coal in its total primary energy mix.

SECTION B: Assessment index results Cluster 1

	Value	Division		Value	Division
A: Institutions	**3.5**	**3rd**	**C: Equity**	**3.3**	**4th**
A1: Institutions and regulations	2.8	3rd	C1: Education	2.1	3rd
A2: Goods and factors markets	4.1	3rd	C2: Health and safety	1.9	4th
B: Economy	**2.8**	**4th**	C3: Equity	5.8	3rd
B1: Macro-economy	2.9	4th	**D: Environment**	**7.8**	**1st**
B2: Innovation	0.5	3rd	D1: Climate change	8.6	3rd
B3: Energy markets	2.0	4th	D2: Environmental factors	7.1	1st
B4: Infrastructure	2.1	4th			
B5: Energy security	5.6	3rd	**Assessment Index**	**4.3**	**3rd**

Note: Division is by cluster

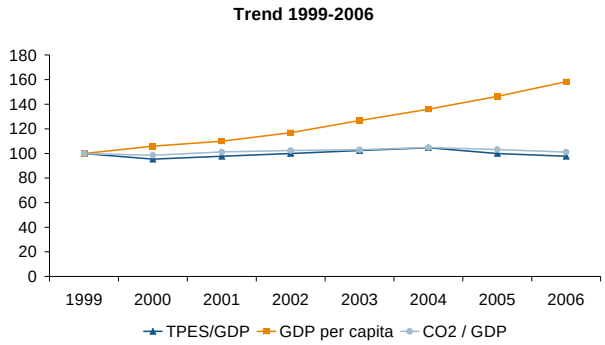
SECTION C: policy examples

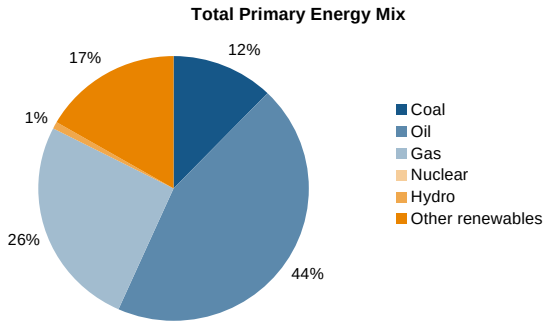
Not available

Thailand

SECTION A: key indicators

Population (mn)	65.1	CO_2/GDP	0.42
GDP ($bn)	515	CO_2/capita	3.42
GDP/capita (US$)	7,907	TPES/GDP (toe per thousand 2000 US$ PPP)	0.20





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**5.4**	**1st**	**C: Equity**	**5.6**	**3rd**
A1: Institutions and regulations	4.3	2nd	C1: Education	3.1	4th
A2: Goods and factors markets	6.5	1st	C2: Health and safety	5.2	3rd
B: Economy	**4.5**	**2nd**	C3: Equity	8.5	1st
B1: Macro-economy	5.4	1st	**D: Environment**	**7.1**	**2nd**
B2: Innovation	1.9	3rd	D1: Climate change	8.0	2nd
B3: Energy markets	6.1	3rd	D2: Environmental factors	6.2	2nd
B4: Infrastructure	4.7	3rd			
B5: Energy security	6.2	2nd	**Assessment Index**	**5.7**	**1st**

Note: Division is by cluster

SECTION C: policy examples

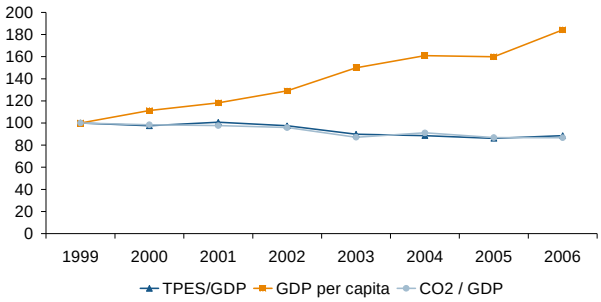
- Thailand is focusing on promoting energy efficiency and the use of alternative energy sources with an environmental friendly concept by using a compulsory tool known as Energy Conservation Promotion Act. 1992.
- Thailand aims to improve energy access and encourage rural development by the electrification of rural areas.
- To reduce carbon emissions, Thailand aims to promote the use of CNG (compressed natural gas) and biofuels in the transportation industry.

