

# **Insurance-related actions to address the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and from the impact of the implementation of response measures**

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## **Executive summary**

Article. 4.8 and 4.9 of the UNFCCC and Article. 3.14 of the Kyoto Protocol call to limit adverse effects on developing countries due to the implementation of response measures to climate change, i.e. mitigation and adaptation. Emission reduction measures can create losses due to reduced export revenues of carbon rich fuels. However, modelling the magnitude of these losses has not been conclusive. In the short term, availability of renewable energy technology can be impacted by mitigation measures. Sequestration projects can enhance timber supply and reduce revenues from timber sales of other countries. Large-scale technical adaptation programmes can drive up prices for commodities used as inputs. Societal adaptation programmes can have negative impacts on neighbouring countries by reducing natural resource availability. However, climate policy measures will not only generate losses but also benefits, often in the same countries that experience losses.

Losses could be reimbursed if emitters were liable for their emissions, with liability covering direct and indirect effects of the emissions. Insurance can be provided if losses can be delineated from normal market "noise". However, the contribution of formal insurance seems to be limited due to short duration of contracts and the difficulty to calculate premia. Market-based financial derivatives allow to hedge against fuel price losses, albeit only up to a certain timeframe. The instruments are complex and entail risks, if operated without the necessary human capacity. In the long term, the best approach to prevent losses is an economic diversification. Here the CDM can be used as leverage to mobilise funds as CER revenues are perfectly negatively correlated with losses from reduced revenues of carbon-rich fuels.

## 1. Adverse effects of response measures in UNFCCC negotiations

The necessity to address negative impacts of the implementation of response measures to climate change is specified in Article 4.8 and 4.9 of the UNFCCC and Article 3.14 of its Kyoto Protocol. Article 4.8 is the key provision related to the adverse effect/impact issues in developing countries. Article 4.9 explicitly refers to the least developed nations as distinct from developing countries mentioned in Article 4.8.

Article 3.14 of the Kyoto Protocol echoes the Convention provisions on this issue by requiring Annex I Parties to strive to implement their emission targets in such a way as to minimise adverse social, environmental and economic impacts on developing countries, particularly those identified in Article 4.8 and 4.9. It also calls on the COP serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP) to consider, at its first session, what actions are necessary to minimise such adverse impacts.

The COP 7 decision on Protocol Article 3.14 includes an undertaking by Annex I Parties to provide information in their annual inventory report submitted under the Protocol on how they are striving to minimise adverse impacts on developing countries. The facilitative branch of the compliance committee shall consider such information. In addition, the decision states that Annex II Parties, and other Annex I Parties in a position to do so, should give priority to certain actions, such as removing subsidies on environmentally unsound and unsafe technologies.

A workshop on the status of modelling activities to assess the adverse effects of climate change and the impact of response measures already implemented on individual developing country Parties was held from 16 to 18 May 2002 in Bonn.

## 2. Typology of potential negative impacts of climate policy measures on developing countries and quantitative estimates.

There is a wide range of climate policy measures that has an equally wide range of potential adverse effects on developing countries. The critical issue is that the effects from the impact of the implementation of response measures for example on terms of trade, international capital flows and development efforts are unequally distributed and difficult, if not impossible to quantify. I will use simple examples in boxes to explain the different effects.

### **2.1. Greenhouse gas emissions reduction and sequestration**

Under the Kyoto Protocol, industrialised countries (Annex I countries) have quantified emission limitation and reduction obligations and thus will embark on mitigation action. The necessary scale of mitigation depends on a number of factors such as economic growth, technological development, supply of different fuels and availability of mitigation options worldwide (e.g. through the CDM). After the U.S. decision not to ratify the Kyoto Protocol and the Marrakech Accords, some model runs on the global greenhouse gas market have been done (Jotzo and Michaelowa 2002, DenElzen and Both 2002, Eyckmans et al. 2001, Blanchard et al. 2002). Several papers (Manne and Richels 2001, Lössel and Zhang

2002) model intricacies of Annex B permit supplies but completely leave aside the CDM. Most of these models conclude that the world market price of CO<sub>2</sub> would be zero if the countries in transition sell all their surplus permits. If these suppliers restrain sales, the world market price would reach about 2 to 5 €/per t CO<sub>2</sub> equivalent.

