

Scoping, assessing and treating the risks associated with renewable energy projects in emerging and developing countries through innovative approaches were the main objectives of the United Nations Environment Programme (UNEP) initiative "Assessment of financial risk management instruments for renewable energy projects" funded by the Global Environment Facility (GEF).

The Risk Due Diligence Process in Renewable Energy Projects

When considering investing in a renewable energy project, a financier assesses the risk/return profile of the investment by looking at each individual risk and the means to mitigate its potential impact on the project. A lender will specifically focus on the ability of the borrower – or, in the case of project finance, the project- to make loan repayments. An equity investor will base his decision on an estimation of the risk-adjusted return of the project.

For on-grid renewable energy projects, the returns are usually easy to assess but not the risks. When it comes to off-grid business models, a financier has difficulty understanding both the risks and the returns.

Continued support for Renewable Energy Technology (RET) projects and their future success is dependent upon the involvement of the financing community. As investors and lenders are averse to risks that can give rise to unexpected reductions in a firm's or project's cash flows, value, or earnings, the application of appropriate risk management instruments is essential.

The process of risk allocation and due diligence is important and requires the project sponsors to have an excellent understanding of the technologies and markets in which the project is being implemented. Ultimately the investors and lenders attempt to strike a deal that allocates risks to the party best able to handle them, that provides ways to measure the project's performance and that gives some monetary safeguards to project investors and lenders.

Fund investors, creditors and guarantors are often more concerned about operational and financial risks being taken by the project sponsor relative to its financial and management capability and operational track record. Sponsors and governments may be concerned about the financial risk aversion of creditors

and their ongoing commitment should the project run into difficulties during construction.

For the same project, the risk borne by each of the parties is different, especially in project finance. The first step to mitigating project risks in developing countries is to identify which party involved in a project is 'best placed' to take on a particular type of risk. Risks may also be allocated to parties whose actions influence the probability of a particular risk materializing. What represents unacceptable risk to one investor e.g. the future value of carbon credits, may not be seen as a significant risk by another.

Risks concerning events that neither governments nor project sponsors can control need to be covered by insurance or other contracts/solutions from private sources depending on the insurance premium demanded relative to the risk and to the possibility of assessing accurately that risk.

Where such insurance is unavailable or premiums are too expensive, then public assistance may be required to mitigate risk, for instance through the offering of guarantees. Along with subsidized insurance cover and credit enhancement vehicles, public funds can be usefully employed to securitize revenue streams using contingent capital. When a structure for risk sharing can be identified and agreed upon, each of the key risks involved can be allocated and priced under contractually binding arrangements.

Standard due diligence steps for renewable energy projects

Business plan (including fatal flaw analysis)

Financial models showing how the project will incur expenses and generate revenues over its life, based on:	Simulations using historical data on technology performance, weather, etc
	Assessment of sales projections, market, off-takers, input costs, competitors and substitutes
	Projected cash flows, margins, IRR, NPV
	Sensitivity to changes in key assumptions
	Fuel source and security - eg. wind resource assessments
Permits and environmental approval - required for projects to begin construction and operation.	
Technology involved - reliability and operating history.	
Power Purchase Agreements, Green Certificates, Carbon Credits	
Price per kilowatt hour of electricity/tenor or agreement.	
Experience and reliability / creditworthiness of all parties involved.	
Schedule of project milestones for completion of various tasks.	
Security payments that the contract requires	
Insurance provisions for any losses than can impact on revenue generation.	
Regulatory environment - possibility of changes to policy environment which can affect the economics of the project.	
Financial interest in project.	
Other risk elements that can impact the project's ability to service its debt.	

Why invest in renewable energy projects?

The total primary energy supply across the world in 2006 was 11,741 Mtoe*, and it is estimated to increase to 17,721 Mtoe* by 2030 with over 60%* expected to come from non-OECD countries. Over 80%* of this energy supply today comes from using conventional fossil fuels. However, the fossil fuel reserves across the world have been considerably exploited and there have been no significant new reserves found. Moreover, recent concerns pertaining to the environmental impact of burning fossil fuels imply that there is an urgent and imperative need to identify and invest in alternate, clean sources of energy.

However, several renewable energy technologies have failed to live up to their full potential to date. Even where technologies have moved to the stage of commercialization, there are several barriers such as risk perceptions that hinder their financing. Appropriate risk management approaches and tools when used can make non solvent projects become commercially viable notably in developing countries.