Trinidad & Tobago

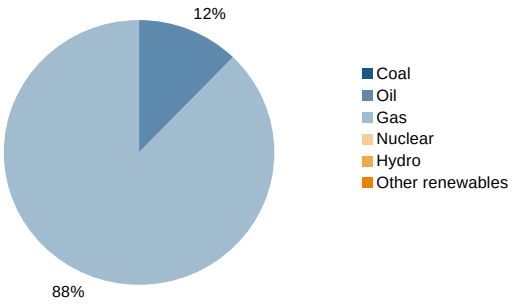
SECTION A: key indicators

Population (mn)	1.3	CO_2/GDP	1.40
GDP ($bn)	20	CO_2/capita	20.28
GDP/capita (US$)	15,333	TPES/GDP (toe per thousand 2000 US$ PPP)	0.74

Trend 1999-2006



Total Primary Energy Mix



Trinidad & Tobago has a minor share, less than 0.5%, of renewables in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.4**	**2nd**	**C: Equity**	**6.2**	**1st**
A1: Institutions and regulations	4.7	2nd	C1: Education	4.6	2nd
A2: Goods and factors markets	4.0	3rd	C2: Health and safety	5.4	3rd
B: Economy	**4.5**	**2nd**	C3: Equity	8.5	1st
B1: Macro-economy	5.4	1st	**D: Environment**	**5.7**	**4th**
B2: Innovation	1.8	3rd	D1: Climate change	5.0	4th
B3: Energy markets	1.8	4th	D2: Environmental factors	6.3	2nd
B4: Infrastructure	6.4	1st			
B5: Energy security	4.4	4th	**Assessment Index**	**5.2**	**3rd**

Note: Division is by cluster

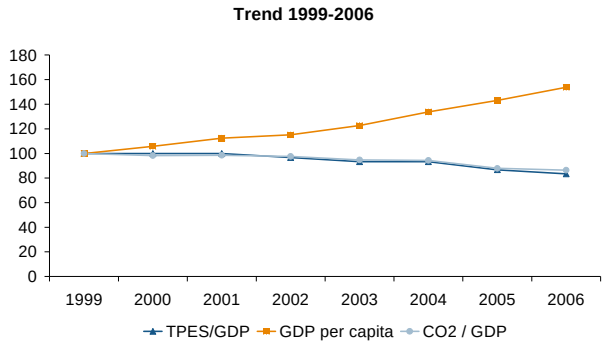
SECTION C: policy examples

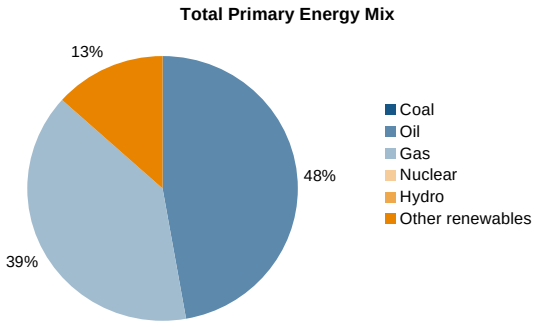
Not available

Tunisia

SECTION A: key indicators

Population (mn)	10.0	CO_2/GDP	0.25
GDP ($bn)	70	CO_2/capita	1.94
GDP/capita (US$)	6,968	TPES/GDP (toe per thousand 2000 US$ PPP)	0.11





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**5.6**	**1st**	**C: Equity**	**5.9**	**2nd**
A1: Institutions and regulations	5.4	1st	C1: Education	4.4	2nd
A2: Goods and factors markets	5.8	1st	C2: Health and safety	5.7	2nd
B: Economy	**4.8**	**1st**	C3: Equity	7.7	2nd
B1: Macro-economy	4.7	2nd	**D: Environment**	**6.8**	**2nd**
B2: Innovation	1.6	3rd	D1: Climate change	8.6	2nd
B3: Energy markets	7.8	1st	D2: Environmental factors	5.0	3rd
B4: Infrastructure	6.0	2nd			
B5: Energy security	6.9	2nd	**Assessment Index**	**5.8**	**1st**

