Technology Fact Sheet for Adaptation

Increasing connectivity through corridors, landscape/matrix improvement and management [i]

1. SECTOR: *To be written by sector expert*	Biodiversity
TECHNOLOGY CHARACTERISTICS	
2.1 Technology name:	Increasing connectivity through corridors, landscape/matrix improvement and management
2.2 Introduction: *Low/high, Brief introduction to the technology*	Establishing corridors and improving matrix management is not a new conservation tool. This can be considered to be a medium level technology. Increasing connectivity in the broader landscape is vital for conserving biodiversity during climate change[1]. It is an important mechanism to connect fragmented areas, as many protected areas are isolated from each other. With climate change, corridors become important as they will allow migration of species, whose range will change to the changing climate[2,3]. This strategy involves the protection of areas and regions that would be essential for climate-induced wildlife movements[4]. Technologies that can be used include movement corridors for terrestrial species, while unblocked streams and rivers are important movement corridors for aquatic species[5]. In the case of forests, a system of corridors could be designed utilizing existing patches or augmenting with aided natural restoration or analogue forestry creating an opportunity for short or long term migration.

[1]Mawdsley, J.R., O'Malley, R., Ojima, D.S., 2009. A review of climate-change adaptation strategies for wildlife management and
Biodiversity conservation. Conservation Biology 23, 1080–1089.

[2]Mawdsley, J.R., O'Malley, R., Ojima, D.S., 2009. A review of climate-change adaptation strategies for wildlife management and biodiversity conservation. Conservation Biology 23, 1080–1089.

[3] Hannah, L and Hansen, L. 2005. Chapter 20 – Designing Landscapes and Seascapes for Change. In: Lovejoy T, Hannah L, eds. 2005. In Climate Change and Biodiversity. New Haven, CT: Yale Univ. Press

[4] Allan, J. D., M. Palmer, and N. L. Poff. 2005. Climate change and fresh- water ecosystems. Pages 274–290 in T. E. Lovejoy and L. Hannah, editors. Climate change and biodiversity. Yale University Press, New Haven, Connecticut.

[5]Mawdsley et al., 2009. Op. Cit.

	This strategy is consistent with a number of existing management approaches, such as analogue forestry, agroforestry, fish ladders, and improving home gardens. Modeling techniques will be necessary to assess landscape permeability to species movement and to predict likely paths of dispersal across the landscape matrix under particular climate-change scenarios[6]. *Reference in existing policies, strategies and action plans:* The Biodiversity Conservation - Framework for Action recommends to 'Study the status/trends in wildlife areas, and identify the need for wildlife corridors and linkages as an option for species conservation'. It also identifies that there is an inadequacy in networking among protected areas. It was recommends programs to rehabilitate degraded critical habitats, and implement strategies for the promotion and strengthening of home gardens[7] – these strategies will allow improvements in the broader landscape to facilitate species movement.[8] According the National Action Plan for Haritha Lanka Strategy 3 in Mission 2: Saving the Fauna, Flora and Ecosystems is to 'Conserve and sustainable use flora and fauna outside the protected area network'[9]. Strategy 2.2 states to 'Study the status/trends in wildlife areas, identify need for wildlife corridors, linkages as an option for species conservation'[10]. The Climate Change Adaptation Strategy[11] for Sri Lanka and the Sector Vulnerability Profile for Biodiversity and Ecosystem Services[12] has identified to 'Link/restore/conserve, forests and other habitat refugia to increase resilience of ecosystems and species' - (B i).
2.3 Technology characteristics/highlights: *Few*	It is not an advanced technology, and a few forest corridors have already been established[13]. There are also activities that aim to link

[6]Mawdsley, et al. 2009. Op. Cit.

[7]Ministry of Environment and Natural Resources. 2007. Biodiversity Conservation in Sri Lanka: A Framework for Action – Addendum.

[8]Ministry of Environment and Natural Resources. 2007. Op. Cit.

[9] National Council for Sustainable Development . 2009. National Action Plan for Haritha Lanka Programme

[10] National Council for Sustainable Development . 2009. Op. Cit.

[11]Ministry of Environment. 2010. National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016.

[12]Ministry of Environment. 2010. Sector Vulnerability Profile: Biodiversity and Ecosystem Services.

[13]Rainforest Rescue International. 2011. Rainforest Corridor Programme.
http://www.rainforestrescueinternational.org/downloads/rri_rcp_case_study.pdf

bullet points, ie. Low/high cost, advance technology; low technology	the broader landscape through land management and working with land users. The cost of this technology will be low-medium. There are provisions for such corridors in wildlife legislation and are referred to as 'jungle corridors'[14]. It will require selecting the correct sites that need linking, and also selecting sites that are able to link fragmented areas. Selection of suitable corridors will need to be supported by modeling which will help predict how species will move with changing slime.
2.4 Institutional and organizational requirements: *How much additional capacity building and knowledge transfer is required for the adaptation option to be implemented.*	As this is not a 'new technology', support can be obtained from experts involved in this activity currently. Capacity building and knowledge transfer will be required to (1) Select suitable areas based on climate change modeling and predictions, and (2) Select the correct methodology and process to create/enhance the corridor/improve landscape connectivity. Knowledge transfer and capacity building will be required for modeling related activities.
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 technology has been recommended as an adaptation strategy for biodiversity for climate change in books and peer reviewed journals[15,16]. According to a study, to improve landscape connectivity, so that species can move, is the most frequent recommendation for climate change adaptation, while the second popular recommendation for improving landscape connectivity is to change how we manage the matrix[17].