The report of the 2002 workshop concluded that although some modelling work has been done to date to assess the impact of the implementation of response measures, current models are not able to model climate policy impacts adequately. Results vary depending on the model used and on input data or assumptions. Existing models produce a wide diversity of short-term impacts, although if a full portfolio of mitigation options is used, all models show that potential adverse impacts would be reduced. In the longer term (post 2020), with more aggressive reductions, impacts may be greater – although this depends on policy choices.

So far, developing countries do not have obligations to limit or reduce emissions. Thus their activities are likely to focus on voluntary mitigation measures with economic benefits (“no regret” measures) such as abolition of fossil fuel subsidies.

#### 2.1.1 Reduction of demand for carbon-rich fuels

Any mitigation action in the energy sector will lead to a reduced demand for fossil fuels which falls particularly heavily on fuels with a high carbon content (Bartsch and Mueller 2000). This in turn will reduce world market prices for these fuels. The fall in price and export volume will reduce revenues of *fossil fuel exporting* countries. However, market share, price and maybe even absolute production of fuels with a low carbon content (natural gas) will rise due to the demand shift. Thus the adverse impacts depend on the structure of the fossil fuel market. Oil producing developing countries argue that the Kyoto Protocol, if fully implemented, would lead to a loss of revenue for them. According to OPEC’s calculations, the financial impact on these countries has been estimated a tens of billions of US dollars per year. Thus OPEC countries request Annex I countries to assist them to compensate these losses.

Countries *importing* fossil fuels will unambiguously profit from the lower prices. Due to the wide range of parameters that influence energy markets, it is impossible to unambiguously separate the price and quantity effect caused by mitigation.

#### **Box 1: Loss through reduction of demand for carbon-rich fuels**

Due to the conversion of the electricity generation system from coal to wind in Annex B country Aeolia, the coal exports from developing country Carbostan to Aeolia drop from 10 million t per annum to zero. Likewise, the coal market price falls from 20 to 10 €/per t. Due to long-term export contracts with the other importers, overall coal exports from Carbostan only fall from 50 to 40 million t but prices have to be adjusted. Carbostan claims a loss of 600 million € (1000 million € previous coal export revenues compared to 400 million € after Aeolia’s action) due to mitigation

### 2.1.2 Increased demand for renewable energy and energy efficiency technologies

Mitigation action will mean an increased investment in renewable energy / energy efficiency technology. Lower availability and higher price of such technologies for developing countries is possible, if supply cannot cope with demand in the short term. For example PV module prices have not fallen in the last years in the highly subsidised markets of Germany and Japan. German wind turbine producers shun export markets due to the high demand in their home market. However these subsidies surpass projected market prices by several orders of magnitude and it is clear that investment at rates derived from market prices will not lead to diversion of renewable technology exports. In the long run positive impacts from increased renewables investment will result. Long-term availability of renewable energy efficiency technologies will be enhanced due to economies of scale that lead to lower prices.

#### **Box 2: Loss through increased demand for mitigation technologies**

Due to a new 10,000 MW wind programme in Annex B country Aeolia, all Aeolian wind turbine manufacturers operate at full capacity. Thus the developing country Tempesto cannot place an order for 100 MW wind turbines with a producer in Aeolia. It thus has to switch to a turbine producer in Breezia which charges a price of 1200 € per kW installed instead of Aeolia's producers' list price of 1000 € per kW. Tempesto claims a loss of 20 million € (200,000 €/MW times 100 MW) due to Aeolia's mitigation

### 2.1.3 Timber market effects due to carbon sequestration in terrestrial vegetation

Carbon sequestration through afforestation and deforestation is allowed under the CDM Increased forestry activities will lead to a decrease in timber prices in the future due to the enhanced supply. This will be negative for timber exporters and positive for timber importers.

