Technology Fact Sheet for Adaptation

Modeling the impact of climate change on biodiversity to predict changes for conservation and management [i]

1. SECTOR: *To be written by sector expert*	Biodiversity
2. TECHNOLOGY CHARACTERISTICS	
2.1 Technology name:	Modeling the impact of climate change on biodiversity to predict changes for conservation and management
2.2 Introduction: *Low/high, Brief introduction to the technology*	Collaboration across disciplines is necessary to plan conservation responses to climate change adequately. Climate change planning needs to take place on a regional level; driven by both regional climate models and general circulation models. This will ensure that regional climate drivers such as land use change and topography are adequately represented. Sensitivity analysis can be carried out to address the substantial uncertainty inherent in projecting future climates and biodiversity response[1]. This can be considered to be a medium level technology. It does not require sophisticated equipment, but will use software. It will require information on current species location, distributions, climatic ranges plus localized climate predictions. This technology is probably one of the most vital mechanisms as most climate change adaptation strategies will need to be based on prediction, even though they may not be totally accurate. Climate change adaptation strategies in some countries base conservation on modeling predictions. It also allows selecting the minimum areas need to conserve all species and ecosystems.

[1] Hannah, L., G. F. Midgley, and D. Millar. 2002. Climate change-integrated conservation strategies. Global Ecology and Biogeography 11:485–495.

	Reference in existing policies, strategies and action plans: Mapping climate change vulnerability for biodiversity in Sri Lanka[2] has been carried out as a preliminary exercise. The Sector Vulnerability Profile states that the mapping exercise itself is preliminary and limited in scope, and should be refined on an on-going basis, based on detailed data, which may become available in the future. The exercise indicates that valuable montane wet zone forests and several lowland forests could be affected. In addition wildlife reserves, including National Parks in the Intermediate Zone, could also be affected.
2.3 Technology characteristics/highlights: *Few bullet points, ie. Low/high cost, advance technology; low technology*	In terms of technology it is not a hard technology but it's a rather new technology. Basic modeling of climate change and biodiversity has been done in Sri Lanka. However for conservation planning more sophisticated modeling will be necessary. Although not totally accurate it is the best possible way of strategically plan for conservation in a changing climate.
2.4 Institutional and organizational requirements: *How much additional capacity building and knowledge transfer is required for the adaptation option to be implemented.*	There will be capacity building and knowledge transfer necessary to carry out this activity. However this will not be too expensive as modeling, GIS specialists are available in Sri Lanka who can be trained, along with conservation professionals.
3. OPERATIONS AND MAINTENANCE	
3.1 Endorsement by experts:	For details of endorsement by local experts and relevant agencies see section on *'Reference in existing policies, strategies and action plans'* in Section 2.1. Globally this is an accepted method, with this technology is featured in many peer-reviewed journals[3]. Some express caution and recommend improved modeling capacity as the first step[4].
3.2 Adequacy for current climate: *Are there negative*	There will be no perceived negative impacts of this technology in the current climate. The modeling can, and should consider current threats

[2]Ministry of Environment. 2010. Op. Cit.

[3]Hannah et al. 2001. Op. Cit.

[4] Heller, N.E. & Zavaleta, E.S. (2009) Biodiversity management in the face of climate change: a review of 22 years of recommendations. *Biological Conservation*, 142, 14.