[14] The Fauna and Flora Protection Ordinance No. 2 of 1937 and Amendment Act No. 49 of 1993.

[15]Mawdsley, J.R., O'Malley, R., Ojima, D.S., 2009. A review of climate-change adaptation strategies for wildlife management and biodiversity conservation. Conservation Biology 23, 1080–1089.

[16] Hannah, L and Hansen, L. 2005. Chapter 20 – Designing Landscapes and Seascapes for Change. In: Lovejoy T, Hannah L, eds. 2005. In Climate Change and Biodiversity. New Haven, CT: Yale Univ. Press

[17] 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.

3.2 Adequacy for current climate: *Are there negative 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.*	There will be no negative impacts under the current climate. In fact it will also assist in alleviating existing issues relating to fragmentation of habitats. In the future its usefulness will only increase. Protecting such areas will also allow for ecosystem services, carbon sequestration and a habitat for many critical species that exist outside the current protected area system.
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 benefits associated with ecosystem services for the larger population. The enhancement of the landscape will also increase the opportunities jobs and income related to conservation.
4. COSTS	
4.1 Cost to implement adaptation options: *Cost measures*	The cost of the technology is variable depending on the condition and connectivity of the matrix. It will require some investment, especially if the area needs to be acquired, restored and managed to facilitate migration. If it mainly works with current land users then the cost be lower. It is estimated that this activity will cost Rs. 90 million annually. This is based on the assumption that a budget increase of 4.5% 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. The activity will need to be carried out until prioritized sites are covered, and will have to be an annual budget. Cost will be for site selection (models and available information), prioritization, establishing corridor (legal declaration, land acquisition if necessary), awareness and training for best practices, restoration (if necessary) and monitoring.
4.2 Additional costs to implement adaptation option, compared to "business as usual"	The additional cost will be associated with obtaining the area and it may need to be purchased, people may need to be relocated. There could also be costs in restoring, managing and maintaining it. Funds will be required when educating and working with landowners.
5. DEVELOPMENT IMPACTS,	

INDIRECT BENEFITS	
5.1 Economic benefits: **Employment** - *Jobs* **Investment** - *Capital requirements*	**Employment:** • There will be some jobs created locally if it requires restoration, monitoring or conservation. • There could be ecotourism, community conservation and sustainable utilization of NTFP **Investment:** • There will not be major capital requirements, however if restoration or any construction (eg: fish ladders) related activities are necessary – it will require some investment. • Investment will need to be made in order to secure land in the case of corridors,. In some cases compensation will need to be paid if there are legitimate owners.
5.2 Social benefits: **Income** – *Income generation and distribution* **Education** – *Time available for education* **Health** – *Number of people with different diseases*	**Income:** • Income could be generated by jobs associated with corridors and matrix management. • Jobs and income from possible ecotourism related activities. • Possible benefits from community conservation, payments for ecosystems services, REDD, NTFPs etc. **Education:** • Educational benefits will include the ability for students to learn about the technology. • University students can learn and contribute to this technology. **Health:** • It will help sustain biodiversity and ecosystem services, contributing to good environmental quality, which in turn improved well-being and health of people.
5.3 Environmental benefits: *Reductions in GHG emissions, local pollutants, ecosystem degradation etc.*	Environmental benefits include maintaining genetic diversity, allowing migration for species with large home ranges, seed dispersal, carbon sequestration and other ecosystem services. It will also allow ecosystems to be resilient to the changing climate as they are better conserved.
6. LOCAL CONTEXT	

6.1 Opportunities and barriers: *Barriers to implementation and issues such as the need to adjust other policies*	**Opportunities:** • The Biodiversity Conservation - Framework for Action recommends this technology[18]. • Technology available, and the country has got some experience in this. • Many private owners maybe motivated due to the various benefits and income opportunities. **Barriers:** • It can be difficult to predict future species movements with high degree of confidence (for corridors)[19]. • Availability, acquisition of sites and possible resettlement. • It will be difficult to formalize such a mechanism when working with private landowners. • Landowners may need benefits to motivate their participation. • Participants may be able to pull out anytime and difficult to ensure long-term commitment from participants. • Difficulties in managing and monitoring scattered land areas.
6.2 Status: *Status of technology in the country*	Technology available, as the country has got some experience[20] in this. Some landscape connectivity mechanisms for freshwater systems, wetlands and other ecosystems may be rather new technologies to the country.
6.3 Timeframe: *Specify timeframe for implementation*	It could take a few months to about a year to identify and legalize the corridor, however periodic maintenance and monitoring may be required.
6.4 Acceptability to local stakeholders: *Whether the technology will be attractive to stakeholders*	It is likely that the technology will be acceptable to local stakeholders. The only opposition it could face is from those who may be required to resettle, or if there is demand for other uses. However in most cases this activity will involve working with the current land use. The technology will be attractive as it could draw ecotourism and long-term benefits from conservation-related income.

[18]Ministry of Environment and Natural Resources. 2007. Op. Cit.

[19]Mawdsley, J.R., O'Malley, R., Ojima, D.S., 2009. A review of climate-change adaptation strategies for wildlife management and biodiversity conservation. Conservation Biology 23, 1080–1089.

[20]Rainforest Rescue International. 2011. Rainforest Corridor Programme.

[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/**