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Bali, 3–11 December 2007

Item 3 of the provisional agenda

Nairobi work programme on impacts, vulnerability and adaptation to climate change

Information on economic diversification

Submissions from Parties

1. At its twenty-fifth session, the Subsidiary Body for Scientific and Technological Advice (SBSTA) invited Parties to submit to the secretariat, by 17 August 2007, information on examples of measures, methodologies and tools to increase the economic resilience of, and reduce reliance on, vulnerable sectors. It requested the secretariat to compile these submissions into a miscellaneous document to be made available to the SBSTA by its twenty-seventh session (FCCC/SBSTA/2006/11, para. 69).
2. The secretariat has received four such submissions. In accordance with the procedure for miscellaneous documents, these submissions are attached and reproduced* in the language in which they were received and without formal editing.

* These submissions have been electronically imported in order to make them available on electronic systems, including the World Wide Web. The secretariat has made every effort to ensure the correct reproduction of the texts as submitted.

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REPÚBLICA DE BOLIVIA
Ministerio de planificación del Desarrollo
Viceministerio de Planificación Territorial y Ambiental
Programa Nacional de Cambios Climáticos

Enfoque Metodológico de la Investigación Participativa
sobre la Adaptación al Cambio Climático en Comunidades Rurales de Regiones de Montaña de
Bolivia

1. Introducción.-

Para evaluar los Impactos, la Vulnerabilidad y la Adaptación al cambio climático en regiones de montaña de Bolivia se ha escogido una metodología de evaluación e investigación participativa para sistematizar y poner en concierto el conocimiento de la comunidad académica, de los agricultores, de extensionistas y de tomadores de decisión en el nivel local sobre los cambios climáticos y sus impactos sobre la producción, los recursos naturales y la salud.

Las metodologías participativas han logrado demostrar en los últimos 20 años que es posible rescatar conocimientos valiosos y experiencia de la gente que puede ser puesto en consonancia con un conocimiento más académico y riguroso. Así mismo en estos 20 años, las agencias de desarrollo han logrado construir una biblioteca extensa de manuales, guías y herramientas participativas que son de fácil utilización una vez que se reconocen algunos principios básicos:

- Por lo general se tiende a poner el conocimiento académico como un conocimiento riguroso y libre de orientación política y/o percepción subjetiva, sin embargo, el conocimiento científico también es subjetivo o está determinado por una determinada corriente o perspectiva,
- La investigación no debe ser para guardarla en los anaqueles sino para ganar en perspectiva para la acción,
- Se tiende a poner mucho como resultado de encuestas y estadísticas, sin embargo el apego a los números y lo cuantitativo por lo general le pone ruido a lo esencial y cualitativo.
- Para poder dialogar es importante buscar un lenguaje honesto, simple y franco que refleje lo más que se pueda el conocimiento, la reflexión y las posibles dudas y no esconder el conocimiento detrás de un lenguaje academicista, difícil y que nadie entiende.

Entendemos que la investigación participativa es una especie de preparación para la acción, en este caso el proyecto ha definido dos regiones piloto en Bolivia con el objetivo de iniciar acciones de adaptación

en los ámbitos locales de Bolivia. Estas dos regiones se han denominado de acuerdo a criterios de manejo de cuencas, de división política:

- La cuenca del Altiplano Norte en la región del Lago Titicaca
- La región de Valles Cruceños en la Mancomunidad de Vallegrande

2. El marco conceptual: Resiliencia, aprendizaje social y capacidad adaptativa

Resiliencia

Aunque existe un cierto nivel de consolidación del entendimiento de la resiliencia como la capacidad interna de un sistema de adecuarse a situaciones adversas, el término se ha venido usando en diferentes ámbitos académicos, desde la teoría de sistemas hasta la psicología, la ecología y las ciencias del comportamiento con diversos enfoques y perspectivas.

Desde el punto de vista de la psicología el enfoque ha estado más vinculado a la capacidad de los individuos de salir airosos de situaciones adversas mientras que en las ciencias ecológicas la resiliencia se ha relacionado con la adaptabilidad de un determinado sistema o la respuesta interna de un sistema a mayor variabilidad y por último un enfoque emergente de las ciencias de la complejidad que empiezan a encontrar asideros en una discusión sobre resiliencia colectiva o comunitaria.

En la psicología existen dos nociones principales que contribuyen al nivel de resiliencia de una persona, por una parte según (Levav 1995) la robustez (hardiness) de una persona depende del nivel de Compromiso, Desafío y Oportunidad que esta asuma en relación a su entorno y (Luthar 1993) que describe a la capacidad de solucionar problemas como el elemento central de la competencia de una persona, así mismo Wolin y Wolin 1993 sistematizan las características personales de individuos resilientes.

Esta claro que llevar estas conclusiones al nivel de la sociedad no esta libre de mayor complejidad, aunque todavía existen dos nociones importantes una desde el punto de vista estructural de las virtudes sociales y otra desde el punto de vista de la promoción la resiliencia. En el cuadro 1, se ha hecho el esfuerzo de poner en concierto estos dos aspectos.

Cuadro 1: El Concepto de resiliencia según diferentes autores

Elementos de robustez Mencionados por (Levav 1995)	Elementos de la resiliencia mencionados por (Wolin y Wolin 1993)	Aspectos de Resiliencia Comunitaria (Varias fuentes)	Aspectos que promueven la resiliencia (Werner 1989) (Gazmezy 1993)
Compromiso	Moralidad Introspección (Insight): Sentido del Humor ¹ Independencia La capacidad de relacionarse	Identidad Cultural Humor Social Solidaridad	La unidad, el amor, y la preocupación por los grupos vulnerables Reflexión
Desafío	Iniciativa	Autoestima Colectiva	El buen uso de la Inteligencia
Oportunidad	Creatividad		
		Honestidad Estatal Liderazgo Auténtico	Apoyo externo
Elementos de Competencia (Luthar 1993)			Inteligencia y habilidad de resolución de problemas (Sameroff & Seifer 1990)

Aprendizaje social

Ver el proceso adaptativo como un proceso de aprendizaje resalta tanto los procesos tangibles o materiales, como han venido siendo conducidos inicialmente por la comunidad internacional en el marco de “Adaptación al Cambio Climático” pero también aquellos procesos más intangibles que tienen que ver con cambios de actitud y/o de comportamiento resultantes de un proceso de aprendizaje.

El aprendizaje en una comunidad surge de dos procesos. Por una parte surge de una interacción continua con el entorno socioeconómico y biofísico, las acciones adaptativas son la fuente del aprendizaje a través de un proceso de “ensayo – error” o de “aprender haciendo” y que quedan en la memoria de una determinada sociedad a través de la experiencia.

Desde el punto de vista del proceso adaptativo y del aprendizaje, que son procesos continuos, es interesante observar que tanto la adaptación como el aprendizaje son procesos cíclicos (ver figura 3.1).