#### **Box 3: Loss through timber market effects**

In 2000, the developing country Arboria approved a CDM afforestation project on 100,000 ha whose first harvest occurs in 2020. In 2020, the country Verdura logs 10,000 ha and harvests 1 million t of timber. Due to Arboria's timber supply, timber prices fall from 50 €/t to 45 €/t. Verdura claims a loss of 5 million € (5 €/t times 1 million t) due to Arboria's sequestration.

## ***2.2 Adaptation to climate change***

In contrast to mitigation, developing countries have an interest in adaptation if they can reduce the net costs of climate change impacts. As adaptation can be anything that enhances the resilience of a society (and thus is correlated with the degree of development of a society in general), the paper will concentrate on the main options. It will not focus on the costs of adaptation but on the impacts of adaptation measures on other countries.

### 2.2.1 Technical adaptation to meteorological extremes

Adaptation to sea level rise and enhanced flooding will generate expenses for coastal and riparian protection – such as dikes, shelters, pumps and sluice-gates. These expenses will stimulate the construction industry and raise prices for corresponding inputs. As construction is a localised industry, there will not be many direct adverse impacts for other countries.

#### **Box 4: Loss due to technical adaptation**

In 2005, the developing country Neptunia builds a seawall on 500 km of coastline. Due to the high demand for building material, export prices for 1 million t of cement to neighbouring Montania increase from 55 to 65 €/t. Montania claims a loss of 10 million € (10 €/t times 1 million t) due to Neptunia's adaptation.

### 2.2.2 Societal adaptation

Adaptation not only entails technological fixes but also increases in flexibility to lower the susceptibility to climatic extremes. This entails expenses for early warning systems and for institutions such as agricultural and forestry extension services. Management of certain natural resources such as irrigation and hydropower systems or skiing resorts will have to be changed. Direct adverse effects of such activities are unlikely; in some circumstances indirect effects on resource availability could result (see Box 5). Normally, societal adaptation will have benefits concerning other economic activities and thus ancillary benefits. For example, an improved agricultural extension service will also be useful to deal with a new pest infestation that has nothing to do with climate change.

#### **Box 5: Loss due to societal adaptation**

In 2005, the developing country Fluvia introduces a new operation plan for its irrigation system to be able to withstand more severe droughts due to projected climate change. Due to the much lower cost of irrigation farmers expand irrigation and the amount of water discharged to neighbouring Desertum declines by 10%. Desertum argues that it has to reduce its irrigated area by 100,000 ha and claims a loss of 10 million € (100 €/ha times 100,000 ha) due to Fluvia's adaptation.

## 3. Principal options for alleviating losses and applications in other contexts

For a long time, insurance and financial markets have developed many instruments to deal with risks. In the climate change context, all publications have discussed only insurance /hedging against damages from climate change, not insurance against losses from action that aims to directly or indirectly reduce these damages (see e.g. Vellinga and Mills 2001). Any insurance or hedging approach will reduce the incentive to adapt behaviour to the new circumstances. Financing production increases of carbon-rich fuels out of insurance payments or proceeds from financial derivatives increases exposure to risks and undermines the capacity of the insurance / financial sector to cover such risks in the future.

### 3.1 Provision of insurance

Insurance is possible if risks, i.e. probabilities of a damaging event, can be assessed in a systematic way. Moreover, risks must be spread across a large set of entities. Most of the possible impacts from the implementation of response measures are fairly evenly spread. Insurers can also spread risks through reinsurance. However, their willingness to enter new and high-risk fields of business is limited (Mills 2003).

In the case of losses from the implementation of climate policy measures the characteristics of the event triggering insurance payments differ from normal insurable events. In the latter case, past experience has generated a probability distribution of a loss-triggering event. If events happen that go beyond this experience, premia are adjusted and insurance coverage reduced, as was the case on hurricane-stricken islands in the Caribbean.

Concerning losses arising from the implementation of climate policy measures, the following event characteristics can be found:

- Implementation of emission reduction measures invariably reduces prices of carbon rich fuels but the effect will be masked by a multitude of other influences
- Only rarely, there will be one distinct event. Normally many small activities will have a gradual influence over time
- Adverse effects from adaptation action can be specified more clearly as the adaptation action has a clear starting and end point

Insurance could thus apply in the short term if suitable definitions of loss-triggering events can be developed (see Box 6). These can include proxies.