Note: Division is by cluster

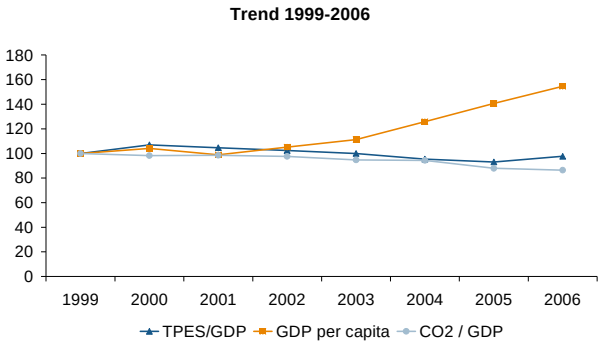
SECTION C: policy examples

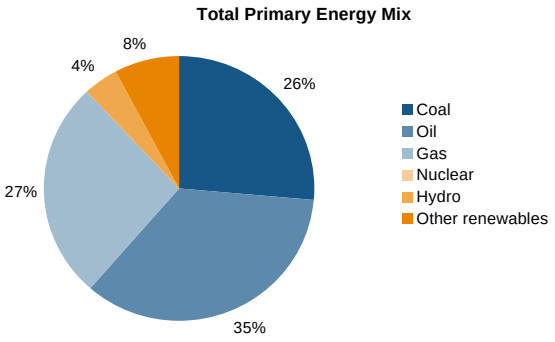
- Tunisia seeks to improve its energy efficiency by investing in combined cycle and gas turbine technology and optimising its power grids.
- Tunisia is promoting the usage of renewable energy sources in a bid to reduce its impact on the climate.

Turkey

SECTION A: key indicators

Population (mn)	67.9	CO_2/GDP	0.39
GDP ($bn)	873	CO_2/capita	3.04
GDP/capita (US$)	12,858	TPES/GDP (toe per thousand 2000 US$ PPP)	0.15





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.5**	**2nd**	**C: Equity**	**5.0**	**4th**
A1: Institutions and regulations	4.1	2nd	C1: Education	3.2	3rd
A2: Goods and factors markets	4.9	2nd	C2: Health and safety	5.3	3rd
B: Economy	**4.2**	**3rd**	C3: Equity	6.5	3rd
B1: Macro-economy	2.4	4th	**D: Environment**	**6.7**	**2nd**
B2: Innovation	2.1	2nd	D1: Climate change	7.7	2nd
B3: Energy markets	6.5	2nd	D2: Environmental factors	5.6	3rd
B4: Infrastructure	6.3	1st			
B5: Energy security	6.0	3rd	**Assessment Index**	**5.1**	**3rd**

Note: Division is by cluster

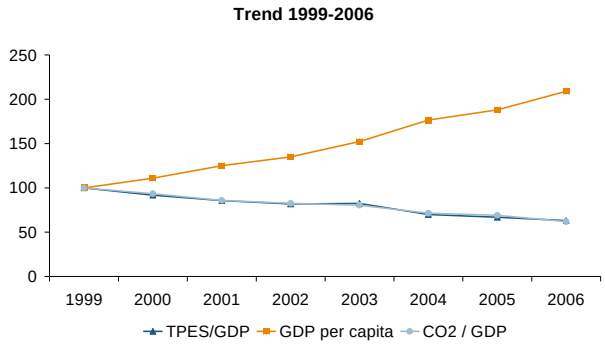
SECTION C: policy examples

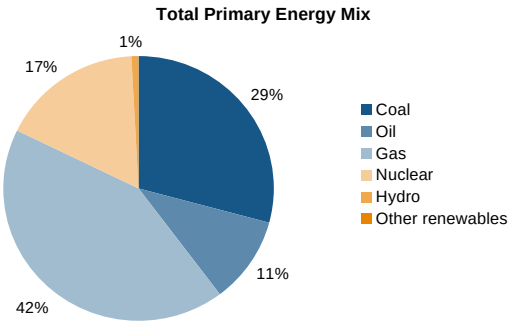
Not available

Ukraine

SECTION A: key indicators

Population (mn)	46.7	CO_2/GDP	1.01
GDP ($bn)	326	CO_2/capita	6.63
GDP/capita (US$)	6,968	TPES/GDP (toe per thousand 2000 US$ PPP)	0.45





Ukraine has a minor share, less than 0.5%, of renewables in its total primary energy mix.

SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**3.2**	**4th**	**C: Equity**	**6.0**	**2nd**
A1: Institutions and regulations	1.8	4th	C1: Education	4.7	1st
A2: Goods and factors markets	4.5	2nd	C2: Health and safety	5.3	3rd
B: Economy	**4.6**	**1st**	C3: Equity	7.9	2nd
B1: Macro-economy	3.1	4th	**D: Environment**	**5.4**	**4th**
B2: Innovation	2.5	1st	D1: Climate change	5.5	4th
B3: Energy markets	4.4	4th	D2: Environmental factors	5.3	3rd
B4: Infrastructure	5.7	2nd			
B5: Energy security	7.2	1st	**Assessment Index**	**4.8**	**4th**

Note: Division is by cluster

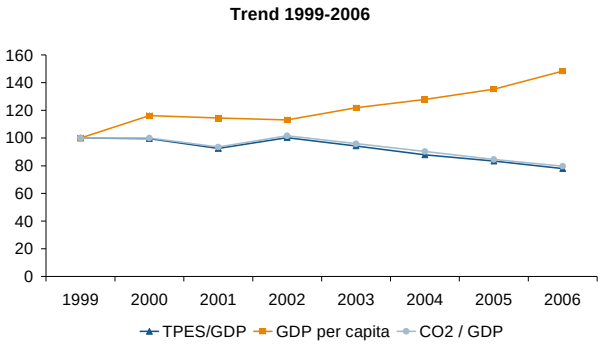
SECTION C: policy examples

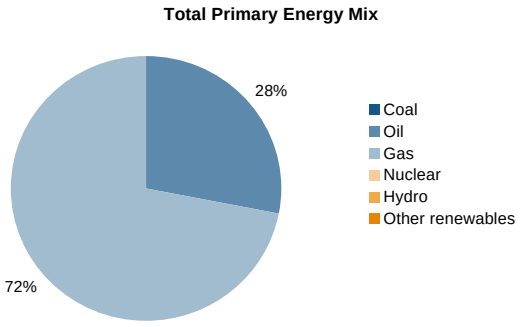
Not available

United Arab Emirates

SECTION A: key indicators

Population (mn)	4.1	CO_2/GDP	0.98
GDP ($bn)	156	CO_2/capita	25.96
GDP/capita (US$)	37,941	TPES/GDP (toe per thousand 2000 US$ PPP)	0.42





SECTION B: Assessment index results Cluster 4

	Value	Division		Value	Division
A: Institutions	**6.4**	**3rd**	**C: Equity**	**6.4**	**3rd**
A1: Institutions and regulations	6.2	3rd	C1: Education	3.6	4th
A2: Goods and factors markets	6.6	3rd	C2: Health and safety	6.4	3rd
B: Economy	**5.7**	**3rd**	C3: Equity	9.1	2nd
B1: Macro-economy	5.9	2nd	**D: Environment**	**3.5**	**3rd**
B2: Innovation	3.1	3rd	D1: Climate change	4.9	3rd
B3: Energy markets	3.7	4th	D2: Environmental factors	2.2	3rd
B4: Infrastructure	8.1	2nd			
B5: Energy security	5.5	3rd	**Assessment Index**	**5.5**	**3rd**

Note: Division is by cluster

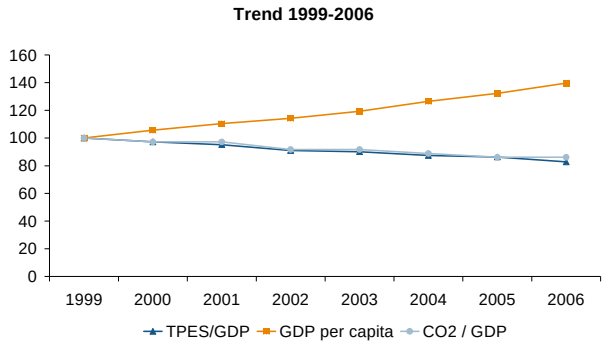
SECTION C: policy examples

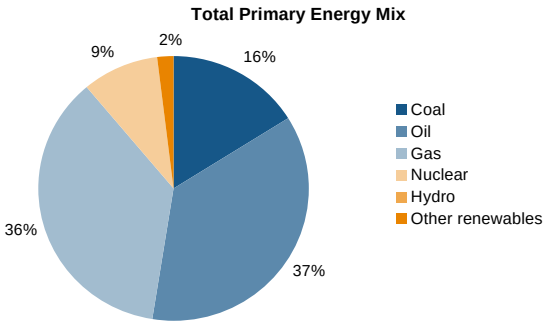
Not available

United Kingdom

SECTION A: key indicators

Population (mn)	60.2	CO_2/GDP	0.31
GDP ($bn)	2,146	CO_2/capita	8.80
GDP/capita (US$)	35,634	TPES/GDP (toe per thousand 2000 US$ PPP)	0.14