consequences of the adaptation option in the current climate? Some adaptation may be targeted at the future climate but may have costs and consequences under the current climate.	and incorporate these considerations as well, making the models relevant in both the current and future conditions.
3.3 Size of beneficiaries group: *Technology that provides small benefits to large number of people will be favored over those that provide larger benefits, but to fewer people.*	There will be a large number of beneficiaries who will benefit from climate change adaptation strategies being carried out in a strategic manner using modeling. Although it may not be direct or visible, it will ensure that climate change adaptation strategies can be planned and executed as well as it can be possibly done, ensuring that impacts on biodiversity will be minimal. This will ensure sustainability of biodiversity and associated ecosystem services, and make them more resilient, benefiting many who depend on ecosystem services for well-being and livelihoods.
4. COSTS	
4.1 Cost to implement adaptation options: *Cost measures*	This activity will mainly involve modeling using computers, and use of existing species data, which will not be very costly. There will be costs involved with data gathering, training etc and also conservation activities that will need to be carried out to implement it. Modeling will need to be incorporated into all climate-change adaptation strategies to make them effective (which are listed as separate technologies). It is estimated that this activity will cost Rs. 65 million annually. This is based on the assumption that a budget increase of 3.25% of current conservation budgets will be necessary for this activity (based on total Forest Department and Wildlife Department annual budgets). It is estimated that 25% of this will be borne by the public sector. This activity will need to be carried as periodically and is an annual budget. Cost will be for technology transfer, training, collecting available information, and simulation of models
4.2 Additional costs to implement adaptation option,	There will be some additional costs as modeling for climate change adaptation strategies have not been done at a fine scale in Sri Lanka

compared to "business as usual"	yet. However this cost will be relatively small, and is essential to plan conservation in a changing climate.
5. DEVELOPMENT IMPACTS, INDIRECT BENEFITS	
5.1 Economic benefits: **Employment** - *Jobs* **Investment** - *Capital requirements*	**Employment:** • This activity will require employment for activities relating to data gathering, modeling etc. • Modeling will lead to climate change adaptation strategies (mentioned separately), which will generate employment. • This technology will lead to suitable conservation activities to conserve biodiversity in a changing climate and many will benefit from it due to community conservation programs and ecotourism. **Capital requirements:** • The capital requirements will be relatively low, as it will not require investments in any hard technology. There will be investment required for computers and other equipment necessary for modeling.
5.2 Social benefits: **Income** – *Income generation and distribution* **Education** – *Time available for education* **Health** – *Number of people with different diseases*	**Income:** • There will be some income generation from employment. However the bulk of the income will come from the implementation of modeling into conservation activities. • These activities will allow income generation from community conservation, payments for ecosystem services, REDD, ecotourism etc. **Education:** As this is a relatively new and emerging technology, university level student can benefit from exposure to this technology. **Health:** The improvement of biodiversity and ecosystem services through climate change adaptation strategies based on modeling will contribute to health and well being of the population.
5.3 Environmental benefits: *Reductions in GHG emissions, local pollutants, ecosystem*	Will contribute to minimizing impact of climate change as it would give a better idea on how adaptation activities should be planned and how biodiversity will be affected.

degradation etc.	Integration of such a technology in climate change adaptation strategies would allow ecosystems to be more resilient, and damage to ecosystem services be minimized.
6. LOCAL CONTEXT	
6.1 Opportunities and barriers: *Barriers too implementation and issues such as the need to adjust other policies*	**Opportunities:** • Ability to plan ahead for biodiversity conservation (although predictions may not be totally accurate – it could point to possible impacts). • Advanced modeling and planning of strategies climate change adaptation are being carried out in some countries, including the Cape Floristic Region in South Africa[5]. • Adaptation strategies will be more effective if they are based on climate models and existing data. • Ability to gain knowledge and expertise from other countries. **Barriers:** • Lack of data on species locations, ranges etc. • Lack of specialists in modeling biodiversity and climate change.
6.2 Status: *Status of technology in the country*	This technology is very new in the country but with capacity building and technology transfer it should be possible to introduce it relatively easily. This is also because there is considerable data in the Red List, conservation professionals and GIS experts in the country.
6.3 Timeframe: *Specify timeframe for implementation*	Several months to a year or two, for initial modeling and predictions. Will need to be updated periodically.
6.4 Acceptability to local stakeholders: *Whether the technology will be attractive to stakeholders*	It should be attractive to local stakeholders, as predictions will ensure better planning and long-term conservation of biodiversity and ecosystem services. When implemented, there could be opportunities from employment for additional conservation activities, ecotourism, community conservation, payments for ecosystem services, REDD etc.

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Adaptation – Sir Lanka. You can access the complete report from the TNA project website http://tech-action.org/**

[5]Hannah, L et al. 2002. Op. Cit.