¹ El sentido del humor como elemento de la introspección, “Quien ejerza la difícil virtud de reírse de si mismo ganará en libertad interior y fuerza”

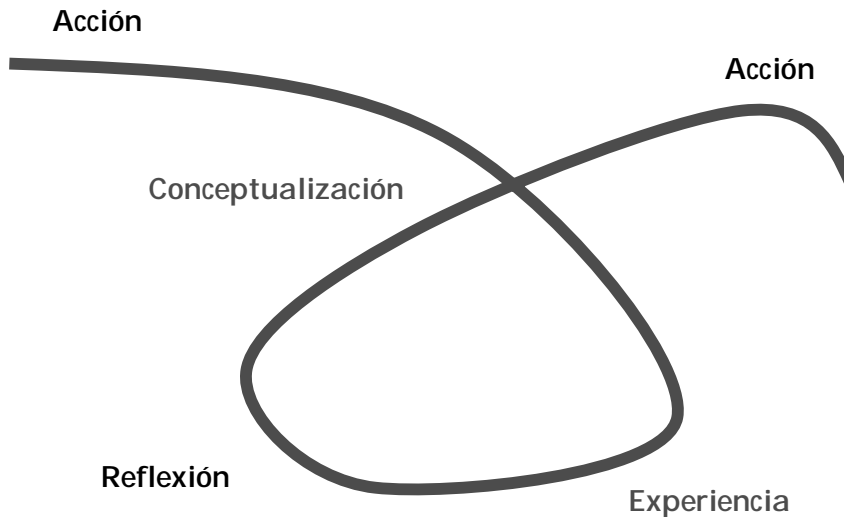


Figura 1: Ciclo de aprendizaje

Por otra parte el aprendizaje puede surgir de la imitación en el marco de un proceso de replicación cultural que se ha denominado en las ciencias del comportamiento “aprendizaje social”. En las ciencias del comportamiento se ha planteado el dilema Innovación - imitación (producer-scrounger dilemma) (Rogers 1988, Boyd & Richerson 1994, Kameda & Nakanishi 2002), para explicar los aportes culturales a la adaptabilidad y capacidad adaptativa humana y describir las características más relevantes del aprendizaje en sociedad, lo cual será desarrollado a más profundidad en el próximo punto.

Desde la perspectiva del aprendizaje social, el principal argumento de las ciencias del comportamiento y la teoría de juegos para ver el aprendizaje social como elemento fundamental de la capacidad adaptativa radica en torno a los costos del aprendizaje. Aprender es costoso y si no existiera el aprendizaje social a través de la imitación o la educación, entonces cada individuo estaría obligado a aprender por sí mismo y pagar los costos de la experimentación y validación de tal conocimiento.

Las ciencias del comportamiento han demostrado consistentemente que el aprendizaje social no es suficiente para mejorar la capacidad de una especie a adaptarse sobre todo si existen condiciones ambientales cambiantes, sino que en el transcurso de la evolución de una determinada especie su capacidad adaptativa (average fitness) depende por una parte de la innovación y por otra parte de la validación del conocimiento por parte de la sociedad (Boyd 1994), desde otro punto de vista la capacidad adaptativa de una especie depende de la calidad del pool de conocimiento cultural (Kameda & Nakanishi 2002).

Es decir, la capacidad adaptativa depende de dos aspectos importantes, por una parte de la calidad del pool de conocimiento y por otra parte de los costos y/o los incentivos para la innovación; aquí hay algo que es muy relevante desde el punto de vista de las agencias e instituciones del Estado, por una parte el Estado como representante de la sociedad deberá promover un pool de conocimiento de alta calidad y por otra parte incentivar el aprendizaje y la innovación.

Capital social y capacidad adaptativa

En cuanto a la adaptación y la adaptabilidad humana, existen por lo menos tres grandes ámbitos para la investigación - acción. El primer ámbito, el cual ha sido más explorado y motivado por la discusión en el entorno formal de la convención de cambio climático se enfoca fundamentalmente en lograr una implementación coherente de la “adaptación al cambio climático”.

El IPCC en el Tercer Reporte de Evaluación menciona que esta adaptación es planificada pues responde a una evaluación de los Impactos, de la Vulnerabilidad y de la Adaptación espontánea que se ha dado en un determinado sistema. Por otra parte y más motivado por el accionar de las ONG's y las agencias de desarrollo se ha puesto especial énfasis en aprender de la experiencia que existe en la gestión de riesgos, argumentando que los esfuerzos que se han hecho para mitigar el impacto de sequías e inundaciones y otros riesgos ambientales de la variabilidad climática, también podrían servir para promover la adaptación al cambio climático. La investigación que se ha llevado a cabo en este ámbito se ha enfocado más en sistematizar las acciones de adaptación y desarrollar buenas prácticas que puedan ser utilizadas en otros contextos regionales y locales.

Un segundo ámbito de investigación acción ha estado más vinculado a explorar los aspectos estructurales de la adaptabilidad humana, los cuales se han enfocado más en explicar las estructuras sociales, económicas y políticas que transforman el capital innato (entitlements) en activos y determinan la capacidad adaptativa. Aquí es importante mencionar que esta discusión no se restringe a la "Adaptación al Cambio Climático" sino más bien pone su principal énfasis en la arquitectura institucional y en la discusión sobre capital social.

En este sentido, tal vez una de las preguntas más centrales desde la perspectiva de las instituciones es como ha sido planteado por (Pelling 1998; Adger 2003 cit. Pelling 2005) sobre como maximizar, a través del diseño institucional, la capacidad adaptativa de una organización o un sector a los posibles y no completamente conocidos impactos del cambio climático.

Desde el punto de vista del diseño institucional, como ha sido mencionado por (Ostrom 2001) los sistemas policentricos de gobernanza tienen grandes ventajas visto desde la perspectiva de sistemas dinámicos complejos, y esto debería considerarse desde el punto de vista de la adaptación a los cambios ambientales globales, pues la capacidad adaptativa aumenta a través de la autonomía de unidades paralelas de similar jerarquía de experimentar con reglas diversas para el manejo de los recursos y responder a los impactos externos.

Desde la óptica del capital social, las comunidades que están provistas de un mayor "Stock" de capital social, se encuentran en una posición más fuerte de afrontar situaciones de pobreza y vulnerabilidad, resolver disputas y situaciones de conflicto así como tomar ventaja de las nuevas oportunidades (Woolcock & Narayan 2000).

3. Los diagnósticos participativos

En la primera fase del proyecto (2004 – 2006), la investigación participativa tuvo el objetivo de evaluar la Vulnerabilidad y Adaptación de los sistemas de subsistencia en ambas regiones para explorar medidas claves de adaptación al cambio climático que entonen con las expectativas de desarrollo de la región y con los temas y prioridades de la Convención y las prioridades del país en Cambio Climático. En este sentido se espera que el proyecto aporte con lecciones aprendidas y la experiencia de cómo iniciar medidas de adaptación en el nivel local.

Se trabajó en función a dos aspectos importantes de la sostenibilidad de las regiones, la alimentación y la salud humana. Mientras que en agricultura se trabajó en base a herramientas participativas, en salud se realizó una evaluación integral bajo un esquema de estudio de caso.

