Country Energy Sector Vulnerability Assessments Program

Helping Countries Prepare an Effective Energy Sector Response

ESMAP
Energy Sector Management Assistance Program

Energy Vulnerability in Times of Crisis

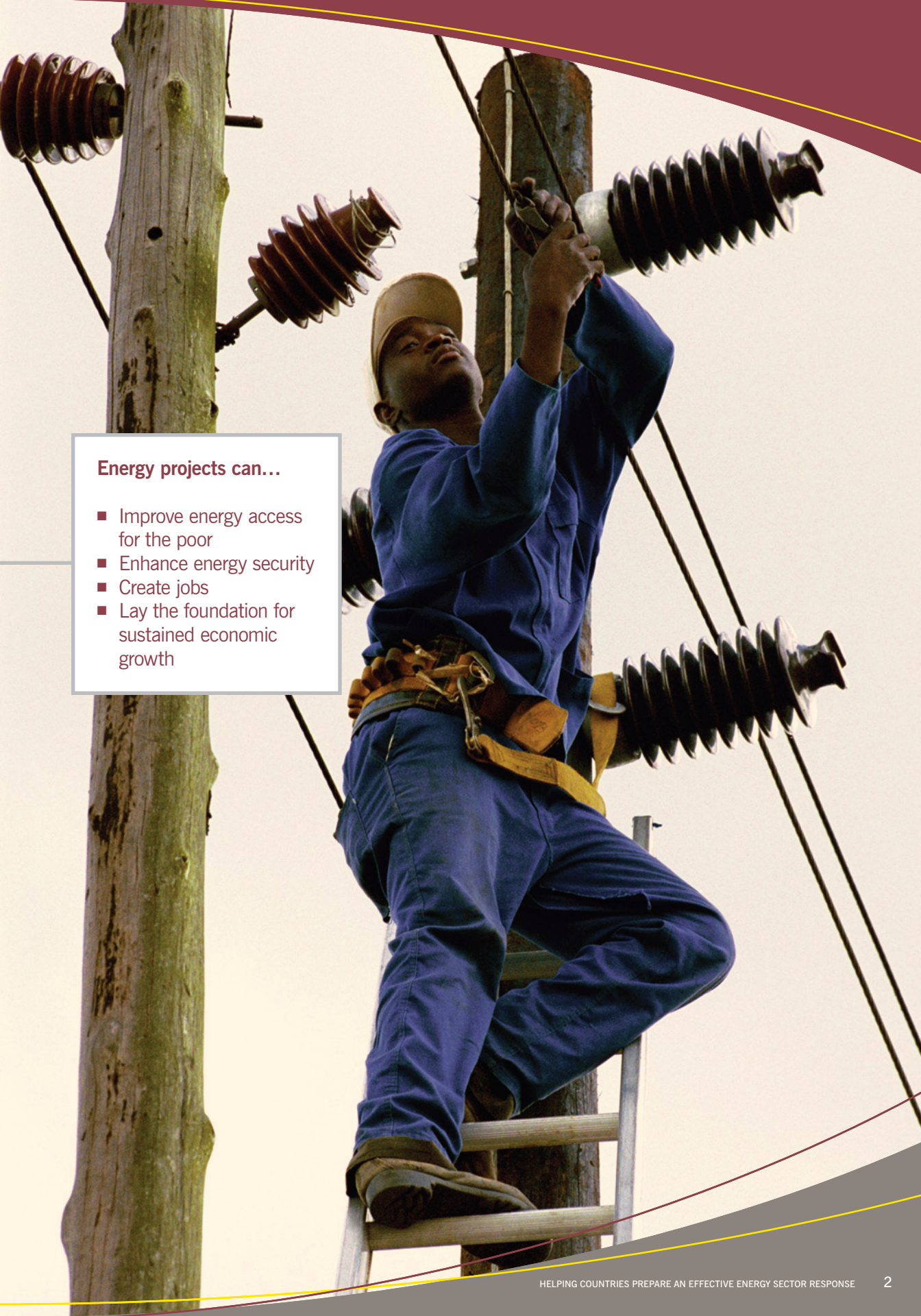
Emerging energy transitions—recently triggered by the global financial crisis, highly volatile energy prices, and climate change—have created a turbulent environment for the energy sector, testing governments and nongovernment actors around the world. Energy industries in developing countries are particularly exposed to these new sources of vulnerability. Governments are constrained in cushioning the adverse impacts due to limited institutional capacities and fiscal resources.