[*Data Source: International Energy Agency, Key World Energy Statistics 2008]

Identifying the risks and barriers to investment

Barriers affecting investments in renewable energy projects lead to risk perception. In emerging and developing countries, these barriers, both real as well as potential, include:

- Unavailability or poor quality of information, such as historical weather or technology data, which is needed by lenders and underwriters in assessing a renewable energy project's viability.
- Small scale of the projects, lack of technology efficacy, operational risks and regulatory uncertainty.

The risks associated with renewable energy projects, irrespective of size, can be classified as follows:

- Regulatory and policy issues that favour conventional energy sources or hamper RETs and insecure legislation with respect to take off contracts/ feed-in laws.
- Energy market distortions: direct financial subsidies and preferential tax treatment for fossil fuel industries; non Value Added Tax (Vat) reductions on the manufacturing of renewable energy components and absence of other tax incentives in a number of countries.
- Deficiencies in policy frameworks which consist of the financial, legal and institutional structures supporting renewable energy projects.
- Credit issues, inadequate loan tenors, and lack of bankable structures.

There exists a financing continuum for renewable energy projects depending upon the scale of the project and the stakeholders involved, which consists of:

- Project finance for large renewable energy projects;
- Corporate finance for small on-grid renewable projects and new technologies;
- Consumer finance (e.g. loan programmes) and microfinance for off-grid renewable projects.

Given that renewable projects are of a smaller scale and therefore have a higher opportunity cost, innovative insurance solutions are likely to be provided by small to medium-sized specialist risk transfer / finance operation with dedicated capital and low overheads. While existing insurance products are being customized to address certain risks in the renewable sector, in some countries institutional inertia is preventing significant progress with regards to product development.

There are several new risk management instruments and approaches – alternative risk transfer products, specialist underwriting vehicles, credit derivatives, political risk insurance, etc – which can be adapted to address the needs of the renewable energy sector.

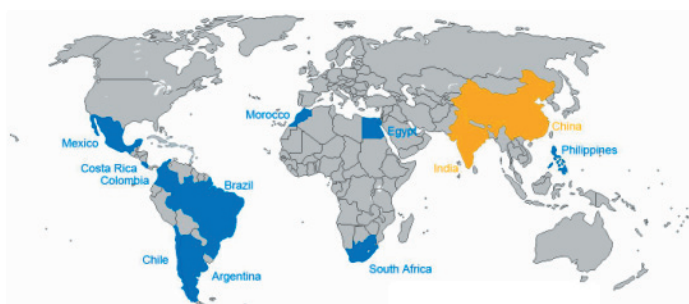
Triggering innovative financial risk management approaches

Wind power derivatives

UNEP supported the development of a methodology for the structuring of Wind Power Derivatives for developing countries, by partnering with two leading insurance companies, Paris Re (formerly known as AxaRe) and Marsh Finances, with the objective to evaluate the effectiveness of weather derivatives as alternative risk management tools given the legal and actuarial framework of selected emerging and developing countries.

Challenge 1

Weather derivatives for renewable energy projects are expensive. The aim of the UNEP-GEF sponsored feasibility study was to develop a wind power derivative for wind farms in Mexico at an affordable premium using an innovative financial model. The Mexican Wind Farm La Venta III (101 MW) was chosen as a pilot project.



Countries where the wind derivative reserve model can be replicated

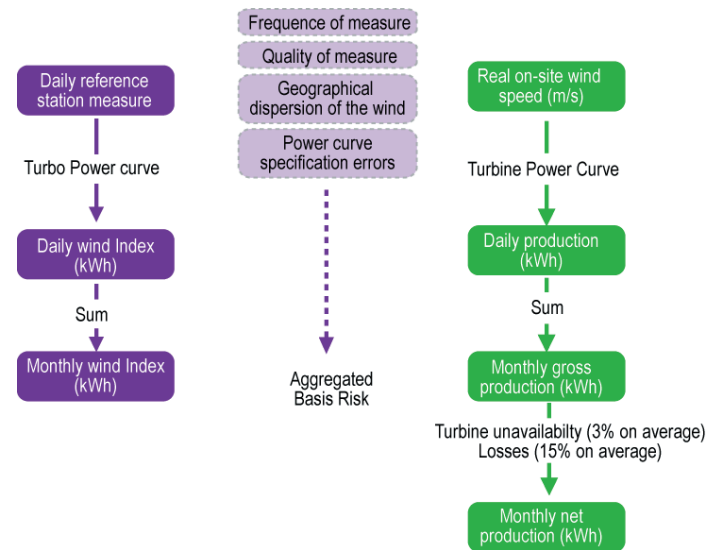
Challenge 2

Lack of viable and complete wind speed data series in developing countries. Marsh and Paris Re explored different quantitative approaches that can be used to exploit discontinued series of historical wind speed data to develop a wind index for a wind power derivative.