El trabajo de campo y de consultas con actores locales se realizó de la siguiente manera:

- Reuniones periódicas con 6 autoridades municipales.
- Reuniones periódicas con 20 comunidades seleccionadas

- Reuniones con expertos e investigadores

4. Indicadores de Resiliencia y capacidad adaptativa en el nivel local

Fortalecimiento de la capacidad adaptativa de las comunidades y del municipio (Resiliencia comunitaria)

- Existe mayor conciencia y conocimiento del tema y creciente interés y compromiso por adaptarse a los cambios climáticos.
- Mayor capacidad en las comunidades y en las familias para garantizar su subsistencia, calidad de vida y generar excedentes que contribuyan al bienestar de sus familias.
- Autoridades y líderes de la comunidad y otros grupos de personas (jóvenes y mujeres) toman la iniciativa para abordar soluciones propias en torno a la adaptación al cambio climático.
- Manejo comunitario de los recursos naturales como un instrumento para el aumento de la resistencia.

Mejoramiento de la calidad del ecosistema y socio-ecosistema (Robustez del ecosistema)

- Mayor conciencia en las personas y en particular en los niños y jóvenes sobre los servicios que brindan los ecosistemas.
- El municipio tiene mayor comprensión de la fragilidad del suelo, de los recursos hídricos y de cuales son las tendencias del cambio climático y está tomando medida para su conservación.

Calidad del proceso municipal

- El municipio se ha apropiado de la estrategia de adaptación y muestra una capacidad de gestión creciente en temas relacionados al cambio climático (las autoridades conocen del tema y muestran interés, dispone recursos de contraparte, participa en comités de gestión y otras reuniones para gestionar recursos, asegura la transparencia en los procedimientos de ubicación de recursos)
- El municipio ha dispuesto personal idóneo para dar seguimiento a los temas de la estrategia de adaptación cambio climático y aumenta progresivamente su capacidad técnica para el tratamiento de temas relacionados al cambio climático

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PAPER NO. 2: NEW ZEALAND

New Zealand submission under the Nairobi work programme on impacts, vulnerability and adaptation to climate change

August 2007

This submission responds to the invitation from SBSTA to provide information on examples of measures, methodologies and tools to increase the economic resilience of, and reduce reliance on, vulnerable sectors.

Introduction

The Government has signalled that New Zealand's future is dependent on long-term sustainable strategies for the economy, society, environment, culture and way of life. Sustainability is seen in an urgent light due to the environmental challenges that the world faces, in particular climate change and managing those risks has been elevated in government programmes.

In the context of this submission, the agriculture sector in New Zealand has been identified as being of particular significance because of the role it plays in the New Zealand economy and because of its vulnerability to a changing climate. Within this sector over the next 20 years there is likely to be a mix of positive and negative impacts. To add to the complexity of responses, one impact can be positive for some in the sector and negative for others e.g. fewer frosts can lead to increased pasture growth, but can be a limiting factor for kiwi fruit and other fruit production that depends on winter chilling as part of the production cycle.

Agriculture dominates land use in New Zealand, accounting for over 50 percent of total land use. Most New Zealand agriculture is based on extensive pasture systems with animals grazed outdoors year-round. New Zealand's land management sectors – agriculture, horticulture and forestry – are most vulnerable to the extremes of weather that are the long-term predicted impacts of climate change. A significant portion of New Zealand's economy is based on the way the land is managed, and the Government recognises that the need to adapt to the impacts of climate change, as well as recognising that policies and strategies that limit greenhouse gas emissions (both domestically and globally), are necessary parts of ensuring a viable economy.

The 4th Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4) identifies the following impacts for agriculture in New Zealand:

- higher temperatures, a longer growing season, higher CO₂ concentrations and less frost very likely leading to increased annual pasture production in western, southern and higher-altitude areas up to 2030; these gains may decline thereafter
- in eastern and northern areas pasture productivity is likely to decline by 2030 due to increased drought frequency
- sub-tropical pastoral species with lower feed quality are likely to spread southwards
- the range and incidence of many pests and diseases are likely to increase
- drought and water security problems are likely to make irrigated agriculture vulnerable.

Resilient land management practices and upgraded infrastructure can assist New Zealand to avoid, or significantly reduce, the potential costs of the physical impacts of climate change. Adaptation to these new conditions involves identifying and implementing a range of actions to help land managers understand more about the expected impacts of climate change in their sector, and to manage the risks.

Measures, methodologies and tools

To date the New Zealand government has taken an information based approach to adaptation to climate change in the agriculture sector, and this approach is likely to continue and to be enhanced with, for example, the provision of more regionally specific data, and the identification of the most vulnerable areas.

New Zealand's submission to SBSTA earlier in the year on relevant programmes, activities and views on the issues relating to climate related risks and extreme events (FCCC/SBSTA/2007/MISC.4 refers) contained information on some of the programmes that are relevant to this current submission on increasing the economic resilience of vulnerable sectors. These are described below, updated as appropriate and with further detail where relevant to this submission.

1. Government programmes

- **Sustainable Land Management and Climate Change**

The Government released a discussion document *Sustainable Land Management and Climate Change: Proposals for a Plan of Action* in December 2006 (see <http://www.maf.govt.nz/climatechange/>). The document stated that the Government wants to work in partnership with the land management sectors and local government to develop a joint Adaptation Plan to identify and implement actions for adapting to climate change. It suggested that these would position New Zealand for a future where:

- There is more detailed information available on the expected effects of climate change on agriculture and forestry
- Farmers, forest owners, their advisers and organisations have increased capacity to manage the risks associated with climate change impacts already occurring as well as with future climate variability.
- Land managers and decision-makers understand the implications of increased climate variability and include these risks in their decision-making.

The overall Goal of the Adaptation Plan would be: "To reduce the vulnerability of farmers, foresters and their communities to a changing climate and increase their ability to capture any opportunities".

The Plan would focus on:

- Building capacity, including raising awareness and strengthening institutions.
- Generating and sharing tools and knowledge related to climate change variability and extremes and their effects.
- Preparing risk assessments that translate scientific data and knowledge into information relevant to land management decision-making.
- Mainstreaming environmental change and adaptation information into policies, plans and development strategies.
- Monitoring and evaluating for re-assessing risk and response capabilities over time.

- **Sustainable Water Programme of Action**

This programme addresses water quality, water allocation and availability, including consideration of the impacts of climate variability and change. The work on more efficient water allocation will assist land and water users across a range of sectors (including agriculture, forestry, electricity generators and communities) to adapt to the impacts of climate change and increase resilience to climate variability. Linkages between other government programmes are being made to ensure climate change actions are consistent. The following link provides further details:

<http://www.mfe.govt.nz/issues/water/prog-action/index.html>

- **Adverse events policy**

The Ministry of Agriculture and Forestry (MAF) has assessed the risk profile of adverse events in terms of the impact of projected climate change and variability. MAF has consulted around New Zealand on a discussion document entitled *Building Resilience: Review of the on-farm adverse events recovery framework*, and as a result the government has decided to continue its scaled approach to recovery measures (the small-scale event and medium-scale event recovery measures) and, recognises that following a large-scale adverse climatic event or natural disaster, the government does have a role in providing a special recovery measure to primary producers. See <http://www.maf.govt.nz/mafnet/rural-nz/assistance/adverse-events/outcomes-from-the-review/index.htm> for more details.