In response to these challenges, the Energy Sector Management Assistance Program (ESMAP) has launched a large-scale vulnerability initiative aimed at identifying existing and emerging vulnerabilities for policymakers and energy practitioners alike. Specifically, the **Country Energy Sector Vulnerability Assessments Program** focuses on the impacts of the financial and credit crisis, volatile oil prices, and climate change on the energy sector of developing and transition economies.

The Country Energy Sector Vulnerability Assessments Program is comprised of three components:

1. **Power Sector Vulnerability Assessments** —help countries assess the impact of the global financial crisis on priority investments in the power sector.
2. **Oil Price Volatility Assessments** —help countries assess the effects of oil price increases and heightened price volatility, including their ability to absorb price shocks.
3. **Climate Vulnerability Assessments** —help countries assess their energy sector vulnerability in the face of climate change, including changing average temperatures and precipitation, increasing variability, and extremes.

ESMAP's *energy assessments* focus on the key components of successful energy policy and practices. ESMAP's goal is to help countries build institutional capacity and know how to develop and implement policy reform measures and robust strategies to meet short-, medium-, and long-term challenges to their national energy systems. ESMAP will use the insights gathered from the vulnerability assessments to help mobilize support for client countries in increasing their resistance to external crises.



Energy projects can…

- Improve energy access for the poor
- Enhance energy security
- Create jobs
- Lay the foundation for sustained economic growth

Power Sector Vulnerability Assessments

The global economic and financial crisis is having a major impact on infrastructure financing, in general, and energy financing, in particular. The downturn in global credit markets has created uncertainty regarding the availability and cost of medium-term funding needed to meet energy sector investment targets. Emerging trends in this credit-constrained environment include:

- More stringent energy project approval thresholds
- Withdrawal of commercial lenders from energy project loan syndications
- Lack of viable alternate financing mechanisms
- Unsustainable funding costs

In the face of these obstacles, governments are tempted to ration resources or otherwise postpone essential investments in the sector.

ESMAP's **Power Sector Vulnerability Assessments** estimate the short- to medium-term impact of the credit crisis on the electricity sector and inform a potential strategic response from The World Bank Group (WBG). The assessments combine research and analysis of the latest economic and financial data with wide-ranging interviews and surveys of client country government agencies, project sponsors, and project financiers, as well as other stakeholders.

The assessments help client countries identify:

- A pipeline of priority power projects
- Financing gaps for these projects and options to fill them
- "Green" investments using hydropower, wind, geothermal, and solar technologies
- At-risk public-private partnership projects and potential ways to support them