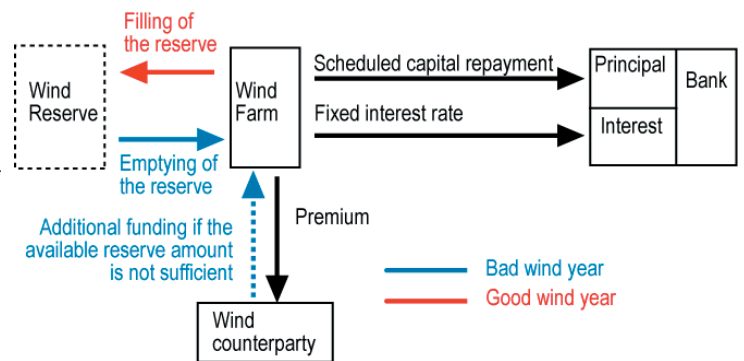
Challenge 3

The legal feasibility of a wind power derivative. In Mexico, like in a number of other countries, the law does not allow the selling or buying of weather derivatives as financial contracts. Therefore the wind farm investor is not allowed to sign a direct financial contract. However, an insurance contract between the wind project and a local insurer is permitted.

Construction of a wind index



Wind Derivative Reserve Mechanism



	Gross production level guaranteed		Equivalent net production		Weather Market Capacity	Wind Reserve Premium		
	(per turbine)	(in MWh)	(per turbine)	(for the wind farm)	(for wind farm)	(in \$ for total covered period)	(in % of monthly revenues)	(in \$ for total covered period)
(Pxx)					(in \$ for total covered period)	(in \$ per month)	(in % of monthly revenues)	(in \$ for total covered period)
P50	355 MWh	290 MWh	35 GWh	8.2 m\$	(90-110) k\$	5%	6 m\$	
P70	335 MWh	275 MWh	33 GWh	3.3 m\$	(30-40)k\$	2%	2 m\$	
P90	302 MWh	250 MWh	30 GWh	1.2 m\$	(5-10)k\$	0.5%	500 k\$	

These indicative premium levels have been estimated by Marsh and confirmed by Paris Re. These levels would have to be reconfirmed with real project data.

Solution

Wind speed data from neighboring sites and grid data were used to define the wind index spread and the wind derivative was structured as an insurance contract. This UNEP-GEF sponsored feasibility study has confirmed the interest of wind risk coverage for wind energy projects in developing countries, but also pointed out the difficulty of implementing such products with the level of premium requested for traditional wind derivatives (around 16% of monthly revenues for a swap derivative). Therefore, an innovative structure, more adapted to the specific periodicity of wind risk and financial structure of wind energy projects, has been developed: the wind reserve derivative.

As a result of this UNEP-GEF study, a wind power derivative using a reserve finance model is now being offered at a competitive premium by Paris Re for Mexico and other emerging and developing markets.

Global Renewable Energy Insurance Facility

UNEP partnered with MunichRe, RSA insurance, CarbonRe and consulted with a number of market players to support the development of a Global Renewable Energy Insurance Facility with a special focus on medium and large scale renewable energy projects (wind, solar, biomass and hydropower) in developing and emerging countries. In addition to standard renewable energy insurance, the facility will offer special lines which include Country and Political Risk, Third Party Counter Credit and Credit Insurance Covers.

Challenge 1

Need for centralized insurance channels for the renewable energy markets of developing countries. The aim of this UNEP public private partnership was to identify the appropriate structure and operational tools that need to be developed to provide renewable energy project developers operating in emerging and developing countries with easy, cost effective and timely access to adapted insurance.

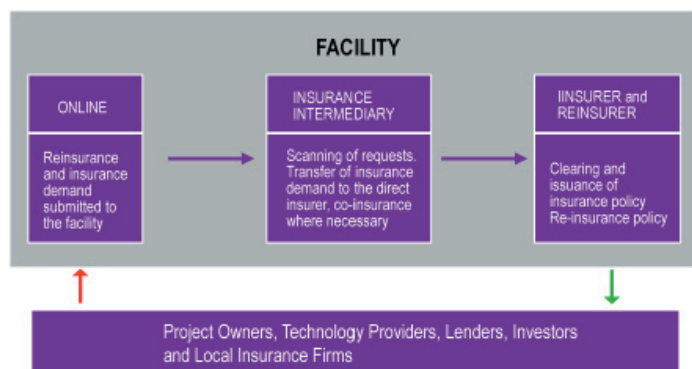
Challenge 2

Overcome the risk and business context perception that investors have of renewable energy markets in developing and emerging countries. UNEP believes that when business acts as an initiator on the renewable energy markets, it can result in beneficial policy initiatives and reforms that will help scale up investments in the field.