- **Sustainable farming fund**

This MAF administered fund supports rural communities to achieve economic, environmental and social sustainability. A large proportion of the funded projects have benefits for adaptation of current farming systems to increase economic and environmental resilience e.g. drought tolerant species, dry land management, irrigation efficiency, water feasibility studies and new forestry species. Some details of funded projects were described in New Zealand's submission in May this year (see FCCC/SBSTA/2007/MISC.4), and more detail is available on the MAF website <http://www.maf.govt.nz/sff/>

2. Research on Adaptation to Climate Variability and Change

This multi-year research programme on adaptation to climate variability and change provides information, predictions and tools to help New Zealanders make best use of climate-dependent natural resources, adapt to natural variations in climate, and identify and manage expected regional impacts of global climate change. The underpinning science helps improve understanding of the interactions within the climate system – between the atmosphere, ocean, and land and sea ice. This informs regional climate information, advances national climate modelling and prediction capabilities, and contributes systematic climate observations to national and international archives.

This research enables New Zealand to make better use of its climate-dependent natural resources, increases resilience to natural variations in climate through appropriate adaptation actions, and enables identification and management of regional impacts of global climate change. It has been developed to include increased research on the development of climate tools for end users, and new social research focusing on community response to extreme events and the economic impacts of climate variability, and climate impacts.

Relevant to this submission, further developments are likely to include:

- new information on past climate variability, improved models of future variability and new tools and products tailored to climate sensitive industry needs to facilitate their adaptation to climate variability
- improved risk assessments to better understand how climate extremes (droughts and storm/flood events) respond to changing climate to reduce New Zealand's vulnerability to climate extremes
- quantifying the economic impacts of climate change incorporating the AR4 scenarios and climate change impacts on land use, agriculture, energy and other climate sensitive sectors
- enhanced global and regional climate models

Information about progress on the programme may be found at: www.niwa.co.nz/ncc/clivar and www.niwa.co.nz/ncc/

3. CLIMPACTS programme

The programme (see <http://www.waikato.ac.nz/igci/climpacts/index.htm>) is designed to improve capacity in New Zealand to respond effectively to the risks posed by global change, particularly climate change, including climate variability and extremes. It aims to enhance the ability to anticipate the future impacts of climate change and to develop behavioural responses and tools to adapt to the changes. It is led by the International of Global Change Institute (IGCI) at Waikato University in collaboration with a number of Crown Research Institutes.

The programme has three broad purposes:

- To enhance the means of determining the environmental effects of climate change and variability;
- To improve the basis for decision-making and sustainable management in avoiding adverse consequences of such changes;
- To build a base of multi-skilled expertise in New Zealand for better understanding climate-environment relationships.

The unifying aim of the programme has been the development of an integrated assessment model (IAM) and the CLIMPACTS system, an integrated computer-based model developed to examine the sensitivity over time and space of New Zealand's climate, agricultural and horticultural sectors to climate change and variability. It has the flexibility to allow the user to generate a vast number of climate change scenarios and thus ask a range of "what if" questions about the climate sensitivity of selected sectors.

At the top end of the system is a MAGICC (Model for the Assessment of Greenhouse-gas Induced Climate Change), a simple global climate model used to provide time-dependent projections of global temperature change from 1990 to 2100, for any greenhouse-gas emissions scenarios. The global temperature changes from MAGICC are used to scale patterns of climate change for New Zealand, derived from more complex general circulation models (GCM's). The scaled patterns of climate change are then used to perturb the reference (1951-80) climate for New Zealand, to give scenarios of future climate up to 2100. This "scenario generator" is linked to a range of crop models, as well as an extreme event analysis tool. It is thus possible, using the CLIMPACTS system, to ask a wide range of policy-relevant questions, in particular relating to changes in areas of suitability and changes in climate-related risk

Demonstration version of CLIMPACTS can be downloaded from:

<http://www.waikato.ac.nz/igci/climpacts/demos.htm>

IGCI has developed CLIMsystems Ltd to help individuals and organisations to find sustainable solutions to problems arising from global environmental change. It is focussed on the provision of software products and related services for assessing the potential risks posed by climate change and variability, and for evaluating adaptation options. For a demonstration of software, go to <http://www.climsystems.com/site/home/>

4. Land Use, Climate Change and Kyoto: Human Dimensions Research to Guide New Zealand Policy

This research programme aims to understand human-induced land-use change processes, understand their implications for the environment, and model possible management systems at a national policy level. The research programme has two main components. The first is to build an integrated socio-economic/natural-science land-use model and the second is to provide policy design and analysis, both by using this model and through additional qualitative research. This programme has application for adaptive management by the land use sector. See http://www.motu.org.nz/land_use_nz.htm for further information as well as links to publications, presentations and workshops resulting from the programme.

The first version of the Land Use in Rural New Zealand Model (LURNZv1) is documented in the linked paper http://www.motu.org.nz/motu_wp_2007_07.htm

It describes the overall modelling approach, the database underlying the model, and the construction of each module within the model. The model is econometrically estimated from national time series data and spatially extrapolated using economic and geophysical variables. It is primarily a simulation model but is also set up to produce predictions based on future price scenarios. The model output includes projections of four types of rural land use under different scenarios and 25 ha grid maps of where land use, and changes in land use, are likely to occur.

5. Reports

Some of the reports described in New Zealand's submission in May this year (see FCCC/SBSTA/2007/MISC.4) have particular relevance when considering measures, methodologies and tools that can be applied in the agriculture to increase the sector's economic resilience in the face of a changing climate. Relevant reports are described briefly below, with links to the full reports for further detail.

- **Changes in Drought Risk with Climate Change – NIWA report: May 2005**

This report (commissioned by the Ministry for the Environment and the Ministry of Agriculture and Forestry) aims to give central and local government and the agriculture sector an indication of how big future drought changes could be in the various regions over the 21st century, under low-medium and medium-high climate change scenarios. This information will be relevant for managing long-term water resources and land use, including planning for irrigation in a future with climate change and greater climate variability.

<http://www.mfe.govt.nz/publications/climate/drought-risk-may05/index.html>

- **The view from the ground: a farmer perspective on climate change and adaptation: July 2003**

This report provides a summary of farmers perspectives on climate change impacts and adaptation options collected through a series of workshops and compiled into a resource kit that helps to build climate change resilience on New Zealand farms. It was compiled by Gavin Kenny and Mark Fisher and published by Earthwise Consulting Limited and the Hawke's Bay Climate Change Adaptation Group.

<http://www.mfe.govt.nz/publications/climate/view-from-the-ground-jul03/index.html>

- **Adapting to Climate Change in Eastern New Zealand: July 2005**

This brochure outlines the impacts and opportunities for agriculture arising from climate change in Eastern New Zealand, and adaptation options at farm level and for rural communities. Compiled by Gavin Kenny and published by Earthwise Consulting Limited (July 2005).