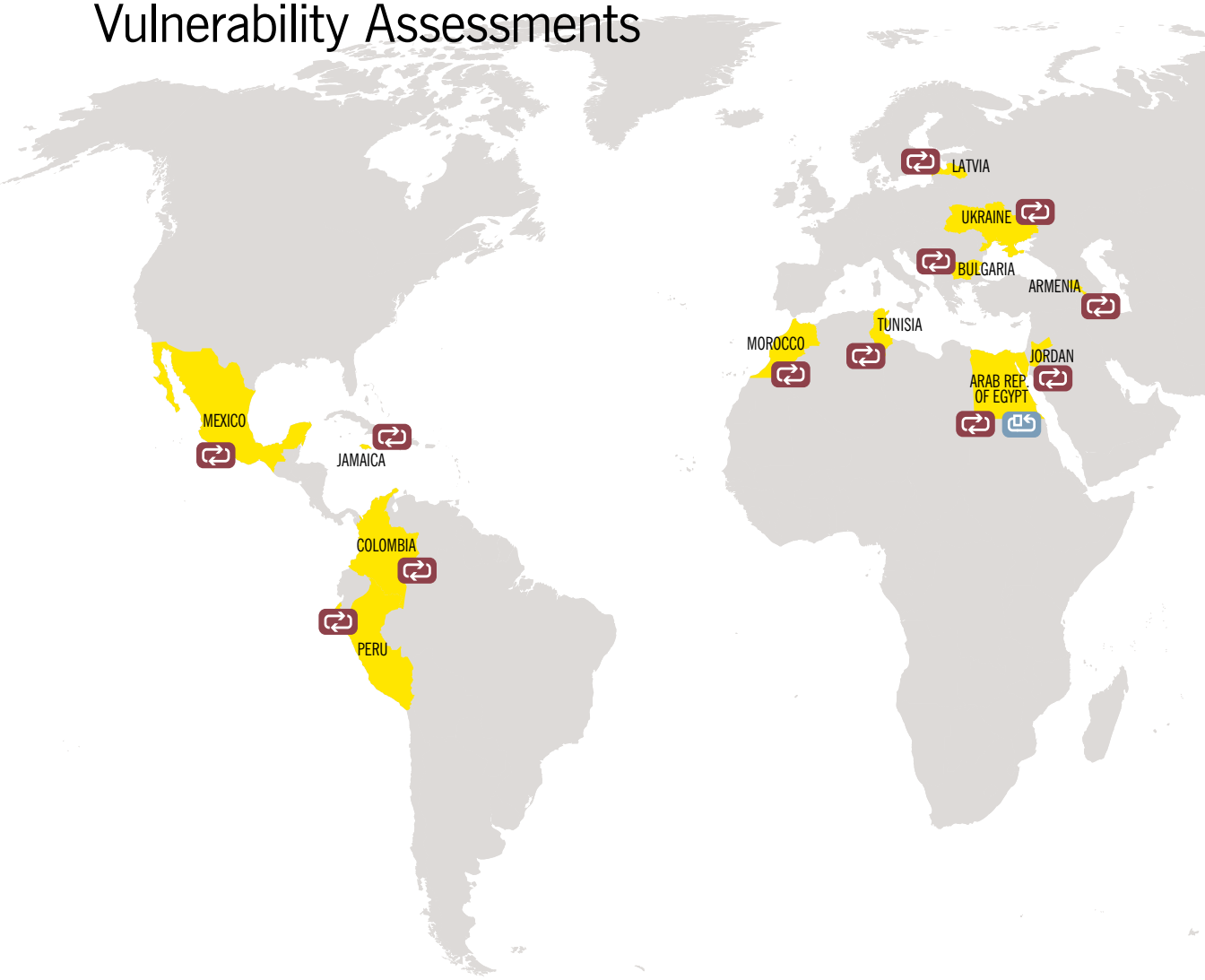
Currently, ESMAP is supporting power sector vulnerability assessments in 19 countries most affected by the global credit crisis. The assessments, which last about four to six months, first pinpoint how the credit crisis affects the power sector in a specific country. Then, the assessments identify measures that could counter the adverse effects. Finally, the assessments offer financing options to implement these projects.

The power sector vulnerability assessments are carried out in two stages:

- **Review of Potential Financing Needs for Existing and Future Power Projects** by examining investment plans and other relevant information of ongoing and planned projects.
- **Identification of Possible Interventions** based on the information gathered from stakeholders that comprises a demand/supply analysis, assessment of the financing gap, and a strategic response proposal, including a proposed financing plan to close the gap that also identifies projects suitable for WBG support.

Capital market financing of infrastructure investment in developing countries has declined from US$200 billion in 2007 to US$135 billion in 2008, with a further decline expected in 2009.