#### **Box 6: Possible definitions of loss-generating event**

An insurance payment could become due

- when Annex B country Aeolia's wind power capacity has reached 20 GW
- when coal world market prices fall below 20 €/t
- when annual coal export revenues of developing country Carbostan fall below 300 million €
- when prices for wind turbines rise above 1200 €/kW
- when developing country Neptunia completes 500 km of seawall

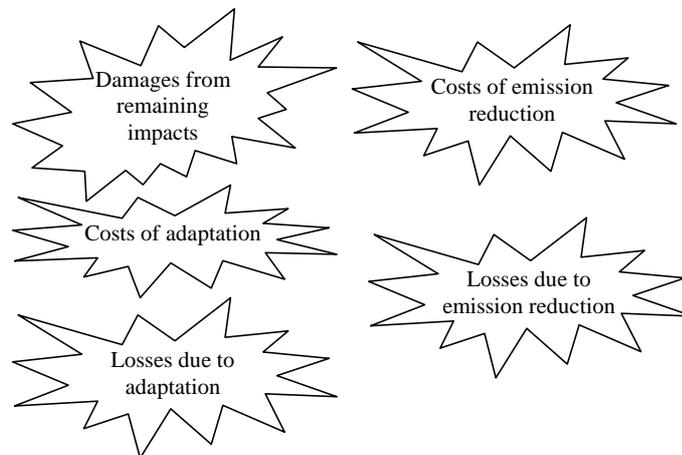
The probability of these events can be assessed and insurance providers can calculate premia. Even uninsurable losses often are spread through public funds financed essentially out of taxpayers' contributions (Vellinga and Mills 2001, p. 436). However, for climate policy damages in other countries, taxpayers' willingness to pay will be extremely low. As typically, less than 70% of the pool of insurance premia is recycled to claimants to indemnify their losses, insurance is a purchase with negative connotations for the purchaser, so that marketing costs tend to be high in a non-compulsory market. Moreover, insurance contracts generally have a duration of one year in non-life business only. While this protects the insurer from unforeseen changes in the operating environment, it tends to be associated with alarming swings in price and availability of cover (UNEP-FII 2002, p. 45).

### 3.2 Allocation of liability

Losses could be covered if greenhouse gas emitters were liable for adverse effects from their emissions (Germanwatch 2003). Tol and Verheyen (2003) argue that a country has to pay compensation if an “activity under its control does damage to another country, and if this is done on purpose or due to carelessness”. A country would thus be liable for emitters on its territory. Making such emitters liable is a process that can take decades as the cases of asbestos and tobacco production have shown, so immediate results are unlikely. However, insurers are already beginning to exclude risks from eventual future emissions liabilities in company directors-and-officers liability contracts (Ball 2003).

Liability could be defined as covering the *direct* effects of the emissions (climate change impacts) as well as costs of measures aimed at *preventing the direct effects* (mitigation and adaptation). The latter costs would include losses incurred to third parties from the implementation of mitigation and adaptation (see Figure 1).

**Figure 1: Different levels of liability**



The main problems are the enforcement of liability (country level, emitter level, consumer level) and its quantification (choice of discount rate). As third party losses from the implementation of mitigation and adaptation would accrue quickly, the temporal problem related to climate change impacts would not exist here. Liable actors are likely to insure themselves. However, current environmental insurance against third party liability is only done after a very careful risk analysis and against sudden and accidental occurrences only (UNEP-FII 2002, p. 37).

#### 3.2.1 Insurance based upon contributions from emitters

Instead of being liable directly, emitters could be mandated to pay the premia of developing country insurance against losses from climate change and climate policy. The insurance industry would have to come up with estimates for the level of premia necessary. To avoid moral hazard, the insured would have to bear a small share of losses.

In 1991, AOSIS submitted a proposal on an insurance mechanism, setting out key elements for an insurance pool to spread loss risks. This insurance pool was to draw its revenue from mandatory contributions from developed countries. While AOSIS focused on losses from

climate change, particularly sea-level-rise, losses arising from adaptation to the adverse effect of response measures could also be covered by such a pool.