<http://www.mfe.govt.nz/publications/climate/adapt-climate-change-eastern-nz-jul05/index.html>

- **Climate Change: Likely impacts on New Zealand Agriculture: September 2001**

This report suggests that the worst effects of climate change can be avoided and the potential benefits realised through a staged approach involving;

- the short term, through further development and implementation of strategies for dealing with present climate variability and extremes
- the medium term, through implementing plant-breeding programmes, developing water conservation programmes, and planning conservatively to ensure there are buffers against adverse years
- the long-term, through developing a more integrated approach to land management that considers climate change alongside other important issues such as biodiversity, biosecurity, land degradation, and water resource use.

Although the report was written six years ago, and some of the information presented will have changed or been improved upon since then, the approach encouraged in the report is still valid. The information presented is aimed at stimulating a greater understanding of climate change, what it might mean, and the things individuals and industry groups might need to consider in order to plan for the future. Importantly, it is also aimed at stimulating a process for identifying gaps in knowledge and how these need to be addressed.

<http://www.mfe.govt.nz/publications/climate/impacts-agriculture-sep01/impacts-agriculture-sep01.pdf>

PAPER NO. 3: PORTUGAL ON BEHALF OF THE EUROPEAN COMMUNITY
AND ITS MEMBER STATES

**Subject: Nairobi Work Programme on impacts, vulnerability, and adaptation to climate change
Information on examples of measures, methodologies and tools to increase the economic
resilience of, and reduce reliance on, vulnerable sectors**

Portugal on behalf of the EU and its Member States welcomes this opportunity to share Information on examples of measures, methodologies and tools to increase the economic resilience of, and reduce reliance on, vulnerable sectors.

1. Introduction

1. Under paragraph 69 of the Nairobi Work Programme (document FCCC/SBSTA/2006/11) on impacts, vulnerability and adaptation to climate change, the Subsidiary Body for Scientific and Technological Advice (SBSTA) invited Parties and other relevant organizations to submit to the secretariat, by 17 August 2007, information on examples of measures, methodologies and tools to increase the economic resilience of, and reduce reliance on, vulnerable sectors.

2. The EU notes that the activities undertaken in this area should "Promote understanding and the development and dissemination of measures, methodologies and tools including for economic diversification aimed at increasing economic resilience and reducing reliance on vulnerable economic sectors, especially for relevant categories of countries listed in Article 4, paragraph 8, of the Convention". As a diverse union of countries, which together exhibit almost all of the characteristics identified in this paragraph (e.g. small island countries, countries with low-lying coastal areas, countries with forested areas and areas liable to forest decay, countries with areas of high urban atmospheric pollution, countries with fragile ecosystems including mountainous ecosystems, and landlocked and transit countries), the European Union welcomes this opportunity to respond to this request.

3. The EU is concerned that according to the recent assessment of the IPCC Working Group II (WGII) "the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time". The EU also notes that "in some locations and amongst some groups of people with high exposure, high sensitivity, and/or low adaptive capacity, net costs will be significantly larger than the global aggregate".

4. The EU also notes that according to the recent assessment of the IPCC WGII :

- a wide array of adaptation options are available, but that more extensive adaptation than is currently occurring is required to reduce vulnerability to future climate change;
- vulnerability to climate change can be exacerbated by the presence of other stresses;
- future vulnerability depends not only on climate change but also on the development pathway;
- sustainable development can reduce vulnerability to climate change;
- severe impacts during the second half of this century can be avoided, reduced or delayed by urgent mitigation action today.

2. Vulnerability to the impacts of climate change of the EU

5. The EU notes with concern that *nearly all European regions* are anticipated to be negatively affected by some future impacts of climate change and these will pose challenges to many economic sectors. Climate change is also expected to magnify *regional differences* in Europe's natural resources and assets and will require solidarity across European regions. It is expected that there will be an increased risk of extreme events such as heat waves, storms, intense precipitation events, forest fires, inland flash floods, more frequent coastal flooding and coastal erosion, increased inland erosion and landslides, glacier retreat, reduced snow cover and extensive loss of species.

6. Specifically, the findings of the IPCC WGII highlight that in Southern Europe, a region already vulnerable to climate variability, climate change will reduce water availability, hydropower potential, summer tourism, and crop productivity and increase health risks due to heat waves and wildfires. In Central and Eastern Europe, summer precipitation will decrease, causing higher water stress and health risks due to heat waves. Forest productivity is expected to decline and the frequency of peatland fires to increase. Whilst Northern Europe may experience some mixed effects, including some benefits such as reduced demand for heating, increased crop yields and increased forest growth, yet as climate change continues, its negative impacts (including more frequent winter floods, endangered ecosystems and increasing soil instability) are likely to outweigh its benefits.

7. Small islands, whether located in the tropics or higher latitudes, are indicated by the IPCC WG II report as having characteristics which make them "especially vulnerable to the effects of climate change, sea level rise and extreme events". With thousands of islands including 2 small islands states, the EU takes note of these findings with particular concern.

8. Although the increase of the average global atmospheric temperature compared to the pre-industrial level is only about 0.76 degrees Centigrade, examples described below show that measures, methodologies and tools to increase the economic resilience of, and reduce reliance on, vulnerable sectors are under investigation or are starting to be implemented in the European Union and its Member States.

3. Activities at the level of the European Union

9. On 29 June 2007, the European Commission adopted a consultation document on adapting to the impacts of climate change. This Green Paper "Adapting to climate change in Europe - options for EU action", builds upon the work and findings of the European Climate Change Programme. (http://ec.europa.eu/environment/climat/adaptation/index_en.htm)

10. The aim of the Green Paper is to launch an EU-wide debate on adaptation which will be concluded by the end of 2007. Public consultation on the Green Paper started on the 3rd of July with a major conference (http://ec.europa.eu/environment/climat/adaptation/green_paper/green_paper_en.pdf).

11. The Green Paper suggests that economic diversification should be considered for sectors where adaptation options are not possible or too expensive compared to the expected future benefits.

12. Specific activities of Member States are included in the Annex.

4. Preliminary Conclusions

- a. Sustainable development can reduce vulnerability to climate change but climate change itself could already be impeding nations' abilities to achieve sustainable development pathways. Adaptation measures themselves need to be integrated mainstreamed into sustainable development pathways and policies.
- b. Climate change is one among several drivers of economic diversification. The substantial body of knowledge that exists on economic diversification can be applied to adaptation to climate change.
- c. Economic diversification, both across and within sectors can be and already is a viable response strategy, particularly where there are limited other adaptation options within a sector. Smallness and limited natural resource endowment may constrain an economy's ability to diversify.
- d. Other strategies to be considered include: increasing robustness of vulnerable activities and infrastructure, increasing the flexibility of vulnerable activities and infrastructure to be able to better respond, enhancing adaptability of vulnerable systems by removing other conventional stressors and reversing trends that increase vulnerability and exposure to climate change.
- e. These strategies can also include "soft" measures like water conservation, changes in crop rotations, sowing dates and use of drought tolerant crops, public planning, and awareness raising.