ESMAP Power Sector Vulnerability Assessments



Completed ESMAP Power Sector Vulnerability Assessments

Indonesia
Philippines
Vietnam

Ongoing ESMAP Vulnerability Assessments

Armenia
Bangladesh
Bulgaria
Colombia
Egypt
India (pending)
Jamaica
Jordan
Kyrgyz Republic
Latvia
Mexico
Mongolia
Morocco
Peru
Tunisia
Ukraine

Snapshot from East Asia

Declining investments in the power sector, especially during times of economic and financial crisis, affect long-term economic growth. For example, in the aftermath of the 1997 Asian financial crisis, Indonesia faced load shedding in many of its islands. Its overall energy infrastructure quality also lagged behind its neighbors, such as Thailand, Taiwan, China, and Sri Lanka. Indonesia's average economic growth in the decade after the Asian financial crisis languished at 2.8% compared to 7.4% in the decade before the crisis. The decline in Indonesia's economic growth was partly the result of underinvestment in energy and other infrastructure.

ESMAP's power sector vulnerability assessment of East Asia reveals a funding gap in **Indonesia** of US$1.3 billion for 2009–10. For comparison, the funding gaps for **Vietnam** and **Philippines** are estimated at US$800 million and US$1.6 billion, respectively.

	Pre-Crisis Funding estimate 2009–13 US$ millions	WB estimate based on post-crisis demand 2009–10 US$ millions	Funding secured through end 2008 US$ millions	Funding Gap 2009–10 US$ millions
EVN, Vietnam	7,847	3,897	2,553	787
PLN, Indonesia	8,071	4,333	3,047	1,286
PSALMTransco Phillipines (NPC Debt Overhang, Transco costs, stranded costs)	**PSALM NPC Debt Repayment Obligation 2009–13** US$ millions 5,280	**PSALM NPC Debt Repayment Obligation 2009–10** US$ millions 3,750	**Privatization Proceeds through end 2008** US$ millions 935	**Funding Gap net of privatization proceeds of $US 2,190 mln 2009–10** US$ millions 1,560
Total	**21,198**	**11,980**	**6,535**	**3,633**

Follow-up Assessments
Philippines
Vietnam
Egypt

Oil Price Volatility Assessments

Sharp fluctuations in oil prices have contributed to the instability of the global economy and could worsen the current financial and economic crisis. Between January 2002 and July 2008, world oil prices increased sevenfold. Natural gas and internationally traded coal prices moved in tandem with oil prices. Since July 2008, fuel prices have declined considerably. Large energy price changes affect relative costs of technologies and price volatility is one of the greatest obstacles to developing alternative energy. The possibility that prices may increase again in the next few years is leading countries to adopt policies for restraining demand and developing a more diversified energy portfolio to cope better with future shocks.

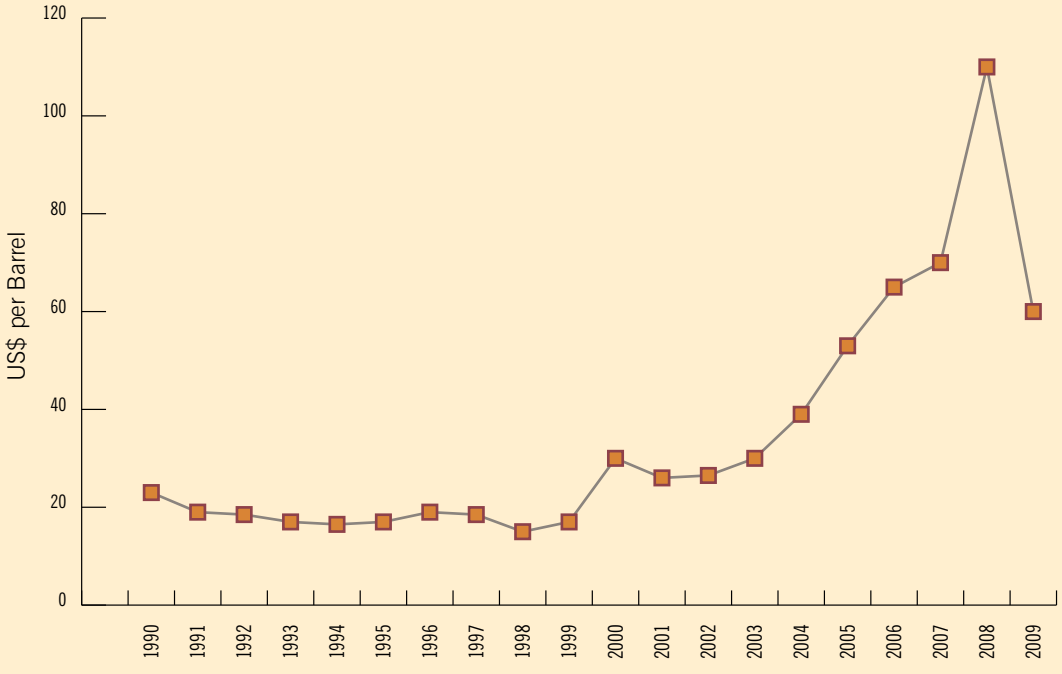
ESMAP's **Oil Price Volatility Assessment** has examined measurements of oil price volatility and evaluated different policy instruments to coping with oil price volatility—hedging security stocks, price-smoothing schemes, taxation, and reducing dependence on oil, including diversification.[1]