### 3.2.2 Insurance based upon contributions from insurance policy holders

If the international community does not mandate emitters to pay the premia and emitters' liability cannot be enforced, developing countries would have to find the funds to pay the premia themselves. A possible source would be the funds established in the Marrakech Accords. In the case of scarcity of funds, support could be dependent on ability to pay, for example inversely linked to per-capita income.

### 3.3 Financial derivatives

There is a broad range of financial derivatives covering different lifetimes to guarantee revenue from commodity exports. Companies regularly hedge their sales. Standardised futures and options are traded on organised commodity exchanges. For metals, petroleum products, and certain agricultural products e.g. coffee, cocoa, soybean and soybean products, wheat, maize, there are relatively liquid markets, and for several commodities traded on international exchanges, the volume of contracts traded is several times the volume of physical production (International task force on commodity risk management 2003b).

However, they are only available for relatively short periods and for homogeneous commodities. Thus their applicability to buffering losses from climate policy measures is limited. Larson et al. (1998, p. 22f) describe examples how oil-exporting countries use these instruments to hedge against price decreases.

Over-the-counter (OTC) instruments are bilaterally agreed risk management instruments that are traded outside of the organised exchanges. OTC options and long-dated swaps can cover multi-year periods. They are common in the oil market, covering periods of 5 to 7 years (UNCTAD 1998a, p. 38). Thus they can form models for the reduction of losses from climate policy measures. Table 1 summarises the different instruments.

**Table 1: Financial derivatives for price hedging**

| <b>Instrument</b> | <b>Characteristics</b>   | <b>Lifetime</b>                | <b>Applicability in climate policy context</b> |
|-------------------|--|--------------------------------|--|
| Forward           | Price fixed at future date, OTC. Physical delivery expected.                                       | < 1 year                       | None   |
| Future            | Price fixed at future date, exchange. Less risky than forward due to margin payments.              | < 3 years                      | Limited  |
| Option            | Price fixed at future date, OTC or exchange. Premium paid at beginning.                            | < 3 years                      | Limited  |
| Swap              | Exchange of specified cash flows at specific intervals (series of forwards). Tailor-made contracts | < 25 years, normally < 7 years | High; can cover multiple commitment periods    |
| Commodity bond    | Repayment linked to price. Tailor-made contracts   | < 30 years                     | High; can cover multiple commitment            |

|  |  |  |         |
|--|--|--|---------|
|  |  |  | periods |
|--|--|--|---------|

*Source: for a detailed description of types, see UNCTAD (1998a)*

The higher the lifetimes, the less standardised instruments become and the higher transaction costs are. Of course, market expectations play an important role in pricing of all instruments. If the market expects a quick implementation of climate policy and a high probability of fossil fuel price decrease, premia for options / interest rates for commodity loans and bonds will rise. The current high price level of fossil fuels due to the political insecurity in the Middle East may be a window of opportunity to negotiate contracts at attractive conditions with a duration that is as long as possible.

### **3.4 Savings and stabilisation funds**

Revenues from the export of commodities can be collected in times of high prices and be distributed in periods of low prices or declining overall production. Over the past half century, the international community has come up with stabilisation or compensatory mechanisms to help developing countries alleviate the negative impact of commodity price fluctuations. These schemes have typically taken the form of institutional arrangements for price stabilisation programs, including physical buffer stock schemes, stabilisation funds or variable tariff schemes, and marketing boards. But many of these programs that attempted to separate domestic commodity prices from international prices over time often proved financially unsustainable.

Many of the schemes failed because they were based on administratively set benchmarks which required large resource transfers in years of low prices. With limited borrowing capacity and generally unhedged exposure to price risks, the stabilisation programmes were difficult to maintain when payments were required over consecutive years. The stabilisation components of the international commodity agreements also proved unsustainable and are no longer in force (International task force on commodity risk management 2003a). More success has been achieved by accumulating savings whose returns were then used to substitute for export revenues.