- f. There seems to be no common approach to economic diversification. However, certain policy measures which stimulate a favorable investment climate may be helpful in providing for smoother diversification activities. These include efficient administration, the rule of law, a stable macroeconomic environment, efficient and effective infrastructure and manageable political risks. Other prerequisites for economic diversification could include sustained efforts to improve the education, well-designed market based instruments and a policy regime that encourages sustainable development.
- g. The process of economic diversification itself can be made smoother by mainstreaming the short, medium and long term economic considerations of climate change (both mitigation and adaptation) in economic decision making, investments and funding programmes.
- h. Economic diversification is an issue for all countries and regions.
- i. Given that both drivers and responses to economic diversification could go beyond adaptation to climate change, it is likely that the climate change process under the UNFCCC cannot by itself make a sufficient notable impact on the economic diversification required for sustainable development.

13. The EU is looking forward to learn more about the views and experiences from other countries, addressing the issues identified in the above preliminary conclusions, and is willing to further discuss those under the Nairobi Work Programme.

Annex

Activities at the level of Member States relating to the subject of this submission.

The following examples from Austria, Malta, the Netherlands, Portugal and the United Kingdom are neither exhaustive nor easy to compare but provide some insight into the specific circumstances in various member states and the approaches taken.

a. Austria

In Austria winter tourism is vulnerable to the availability of a permanent snow cover. This is an issue for regions below a sea-level of about 1500m. Whereas for many low-lying regions it was economically viable to invest in the production of artificial snow some regions did not reinvest in new cable cars and closed. As climate change will continue, at least, for decades to come more and more regions will have to consider economic diversification. This becomes a national challenge due to the significant contribution of winter tourism to the Austrian GDP (about 9%). Earlier in May 2007 a special meeting in Parliament, with broad participation of political and private stakeholders and including representatives from the scientific community discussed this issue. It became evident that there will be no single solution that fits all regions and that this is a long term issue. The dimension of the problem will require a joint effort at all levels, including the federal, the provincial and the community level. It has been obvious that the whole process has been initiated by the private sector and those that are most vulnerable. More information at: http://www.parlament.gv.at/portal/page?_pageid=908,5232643&_dad=portal&_schema=PORTAL (in German only).

b. Malta

Background

Malta's reality as a small island state places it in a particularly economically vulnerable situation with respect to the climatic changes that it faces. Malta is one of the most densely populated areas in the world, with some 400,000 people (excluding tourists totaling over 1.1 million per year) living in an area of 316km². The Maltese economy is small and very open, with strong trade ties to other EU member states and limited natural resources. In the Maltese economy, the public sector, the services sector and the manufacturing sector constitute the main pillars. Tourism is one of the largest sectors contributing for over a third of earnings in the current account. In terms of

manufacturing, there is a predominance of hi-tech firms involved mainly in the production of semi-conductor chips and medical equipment.

Studies to quantify economic vulnerability

Recent studies have attempted to quantify overall economic vulnerability¹. In one such study an analysis of the impacts on the supply side of production operations was undertaken whereby the extent of the strength of the effects was derived on the basis of a qualitative evaluation involving expert opinion considering the magnitude of the initial impact; the degree of certainty of the realization of the impact (with basis on the precautionary principle); the extent to which such impact is already present in the baseline scenario, to assess the net effects of future global warming; the degree to which the impact can be easily mitigated or its effects reduced through substitute activities or autonomous adaptation.

Anticipated economic vulnerability

In terms of vulnerability to climate change, Malta's First National Communication (FNC) on climate change under UNFCCC (2000) had also reported the following key concerns:

- Drought (due to reduction in precipitation and increase in evapotranspiration).
- Deterioration of freshwater quality and availability (due to increased evaporation, decreased precipitation and increased saline water intrusion into mean sea level aquifer due to sea level rise).
- Increased risk of floods (due to increased rain intensity).
- Increase in soil erosion and desertification and associated impacts on agriculture.
- Increased risk of storms and severe weather incidence.
- Accelerated coastal erosion (due to sea level rise and increased incidence of storms).
- Changes in sea water mass characteristics (changes in physico-chemical parameters).
- Sea level rise.
- Biodiversity loss and degradation (fragmentation of habitats, Westward migration of Red Sea species, loss of marine biodiversity due to changes in salinity and turbidity).

¹ Relevant studies for Malta include:

The Effects of Climate Change in Malta, IPCC Conference, Beijing, April 2003, Gordon Cordina, L Briguglio.

Economic Vulnerability and Economic Growth: Some Results from a Neo-Classical Growth Model, Gordon Cordina, Journal of Economic Development, vol.42 Dec 2004.

Building Resilience Through Capital Formation, in Economic Vulnerability and Resilience of Small States, L Briguglio and E Kisanga (eds), Commonwealth Secretariat and University of Malta, 2004.

Economic Vulnerability and Resilience of Small States, Insula International Journal of Island Affairs, December 2005, Gordon Cordina, L Briguglio).

Building the Economic Resilience of Small States, Commonwealth Secretariat and University of Malta, 2006. (co-edited, Gordon Cordina, L Briguglio and E J Kisanga).

Many economic sectors are vulnerable, albeit to differing extent, to these impacts. Certain areas of economic activity where this vulnerability is most evident have been studied and a basic summary of findings reproduced below:

Economic Activity	Effects
Agriculture and fisheries	Water shortage More arid, less fertile soil Increase in pests Land floods Change in fish migration Loss of marine biodiversity Disruption to fish-farming
Industry	Higher costs of production due to environmental control for hi-tech and food sectors Deteriorating working conditions in other sectors, especially in construction Disruption due to flooding Compliance to pollution standards
Transport and communication	Infrastructural damage Road flooding Disruption to maritime transport and air transport Disruption to wireless communication Compliance to pollution standards
Distribution	Higher costs due to transport disruption Higher costs of storage and service due to environmental control
Service activities	Higher costs of service due to environment control
Utilities	Aquifers affected by sea-water intrusion and lower precipitation Disruption to sewerage due to sea outflow points Flooding of sewerage network Disruption to energy production due to high peak demands and higher investment costs Compliance to pollution standards Disruption to renewable energy production

Looking at the economy from the expenditure rather than the output side, one can also forecast changes to be expected as a result of climate change, a summary of which is provided below.

Activity	Effects
Private consumption	Increased expenditure on environmental control in houses and cars, and consequently on energy, crowding out other consumption Increased expenditure on water quality Increased expenditure on health Disruption to housing in coastal areas Disruption to housing due to rainwater flooding Disruption to entertainment associated with natural amenities Disruption to transport and communication
Public consumption	Increased expenditure on health services
Investment	Resources diverted to climate change adaptation crowd out other activities
Tourism exports	Lower demand due to: - disruption to coastal activities and environment - warmer climate in home countries - health hazards
Other exports	Reduction in competitiveness due to increased costs to adapt to climate change

Adaptation (including diversification) activity in Malta

Autonomous reactions, mainly to climate variability, are already taking place in Malta, for example in the form of air-conditioning, water collection on roofs and retaining walls in agricultural land. While these spontaneous measures are important, they are likely to be insufficient in meeting future challenges.