Ongoing work builds on these findings by focusing on Central America and the Caribbean. The power sectors of this region are particularly affected by volatile oil prices as oil prices are a major driver of electricity costs. The study will explore policy measures to deal with oil price volatility in the power sector. Short-term strategies to manage the impact of high and volatile oil prices will address the availability and potential usage of financial instruments to manage risks. While the previous ESMAP report concluded that governments have historically made low use of hedging programs in managing fuel risks, this study will propose comprehensive strategies that are practical and actionable for countries in the region. The report will explore the feasibility of more customized instruments, such as basis swaps that eliminate a great deal of residual risk while avoiding large capital commitments of exchange-traded contracts. Petroleum stabilization funds and other price-smoothing mechanisms will also be explored as part of short-term strategies that are relatively easy to implement.

Demand-side management proposals will be outlined as medium-term solutions for managing exposure to oil. Action plans to reduce oil consumption will leverage more traditional conservation techniques in power consumption. Pricing policies in particular will be examined to determine whether consumers are provided with sufficient incentives to conserve energy.

[1] *Coping with Oil Price Volatility*. ESMAP Special Report 05/08.

Average Annual Price of Crude Oil (1990–2009)



Source: The World Bank Development Economics Prospects Group. Note: The 2009 average price is for the first six months of the year.

Climate Vulnerability Assessments

Some regions and ecosystems are more vulnerable than others to changing climatic conditions, such as droughts, floods, and heat waves. The energy sector is potentially vulnerable to the effects of climate change. For instance, as temperatures rise energy demand will increase for space cooling and decline for space heating. Changing seasonal precipitation and temperature, including the timing of snow melt, could affect run-off and, thus, the output from hydropower plants. The consequences vary by energy asset type, but may include financial loss, stress on energy supply, and environmental or social risks. Climate change adds cost and risk to development.

