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The Krabi seas have particularly high biodiversity, including globally endangered sea turtles

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Fisheries. A longer dry season means additional days of fishing and increased pressure on available stocks of fish and shellfish. An agreement by all concerned parties on an equitable, enforceable, and scientifically-based regulatory system to ensure that coastal marine resources are not depleted by either commercial or subsistence fishing must be developed.

Upland areas. Though rainfall will decrease over the next 25 years, it will remain sufficient to meet the needs of rubber cultivation, and the shorter monsoon season will permit additional days of tapping. Productivity per tree is expected to rise by 10-15%.

Reduced rainfall may reduce the productivity of oil palms. This provides another incentive to smallholders, already vulnerable to abrupt income swings traceable to market conditions, to diversify their crop base so as to increase resilience to economic and climate changes.

Rising temperatures will most likely force upland ecosystems – in particular Krabi's hill evergreen forests, protected in Khao Phnom Benja National Park – to retreat to higher elevations wherever possible. Research is needed to develop a strategy that protects the high conservation values of these ecosystems.

Urban areas. Urban zones are likely to face water scarcity during the dry season, in response to which basin-wide water management systems will be essential. Engineering for infrastructure, in particular storm and wastewater management, should anticipate increasing climate change impacts over a 100 year horizon.

In summary, this study underlined the major challenges climate change will pose to Krabi Province. Careful planning, based on rigorous science and involving all stakeholders, will be fundamental to ensure sustainable development for the province's people and ecosystems.

**WWF Greater Mekong Programme
Policy Office**

Chulawich 1 Building, 5th Floor
Chulalongkorn University
Henri Dunant Road
Bangkok 10330 Thailand

Phone: +66 2 218 9463
Fax: +66 2 251 9416
gblate@wwfgreatermekong.org
panda.org/greatermekong



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Assessing the Implications of Climate Change at the Provincial Level: *Krabi, Thailand*

Coastal areas in the Greater Mekong region are particularly vulnerable to the impacts of climate change. To predict how these areas will be affected, their socioeconomic and environmental contexts must also be understood.

In early 2008, the WWF Greater Mekong Programme (GMP), with support from WWF's Macroeconomics Programme, collaborated on a pilot study to assess climate change vulnerability and its implications for economic development in coastal areas. Two provinces - Krabi in Thailand, and Ca Mau in Vietnam - were chosen as different examples of coastal geomorphology and economy. These studies were unique in that for the first time they engaged local stakeholders to explore potential impacts on a variety of sectors using regional scale climate models applied at an appropriate local scale.



Rising sea levels and the clearing of native mangroves for commercial shrimp and salt farms has contributed greatly to the destruction of large tracts of coastal mangroves in Thailand

Krabi Province lies on the west coast of peninsular Thailand, facing the Andaman Sea, and its robust economy relies primarily on agriculture and tourism. Palm oil and rubber, the principal crops, cover 95% of Krabi's cultivated area with many smallholder farms as well as industrial plantations. And, in spite of the December 2004 tsunami, tourism income has recovered and almost doubled since 2002.

Krabi covers 4,710km²; in 2007 its population was 411,000. Per capita income was \$2,800 in 2006. However, not all residents have shared in the agriculture and tourism boom. Inhabitants of small coastal communities continue to depend on harvesting fish and shellfish from Krabi's coastal waters. Some have added family-scale aquaculture as a source of income.



Krabi Province, Thailand

The seas offshore have particularly high biodiversity, including globally endangered marine mammals and sea turtles, abundant mangrove forest, 13.5km² of coral reefs and substantial seagrass beds. These resources remain plentiful and well-protected.

Design of the Study

WWF chose Krabi for this study because of its high level of biological diversity existing alongside valuable economic activities such as fisheries, aquaculture, agriculture and tourism. Emphasis was placed on understanding the impacts of climate change on local people's livelihoods, natural resources, and ecosystem services. The Krabi study was carried out by WWF in partnership with the Southeast Asia Regional Center of the Global Change SysTem for Analysis, Research, and Training (START).

The study team assembled data from a number of government sources and mapped it (using GIS) for the province's upland, coastal and urban areas. Future climate scenarios - simulated with the Hadley Centre's PRECIS model - were based on IPCC projections (A2 scenario) of greenhouse gas emissions and incorporated estimates of