A number of adaptation measures relevant to reduce the vulnerability of the Maltese economy to climate change will be considered as part of an adaptation strategy which will be drawn up in the near future. The examples below are not intended to be exhaustive but simply illustrative of the type of measures likely to be required in Malta:

- Increased reliance on air-conditioning systems across the productive sectors and households.
- Improved energy production and more reliance on renewable sources.
- Constructing and converting buildings to improve energy efficiency and climate control.
- Improving early warning systems of extreme events and upgrading disaster preparedness.
- Constructing flood defense systems.
- Retreating from coastal areas that are most vulnerable to inundation.
- Improving transport systems and infrastructure.
- Improving water run-off facilities so as to reduce possibilities of flooding.
- Directing more resources to primary health care and health surveillance.
- Improving water production and distribution systems.
- Improving farming methods and infrastructure.
- Preventing further development of coastal areas
- Implementing afforestation, wetland creation and beach nourishment programmes.
- Fostering an economic environment necessary for the further development of the less vulnerable sectors of activity.

In this regard, it needs to be considered that Malta's vulnerability is exacerbated by the limited spatial possibilities it has for changes that may be required, and the potentially high costs involved per capita. The

potential conflict of adaptation measures with other policies and measures and the tradeoffs inherent in adaptation, (such as possible loss of certain biodiversity or natural habitats due to adaptation infrastructure required), as well as the potential conflict between adaptation and mitigation (such as the use of air-conditioners and the use of reverse osmosis technology to adapt to climate change) also need to be considered.

The extreme openness of the Maltese economy and its high sensitivity to external market shocks, imply that Malta, as other small island states is highly susceptible to climate changes that influence not only itself but also other countries. The envisaged increase in the numbers of climate refugees may exacerbate the present situation in respect of immigrants from North and sub Saharan Africa. Increased landings on Malta's shores will place an increasing economic and social burden on the population. High population densities imply more extreme socio-economic effects over limited areas.

c. The Netherlands

As a low lying country the impacts of climate change on the Netherlands are linked with water management issues like the risk of flooding, salt water intrusion, managing drinking and irrigation water, navigability of rivers, and the morphology of the coastal zone. Combined with a high population density, adaptation in relation to economic diversification in the Netherlands has a strong spatial challenge. The report, 'Climate adaptation in the Netherlands' (2006) shows, that the Netherlands is particularly vulnerable to climate change in agriculture, ecosystems and the water system. In agriculture changing common practices by, for example, changing the crop variety and genotype or growing different crops that are more resilient to environmental pressure may enhance the adaptive capacity. In a broader context, water storage on farmland in times of excess water supply can be an important instrument to deal with the variability of water availability. The trade off between the decrease of value of the land due to inundation, loss of agricultural production and the potential benefits like the diversification of farmer's risk, and nature development or recreational purposes is not a straight forward and cost-efficient approach. In the long run it will be essential to consider a wide variety of spatial options, including decisions on where economic activity can best take place and which areas could be made less vulnerable to climate change by reducing new investments in areas that are prone to flooding.

More information is available on adaptation options and costs in the report 'Climate adaptation in the Netherlands' (2006). (<http://www.mnp.nl/en/publications/2006/ClimateAdaptationintheNetherlands.html>)

d. Portugal

Economic diversification in the energy sector – introduction of natural gas and renewable energy sources

In 2004, the Energy sector, which consists of the activities of production, transformation and energy products distribution (coal, crude oil and derivatives, gas and electricity), represented 2.8% of the Portuguese GDP. The electricity subsector gained standing, with 67.1% of the sector GVA. Similarly, with 67.9% of the sector total, the electricity subsector is responsible for 4% of the Gross Fixed Capital Formation (GFCF) registered in 2004.

From 1990 to 2004, primary energy consumption grew at an annual rate of about 3%. In 2004, Portugal registered per capita consumption of 2.51 toe, contrasting with the 1990 value of 1.78 toe per capita. Crude oil consumption increased at a rate similar to that of total consumption. In relative terms, crude oil maintained an important role in the supply chain, representing 58.3% of total primary energy consumption in 2004, as opposed to 71.4% in 1990. This decrease was partly due to the introduction of natural gas in 1997, which allowed for the diversification of the energy supply structure and reduction in dependency on external sources of crude oil. Natural gas has increased its penetration in the energy mix representing in 2004, 12.5% of total primary energy consumption. In 2004, about 95.4% of the primary energy consumed in Portugal was imported and, net energy imports represented almost 9% of the total entries of FOB goods².

In Portugal, the generation of electric energy from Renewable Energy Sources (RES) is directly linked to variations in large hydro production, as the latter represented almost 87% of the RES total (2004). Given the strong oscillations in hydroelectric production, the gross RES contribution to primary energy consumption has been highly irregular. The average annual contribution by RES to electricity generation was of 32% in the period from 1997 to 2004. Corrected by the hydraulic index (IPH) on a yearly basis, and considering an average rainfall regime scenario, the annual average contribution by RES to overall electricity generation was 36% for the same period.

The growth rate in installed capacity of renewable energy technologies has risen significantly in 2004 and 2005, particularly with regard to wind energy which contributed with 816 GWh of electricity generation in 2004, up from 168 GWh in 2000 (an increase of 385.7%) and only 38 GWh in 1997. In the Azores, geothermic sources generated 84 GWh in 2004, while only 51 GWh in 1997.

Final energy consumption increased significantly (2.5% per year) from 1999 to 2004 mainly due to the increase in consumption of crude oil products (1.7% oil; 24% natural gas) and of electricity (4.3% a year),

² FOB (Free on Board) Price: price charged at the loading station.

as well as from Transport and Services sub-sectors. The rate of increase in oil consumption was higher than the total energy consumption growth rate, rising from 57.3% in 1990 to 58.5% in 2004.

For the near future, Portugal assumed ambitious goals for the use of renewable energy:

- The production of electricity based on RES rose from 39% to 45% of the total consumption in 2010;
- The target for biofuel used in transportation fuels by 2010 is now 10%, instead of the original 5.75%.

The Portuguese energy strategy includes measures such as:

- Wind: to increase, in 1950 MW, the aim for the installed capacity in 2012 (total of 5100 MW, 45% of the total) and to promote the creation of technological and investment clusters;
- Hydro: to anticipate the investments for the increase of the power of 5575 MW in 2010 (increased in 575 MW);
- Biomass: to increase the goal for the installed power in 100 MW by 2010 (increase of 67%) through the promotion of articulation among the resources of the regional forestry and the fight against forest fires;
- Solar: to accomplish the targets and ensure the connection with microgeneration policies and goals;
- Waves: to increase the installed power in 200 MW;
- Biofuels: 10% of the transports' consumption;
- Biogas: to define targets and action plans, with the 100 MW aim in waste anaerobic units of treatment;
- Microgeneration: promote an installation programme of 50000 systems until 2010 (solar thermo).