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.6**	**2nd**	**C: Equity**	**7.3**	**3rd**
A1: Institutions and regulations	8.5	2nd	C1: Education	6.0	2nd
A2: Goods and factors markets	8.7	1st	C2: Health and safety	7.7	2nd
B: Economy	**6.2**	**2nd**	C3: Equity	8.3	4th
B1: Macro-economy	4.9	4th	**D: Environment**	**8.2**	**1st**
B2: Innovation	4.7	2nd	D1: Climate change	8.2	2nd
B3: Energy markets	7.9	1st	D2: Environmental factors	8.2	1st
B4: Infrastructure	8.3	3rd			
B5: Energy security	6.8	1st	**Assessment Index**	**7.6**	**1st**

Note: Division is by cluster

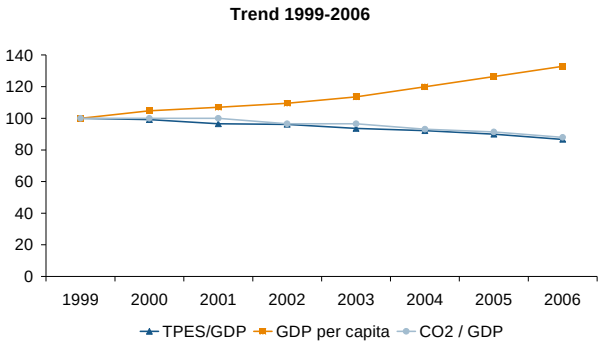
SECTION C: policy examples

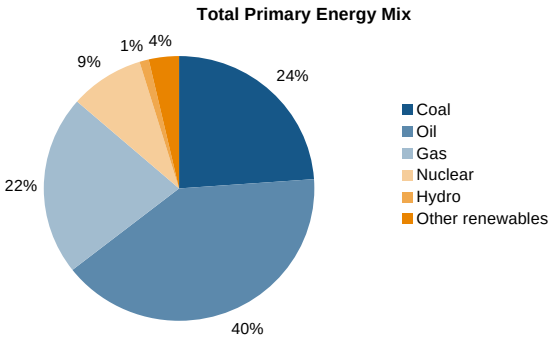
- Renewable obligation ensures renewable energy sources provide a greater proportion of energy consumption and help increase energy security by diversifying energy sources.
- The UK emissions trading scheme, climate change levy and various voluntary agreements enable the UK to reduce its CO_2 emission levels.
- Some of the policies implemented to support energy efficiency are: product standards; a carbon reduction commitment for companies not covered by the EU ETS is being implemented; the banning of incandescent bulbs.

United States

SECTION A: key indicators

Population (mn)	296.3	CO_2/GDP	0.53
GDP ($bn)	13,547	CO_2/capita	19.61
GDP/capita (US$)	45,725	TPES/GDP (toe per thousand 2000 US$ PPP)	0.21





SECTION B: Assessment index results Cluster 5

	Value	Division		Value	Division
A: Institutions	**8.9**	**1st**	**C: Equity**	**7.9**	**1st**
A1: Institutions and regulations	8.2	2nd	C1: Education	5.8	3rd
A2: Goods and factors markets	9.6	1st	C2: Health and safety	9.5	1st
B: Economy	**6.7**	**1st**	C3: Equity	8.4	3rd
B1: Macro-economy	5.2	3rd	**D: Environment**	**7.4**	**3rd**
B2: Innovation	6.1	1st	D1: Climate change	6.9	4th
B3: Energy markets	7.4	2nd	D2: Environmental factors	7.9	2nd
B4: Infrastructure	8.8	1st			
B5: Energy security	6.9	1st	**Assessment Index**	**7.7**	**1st**