Several governments use oil funds; some for savings others for stabilisation purposes (see Table 2). Looking at the oil market in Venezuela, Claessens and Varangis (1994) found that for an stabilisation fund to be effective several preconditions must be met. Most notably: oil prices should not follow a random walk; financial markets are incomplete; and there are large adjustment costs. They can only function if managed in a professional way; rules should not be changed often (Fagano 2000). Revenues of such a fund could be used for diversification. However, policymakers always have an incentive to spend money in a fund accumulated by their predecessors.

**Table 2: Oil funds**

| Name  | Country    | Start date | Value 2002 (billion €)  |
|---|------------|------------|-------------------------|
| Government Petroleum Fund                       | Norway     | 1990       | 80                      |
| Fund for Future Generations                     | Kuwait     | 1960       | Peak 100*, currently 40 |
| Alaska Permanent Reserve Fund                   | USA        | 1976       | 20                      |
| Alberta Heritage Savings Trust Fund             | Canada     | 1976       | 8                       |
| Investment Fund for Macroeconomic Stabilization | Venezuela  | 1999       | 3.5                     |
| State General Reserve Fund                      | Oman       | 1980       | 2                       |
| Foreign Exchange Reserve Account                | Iran       | 1999       | 1                       |
| National Fund                                   | Kazakhstan | 2000       | 1                       |
| State Oil Fund                                  | Azerbaijan | 1999       | 0.5                     |

\* before the Iraqi invasion in 1990, Source KUNA (2003)

*Source: Melby (2002)*

The Norwegian oil fund is designed to fund pensions in the face of declining oil revenues over decades, thus has an aim similar to multi-decadal revenue stabilisation in the face of climate policy. It spreads its investments in equities and bonds on a global scale (Government of Norway 2003). A fund will only be sustainable if it is managed in a transparent manner.

### **3.5 Diversification**

The best long-term insurance policy is to diversify away from commodities that run price and demand risks. Many fossil fuel exporting countries have a good renewable energy resource base, especially concerning solar but also wind energy. Diversification in this direction would reduce several risks at the same time. Moreover, the CDM can be harnessed to provide funding and technology for renewable energy deployment. As the CDM incentive will be the stronger, the higher the world market carbon price, it will be perfectly negatively correlated with the amount of losses due to emission reduction measures. Nevertheless, fossil fuel exporters so far have neither taken up the opportunities of the AIJ pilot phase nor are efforts visible in the upcoming CDM project pipeline.

Another direction for diversification is the production of energy-intensive commodities. As energy prices rise in Annex B countries, they will reduce domestic production of such commodities and increase imports.

Spending of funds to reduce the costs of geological carbon sequestration may lead to a situation where the carbon penalty of fossil fuels loses its relevance if sequestration becomes cost-competitive with emission reduction through renewable energy or energy efficiency.

Diversification is the only viable strategy for the very long term as hedging instruments will not be available for more than two decades at best. There is still a window of opportunity to

become an early player in the CDM market but the necessary institutional infrastructure (Designated National Authority for project approval, specialised consultants for development of project documentation) has to be developed.