Solution

UNEP supported the constitution of a unique partnership between the leading re-insurance and insurance companies, Munich Re and RSA insurance who worked with UNEP to assess the potential of renewable energy markets of developing countries and took the initiative to structure and launch a commercial facility that will provide innovative risk management advice and insurance solutions to project developers operating in developing countries to address renewable energy specific risks. The facility will be managed by CarbonRe, an international insurance broker specialized in clean energy projects.

During a first implementation phase, the Facility will be operated online from the following website (operational in December 2008)
<http://www.insurance4renewables.com>



Facility Operational Structure

Wind Reinsurance Facility for China and South-East Asia

UNEP worked with Marsh, the World's leading insurance brokerage firm and risk advisor and Ascot Renewco, a Lloyd's syndicate specializing in renewable energy reinsurance, to assess the feasibility of a Reinsurance Facility for large and medium scale wind farms in China and other South Asian countries. Both companies are already offering insurance covers for renewable energy projects in China.

Challenge 1

Wind energy insurance is broadly available in domestic markets in China but suffers due to intense competition leading to price cutting and consequent poor underwriting results. Most importantly, the domestic insurance industry has limited underwriting experience and expertise in respect of revenue stream protection during both construction and operational phases inhibiting developers' access to debt financing.

Challenge 2

Improving the investment grade credit rating for wind energy projects in China and attracting alternative risk capital to support new risk management market structures in the emerging carbon trading market.

Challenge 3

Attracting multi-lateral lenders or guarantors within a public-private-partnership framework which would minimize the need for them to extend risk and draw specialist engineering consultancy services to a wind energy financial risk management platform on a portfolio versus project basis.

Solution

Under the UNEP umbrella, Marsh, with support from Ascot Renewco, has conducted a thorough market study and consultations with key stakeholders on the Chinese and Asian markets before concluding to the feasibility of a renewable energy reinsurance facility and/or development of a "Special Purpose Underwriting Vehicle (SPUV)" for the People's Republic of China with direct focus on projects related to wind energy. The development of a "Specialist Reinsurance facility" or "Wind Energy SPUV" would represent a convergence of multiple factors for renewable energy investment. For instance, the reinsurance facility structured within a Lloyd's syndicate umbrella framework would benefit the credit rating of projects, secure investments and increase project profitability. Marsh is currently envisaging launching the facility with a selected team of experts for China and later for the rest of the Asian market.

Development of Insurance Products for Small Scale Biomass Projects

UNEP has worked with the Indian leading insurance and financial companies IFFCO-Tokio General Insurance, National Insurance Company, ICICI Lombard General Insurance and ICICI Bank to assess the most appropriate risk management products and lines of business to address the credit and crop price fluctuation risk in small scale biomass projects (including biodiesel) in India.

Insurance solutions

While adapted insurance approaches are lacking and still need to be further examined to address fuel supply and pricing risks, and other supply chain management risks, business interruption insurance policies can provide compensation for loss of profits arising from shutdown in Biomass Power Plants caused by shortage of fuel. Hedging instruments such as Crop Futures Contracts and Credit Default Guarantee mechanisms can be considered as possible alternatives.

Financial schemes

Partial credit and/or guarantee schemes appear to be the most promising risk mitigation tool for small scale biomass projects in India and other countries.

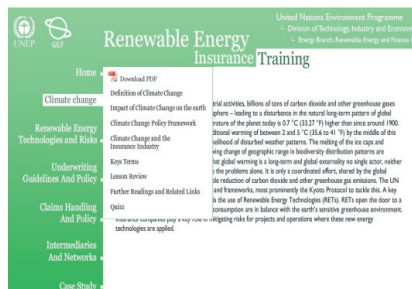
Within the framework of the risk management work conducted by UNEP, ICICI Bank (India) has suggested testing several financial schemes including first loss reserve mechanisms to scale up investments in small clean energy projects. United Bank of Africa (UBA), one of the five leading commercial banks in Africa, is also examining with UNEP the implementation of a partial guarantee mechanism, cofinanced by the bank, for small scale renewable energy projects in selected West African states.