Note: Division is by cluster

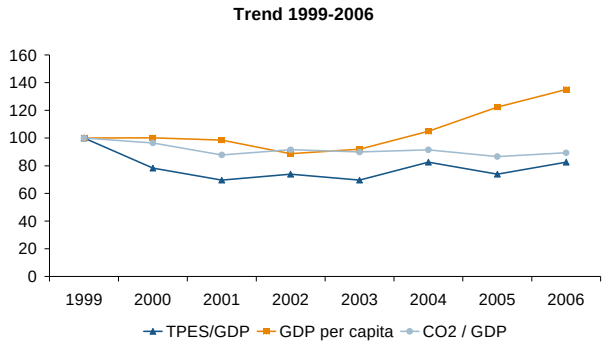
SECTION C: policy examples

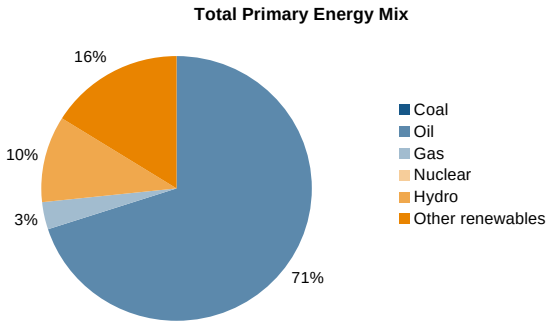
- US government has a target for the strategic petroleum reserve of 1 billion barrel of oil.
- The US promotes the usage of renewable energy sources by providing investment and production tax credits along with loan guarantees.
- The US is seeking to reduce its CO_2 emissions by encouraging biofuel usage in the transportation industry.

Uruguay

SECTION A: key indicators

Population (mn)	3.2	CO_2/GDP	0.19
GDP ($bn)	31	CO_2/capita	1.85
GDP/capita (US$)	9,584	TPES/GDP (toe per thousand 2000 US$ PPP)	0.10





SECTION B: Assessment index results Cluster 3

	Value	Division		Value	Division
A: Institutions	**4.8**	**2nd**	**C: Equity**	**6.1**	**1st**
A1: Institutions and regulations	5.3	1st	C1: Education	4.7	1st
A2: Goods and factors markets	4.2	3rd	C2: Health and safety	6.2	1st
B: Economy	**2.5**	**4th**	C3: Equity	7.6	3rd
B1: Macro-economy	2.2	4th	**D: Environment**	**7.5**	**1st**
B2: Innovation	1.6	3rd	D1: Climate change	9.4	1st
B3: Energy markets	7.0	1st	D2: Environmental factors	5.6	3rd
B4: Infrastructure	1.7	4th			
B5: Energy security	4.4	4th	**Assessment Index**	**5.2**	**2nd**

Note: Division is by cluster

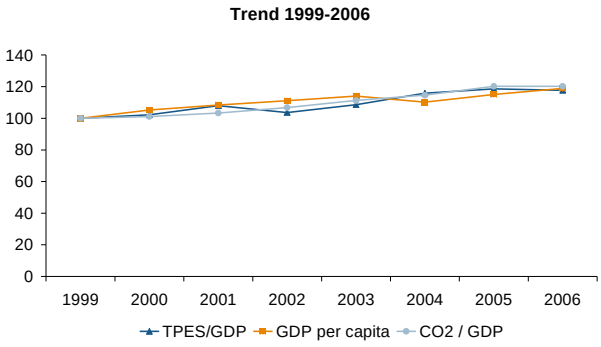
SECTION C: policy examples

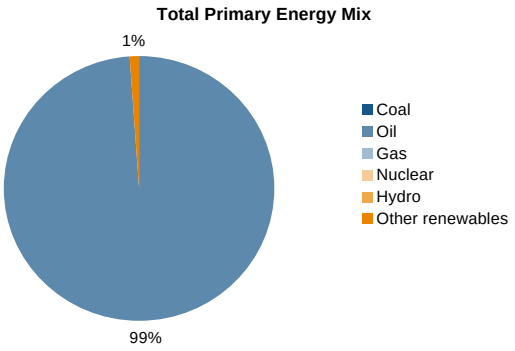
Not available

Yemen

SECTION A: key indicators

Population (mn)	21.0	CO_2/GDP	1.07
GDP ($bn)	15	CO_2/capita	0.91
GDP/capita (US$)	694	TPES/GDP (toe per thousand 2000 US$ PPP)	0.38





SECTION B: Assessment index results Cluster 2

	Value	Division		Value	Division
A: Institutions	**-**	**-**	**C: Equity**	**3.6**	**2nd**
A1: Institutions and regulations	1.8	2nd	C1: Education	1.4	3rd
A2: Goods and factors markets	-	-	C2: Health and safety	2.9	2nd
B: Economy	**2.5**	**4th**	C3: Equity	6.5	1st
B1: Macro-economy	2.0	3rd	**D: Environment**	**4.0**	**4th**
B2: Innovation	0.1	3rd	D1: Climate change	6.9	4th
B3: Energy markets	5.1	3rd	D2: Environmental factors	1.2	4th
B4: Infrastructure	2.0	3rd			
B5: Energy security	5.8	3rd	**Assessment Index**	**3.4**	**4th**

Note: Division is by cluster

SECTION C: policy examples

Not available

Member Committees of the World Energy Council

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

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