#### 4. Evaluation of proposals made in the context of UNFCCC negotiations (Art. 4.8 and 4.9)

In the negotiations, the following proposals have been made

- *Cooperation between Annex I and non-Annex I Parties to create favourable conditions for investment in sectors where such investment can contribute to economic diversification.* This is a sensible proposal but depends on the willingness of Annex I countries to commit resources
- *Annex II Parties assist developing countries in meeting their capacity building needs for the implementation of country's programmes which address these impacts.* The effectiveness and sustainability depends crucially on the subjects treated.
- *Annex II Parties are urged to provide financial and technological support for strengthening the capacity of developing country Parties identified in Article 4.8 and 4.9 of the Convention for improving efficiency in upstream and downstream activities relating to fossil fuels, taking into consideration the need to improve the environmental efficiency of these activities.* This activity is counterproductive as it reduces costs of fossil fuel production and thus runs counter the effort of diversification.
- *Facilitate to develop appropriate technological options in addressing the impact of response measures, consistent with national priorities and indigenous resources.* This needs to be defined before it can be assessed properly. If aiming at support of use of modern financial hedging techniques, it makes a lot of sense.
- *Cooperate among Parties in the technological development of non-energy uses of fossil fuels, and requests Annex II Parties to support developing country Parties to this end.* This proposal only alleviates the problem if the non-energy uses do not lead to carbon emissions at the end of the lifetime of the product.
- *Cooperate among Parties in the development, diffusion and transfer of less greenhouse gas emitting advanced fossil-fuel technologies, and/or technologies relating to fossil fuels, that capture and store greenhouse gases, and requests Annex II Parties to facilitate the participation of the least developed countries and other non-Annex I Parties in this effort.* If capture of fossil fuel CO<sub>2</sub> and its geological sequestration can be achieved at low cost, the continuation of fossil fuel use would be possible without carbon emission. This would decouple mitigation from the reduction of fossil fuel use and thus avoid adverse impacts for fossil fuel exporters.
- *Annex II Parties promote investment in, support and cooperate with, developing country Parties in the development, production, distribution and transport of indigenous, less greenhouse gas emitting, environmentally sound, energy sources, including natural gas, according to the national circumstances of each of these Parties.* The effectiveness of this approach depends on elasticities of substitution between different fossil fuels.
- *Annex II Parties support for research into, and the development and use of, renewable energy, including solar and wind energy, in developing country Parties.* This is the most appropriate suggestion as it leads to a diversification, allows a leverage through the CDM and will offset losses from reduced fossil fuel export revenues through gains in the export of renewable electricity or hydrogen;

- *Identify the insurance-related actions to meet the specific needs and concerns of developing country Parties arising from the adverse effects of climate change and the negative impacts of response measures.* Here the decoupling of the two very different kinds of insurance has to be addressed.

## 5. Concluding thoughts

Instruments to reduce losses from the implementation of climate policy measures exist on different temporal levels. The contribution of formal insurance seems to be limited due to short duration of contracts and the difficulty to calculate premia. In the short term (up to three years), financial derivatives can be used to guarantee prices of carbon-rich export commodities unless the market has already depressed the price. In the medium term up to a decade, commodity bonds may fulfil the same function but are difficult to negotiate.

A long-term strategy is economic diversification where harnessing of CDM funds can provide a leverage that counteracts negative price effects on carbon-rich commodities. A geological carbon sequestration strategy would allow continued use of fossil fuels if cost-effective and irreversible storage technologies can be developed.

### 5.1. Capacity building needs

Market-based financial derivatives can be dangerous, if improperly applied. Especially for complex deals, there is often an information imbalance: the fair costs of structuring the financing, or of the risk management instrument, are only known to the provider. Nevertheless, assistance can be found by those who feel they do not have the specialised skills to evaluate such complex financial deals. Furthermore, if an inappropriate strategy is chosen (that is, a strategy that is more complex than the entity can handle), the risks of using risk management markets can be large. The purchase of options and the strategic use of swaps (in particular, if options are embedded) involves little risk, as long as decision-makers have ensured that the pricing is fair. However, using futures and over-the-counter risk management markets in a more active manner does require a good and relatively sophisticated control environment (UNCTAD 1998b).

#### 5.1.1 Role of Governments

Country officials of fossil fuel exporting countries are usually well-trained in application of financial hedging instruments. For less developed countries training courses in using financial derivatives could be an option but the fast changes in the design of derivatives leads to a quick obsolescence of acquired competencies, unless used regularly. Governments that use funds to cumulate fossil fuel export revenue could disseminate their knowledge about an effective management of such funds. Development of diversification strategies should be the focus of capacity building activities. It could be complemented by targeted CDM capacity building efforts for countries likely to suffer from adverse effects of climate policy measures.

#### 5.1.2 Role of private stakeholders

Private stakeholders, such as fossil fuel companies, actively use insurance and financial instruments for risk management purposes. So they do not need capacity building.

A targeted working group of insurers and reinsurers should be formed under the umbrella of the UNEP Finance Industry Initiatives that brings together approximately 90 insurance bodies from 27 countries (UNEP-FII 2002) to assess whether insurance products can be provided geared towards the coverage of adverse effects of climate policy measures. The question of framing of contracts and estimation of premium level should be the key task of this group.

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