This strategy is directly related with both mitigation and adaptation to climate change. The first is obvious, with the reduction of the greenhouse gases emissions associated with energy production and use. The second, adaptation, is related with lower dependence on the hydro power, given that climate change impacts predicted in Portugal include lower water availability. These measures also aim at a lower dependence on fossil fuels.

e. **United Kingdom**

UKCIP has developed a host of tools to assess vulnerability and potential for adaptation across a range of sectors:

UKCIP Adaptation Wizard

The UKCIP (2005) Adaptation Wizard has been set up to help organisations move from a simple understanding of climate change to integration of climate change into decision-making. The Wizard draws heavily on Willows and Connell (2003) and provides web-based tools for four stages of adaptation:

- Scoping the impacts;
- Quantifying risks;
- Decision-making and action planning;
- Adaptation strategy review.

Socio-economic scenarios-

Computer-driven models of climate change can tell us what sorts of changes we might expect over the next 100 years. What our climate models cannot tell us is what the UK will be like socially in 2020, 2050 or 2080 for example. This is why UKCIP has produced the socio-economic scenarios. The scenarios are designed to give four different social frameworks based on the type of future Governance (autonomous vs. community) and individual values (consumerism vs. interdependence). The scenarios are meant to be used alongside climate change predictions based on emissions of greenhouse gases, so that researchers and decision makers can base impacts studies on a framework with set characteristics.

The last set of socio-economic scenarios was published in 2001, and UKCIP/Defra are now considering updating them to bring them in line with the new UKCIP08 climate scenarios being published last year.

Risk, Uncertainty and Decision making Framework

It provides an eight-stage decision-making framework with accompanying guidance to help assess climate risks and uncertainties and incorporate suitable adaptation measures into a decision. For each stage of the framework, there are questions to answer, and recommended tools to help.

Costings Methodology- Case Study- UKCCP

This is a newer tool, providing a method to work out the costs of climate change impacts on an organisation, an event or an area.

'Costing the impacts of climate change in the UK' is the latest tool from UKCIP to help organisations prepare for climate change. As well as introducing a method for valuing the impacts of climate change, it

also shows how to compare these to costs of adaptation, so that organisations can work out how much they will need to spend on adapting to climate change.

The overview report contains background briefing and case examples which demonstrate how the method works. It is aimed at decision-makers who will commission and make use of costing analyses.

Database of Adaptation Case Studies

This new tool has just been launched and provides a database of example of adaptation from organisations around the UK. The database is searchable by region, sector and type of adaptation, and contains over 250 case studies. The reason for the database is to help organisations see first hand what sorts of adaptive activities are being taken and how they can act to reduce their own risks.

Identifying Adaptation Options

This is a guidance note aimed at exploring the nature and characteristics of adaptation in the context of climate risk and provides further background information and examples of adaptation strategies and options. In doing so it provides guidance related to the identification, selection and role of stakeholders, dealing with uncertainty and identifying and selecting adaptation options.

It is aimed at supporting decision and policy makers who are faced with identifying and appraising the effectiveness of adaptation measures that address identified climate risks. It should be used as a companion piece to other UKCIP tools.

These tools are available from <http://www.ukcip.org.uk/resources/tools/>

The UK also has some experience with economic diversification:

Winter sports: In 1987-88 650,000 people visited Scotland's ski centres. By 2005-06 this had fallen to just 150,000. The ski centres are now increasingly marketing themselves as all-year activity centres catering for mountain bikers, climbers and walkers during the summer months.

Agriculture: the change in climate in the UK, and in particular in southern areas, has led to a shift in focus away from traditional British crops and towards more Mediterranean types. Vineyards have expanded considerably in recent years along with a growing wine industry. More exotic crops that are being planted in the UK include apricots, olives, almonds, pecans and Sharon fruit.

f. **Germany**

A recent study shows that virtually all economic sectors in Germany are or will be affected by climate change³. According to this study, the aggregated and accumulated economic losses, damage costs, and costs of adaptation will amount to as much as 800 billion € by 2050. The energy sector is particularly vulnerable: due to decreased river runoff during heat wave conditions, thermal power plants will have to reduce electricity output. Hydropower generation will be subject to increasing fluctuation due to changes in precipitation patterns. Moreover, energy infrastructure will be threatened by increased occurrence of extreme events such as flooding and storms. While increasing atmospheric CO₂ and a generally warmer climate will lead to slight increases in crop yield, increasing heat wave and drought conditions increase the risk of crop losses, heat stress to live stock, forest fire activity, and infestation with vermin in the agriculture and forestry sectors. Winter tourism will also be strongly affected. A 1°C increase in global temperature will lead to a 60% decrease in snow availability in German Ski resorts. Summer tourism at the Northern German coasts, by contrast, are projected to increase.

It is evident that economic diversification in the most affected sectors will have to play a key role in increasing their resilience to climate change. Possible measures in the various sectors include changing species of crops and forests stands, energy saving as well as diversification and decentralization of electricity production, and a shift of activities in winter tourism resorts.

³ DIW, 2007: Klimawandel kostet deutsche Volkswirtschaft Milliarden (C. Kemfert). DIW weekly report 11/2007. Available at http://www.diw.de/deutsch/produkte/publikationen/wochenberichte/jahrgang07/index.jsp?wochenbericht_diw=wochenbericht_diw&mediennr=0047601&ausgabeformat=wwwpublbereich+d+detail, in German.

SAUDI SUBMISSION ON
“NAIROBI WORK PROGRAMME ON IMPACTS,
VULNERABILITY AND ADAPTATION TO CLIMATE
CHANGE”

The SBSTA at its 25th session held in Nairobi, invited parties to submit to the secretariat, by 17 August 2007, views on the adoption of the Nairobi programme of work as contained in documents (FCCC/SBSTA/2006/11, paragraph 69).

Saudi Arabia is concerned that up to date there are no tools and methodologies that exists to address the increase of the economic resilience and the reducing of the reliance on vulnerable sectors. Therefore, it is essential that the secretariat collaborate with the scientific research community such as the IPCC and other organizations such as The International Energy Agency (IEA), The United Nations Conference on Trade and Development (UNCTAD), The Organization of the Petroleum Exporting Countries (OPEC), the Organization of Arab Petroleum Exporting Countries (OAPEC), the United Nations Economic and Social Commission for Western Asia (ESCWA), the League of Arab States (LAS) and the Gulf Cooperation Council (GCC) to:

- Promote the development and dissemination of measures, methodologies and tools for aimed at increasing economic resilience and reducing reliance on vulnerable economic sectors, especially for relevant categories of countries listed in Article 4, paragraph 8, of the Convention.
- improve the quality of models, in particular those that assess the adverse impacts on social and economic development as consequence of the responses to climate change, taken into full account the legitimate priority needs of developing countries with specific emphasis on countries whose economies are highly dependent on income generated from the production, processing and export, and/or on consumption of fossil fuels and associated energy-intensive products.