UNEP Training tool on risk management in renewable energy projects

UNEP and CarbonRe have worked together to develop training material for insurers and other project stakeholders with the aim to enhance their understanding of:

1. Climate change policy discussions and associated renewable energy market opportunities
2. Renewable Energy Technologies and risks
3. Underwriting Guidelines and policy
4. Claims handling and policy
5. Role of insurance intermediaries and networks
6. Added value of insurance in renewable energy projects (Case Studies)

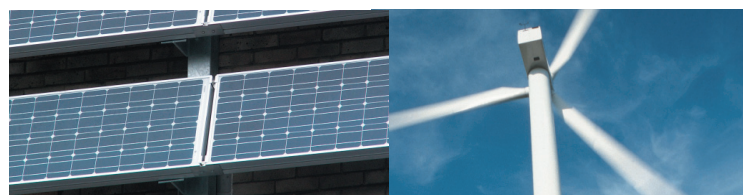
The training kit will be made available free of cost on the UNEP website starting December 2008.



- Assessment of Financial Risk Management Instruments in Large-scale Projects: case study (UNEP/GEF/Marsh, July 2007)
- Financial Risk Management Instruments in Small and Medium-scale Projects (UNEP/GEF/MacLean, July 2007)

Feasibility studies reports:

- Wind Power Derivative for Large Scale Wind Farm Projects in Mexico, by Marsh Finances and Paris Re (May 2008)
- Renewable Energy Insurance Facility for Wind Farm Projects in the People's Republic of China (PRC), by Marsh UK and Ascot Renewco (August 2008)
- Global Renewable Energy Insurance Facility for Large and Medium Scale Renewable Energy Projects, by Carbon Re, Munich Re, RSA insurance, Climate Capital, GSDP, PRS and UPCAR Tunisia. (October 2008)
- Insurance Solutions for Small Scale Biomass Power projects in India, by Crestar Capital. (September 2008)



For more information

Fatma Ben Fadhl
 Project Manager
 Email: fbenfadhl@unep.fr
 Tel: +33 1 44 37 14 68
 Fax: +33 1 44 37 14 74
<http://www.unep.fr/energy/finance/risk>

UNEP
 Division on Technology, Industry and Economics
 Renewable Energy and Finance Unit
<http://www.unep.fr/energy/finance>

Facilitating risk management through Public-Private Partnership programmes

On 13 and 14 October 2008, UNEP held a Roundtable on Financial Risk Management for Renewable Energy Projects which was attended by approximately 50 participants representing more than 30 different organizations from both developing and industrialized countries. The aim of the event was to initiate a dialogue between leading market players and public representatives on the barriers to and opportunities for the development and use of financial risk management instruments in renewable energy projects in the context of different regions. The discussions led to a set of recommendations to UNEP and other international organizations on how to facilitate the deployment of financial risk management instruments through PPPs and to build on past work in the following areas:

- Communication
- Renewable energy policy
- Certification and standardization
- Large-scale financing
- Small-scale financing
- Post 2012 (post Kyoto framework)
- Working with the Global Environment Facility (GEF)

Reports & Publications

Project reports:

- Background Study on Financial Risk Management Instruments for Renewable Energy Projects (UNEP, 2006)
- Scoping Study on Financial Risk Management Instruments for Renewable Energy Projects (UNEP, 2006)
- Survey of Insurance Availability for Renewable Energy Projects (UNEP, March 2006)
- Financial Risk Management Instruments in Geothermal Projects (UNEP/GEF/World Bank, December 2006)

Project publications:

- Financial Risk Management Instruments in Renewable Energy Projects (UNEP/SEFI, 2004)



About UNEP

As an innovating agency of the United Nations system working with the finance sector since the late 1990s, UNEP works with the private sector to identify new investment approaches, to reduce transaction costs and to manage related financial risks with renewable energy projects in emerging and developing countries. Through its Renewable Energy and Finance Unit, UNEP has implemented a variety of support programmes, including seed financing, enterprise development, credit enhancements and financial advisory support facilities. This work also involves the coordination with BASE of the Sustainable Energy Finance Initiative (SEFI). <http://www.sefi.unep.org>



About the GEF

The Global Environment Facility (GEF), established in 1991, helps developing countries fund projects and programs that protect the global environment. GEF grants support projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants. <http://www.gefweb.org>

BASE About BASE

The Basel Agency for Sustainable Energy (BASE) works to promote increased finance sector engagement in sustainable energy in both developing and industrialized countries. BASE is a non-profit foundation and UNEP Collaborating Centre. It is a partner in the UNEP/BASE Sustainable Energy Finance Initiative (SEFI).