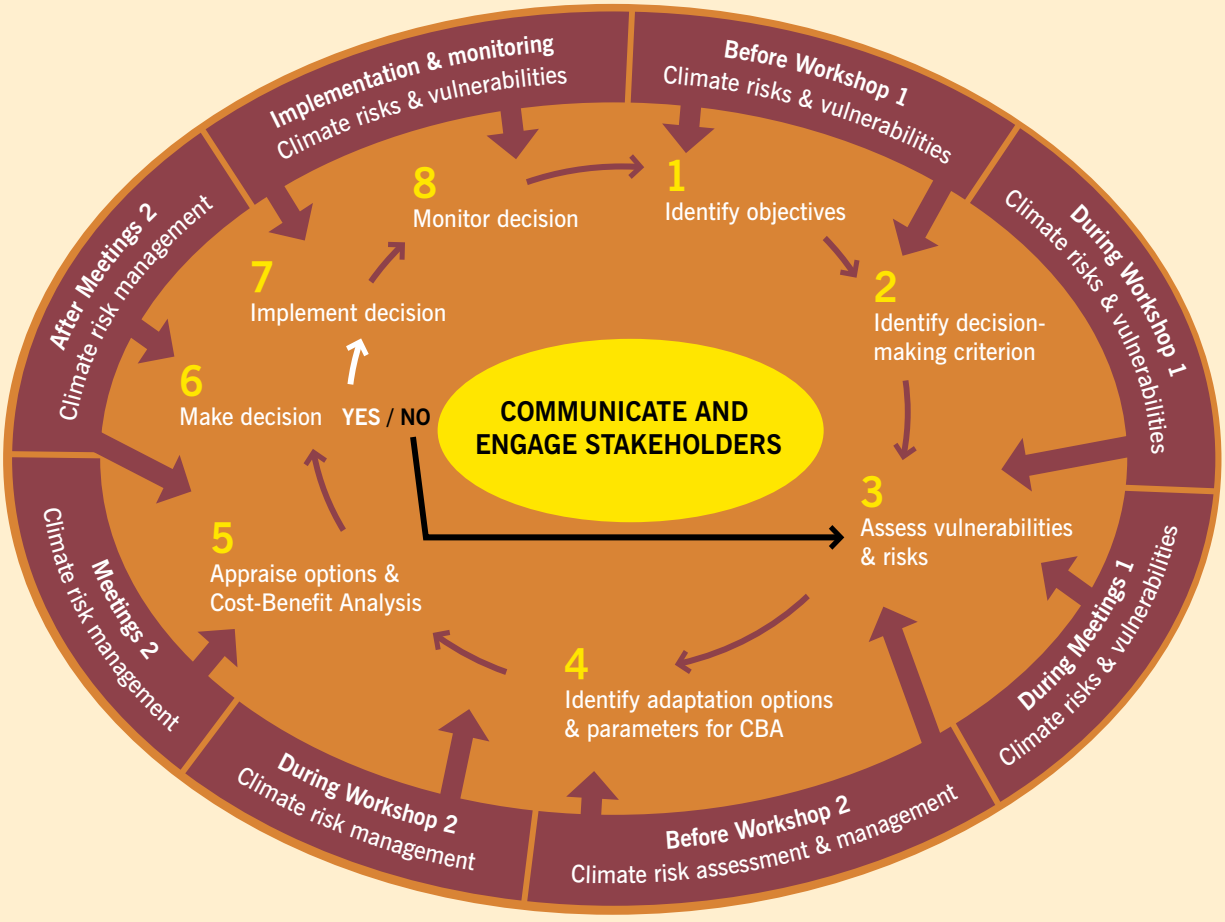
ESMAP's **Climate Vulnerability Assessments** has developed a framework for decision-making to support adaptation of energy infrastructure vulnerable to climate change. The framework is a first step in bringing together policymakers, planners, asset owners, academics, and civil society to discuss a country's energy sector and the risks it may face from current weather and projected climate change. Drawing on experience and published guidance from the United Kingdom and Australia, the program uses a bottom-up, stakeholder-based, qualitative risk assessment approach to identify possible adaptation measures, their costs, and benefits in a developing country context. The program proposes pilots in two countries in Europe and Central Asia and a toolkit documenting the approach and methodology by 2010.

The climate vulnerability assessment puts stakeholders at the heart of the decision-making process and involves:

- Climate risk screening of the energy sector to identify and prioritize hazards, current vulnerabilities, and risks from projected climate changes out to the year 2050
- Identification of adaptation options to reduce overall vulnerability
- High-level cost benefit analysis of key physical adaptation options

The goal of this pilot program is to test approaches that can help countries and energy sector stakeholders develop policies and projects—future energy assets—that are robust in the face of climatic uncertainties, and assist them in managing existing energy concerns as the climate changes. Climate change vulnerability assessments can help identify ways to build in resilience to climate change at the planning and designing stages of new energy infrastructure projects when costs are lowest.

Decision-making Framework for Adapting Vulnerable Energy Infrastructure to Climate Change



The **Energy Sector Management Assistance Program (ESMAP)** is a global knowledge and technical assistance program administered by The World Bank and assists low- and middle-income countries to increase know how and institutional capability to achieve environmentally sustainable energy solutions for poverty reduction and economic growth.

For more information on the **Country Energy Sector Vulnerability Assessments Program** or about ESMAP's energy assessments and strategy work, please visit us or write to us at:

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