Technology Fact Sheet for Adaptation

Ex-situ conservation for highly threatened species and possible reintroduction [i]

1. SECTOR: *To be written by sector expert*	Biodiversity
TECHNOLOGY CHARACTERISTICS	
2.1 Technology name:	Ex-situ conservation for highly threatened species and possible reintroduction
2.2 Introduction: *Low/high, Brief introduction to the technology*	Ex-situ conservation refers to conservation activities that occur outside the usual habitat of a species. Usually this approach focuses on captive maintenance programs for species that would otherwise become extinct due to climate change. Such an approach would generally be a last resort for species[1]. Zoo's, captive breeding centers, seed banks etc are some example of such conservation activities, and therefore not a new technology. However some advanced facilities may be necessary for certain species. Zoos and breeding centers have long been carrying out captive breeding, especially for keystone mammals. Sperm and egg banks would be rather extreme forms of this strategy, but may be necessary[2]. Often such activities are carried out as insurance against future or unexpected threats that will make in-situ conservation difficult. Ex-situ conservation is usually not favored where in-situ conservation is possible, but its importance as an insurance mechanism is recognized. *Reference in existing policies, strategies and action plans:* The Biodiversity Conservation - Framework for Action has a separate section on ex-situ conservation, recommending activities such as developing ex-situ programs, establishing more botanical gardens and

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

[2]Mawdsley et al. 2009. Op. Cit.

	developing the capacity of the National Zoological Gardens, among others[3]. According the National Action Plan for Haritha Lanka Strategy 1.3 states to 'Develop rules and guidelines for starting and operating ex-situ conservation centers including the acquisition of specimens for breeding and the re-introduction of captive-bred specimens'; Strategy 3.1 recommends to 'Identify species requiring ex-situ conservation measures, assess and restore their habitats and provide for their reintroduction'; Strategy 3.2 to 'Establish more botanic gardens and field gene banks and mandate them to undertake ex-situ conservation of biodiversity in all bioclimatic regions of Sri Lanka'; Strategy 3.3 to 'Develop capacity of National Zoological Gardens to engage in ex-situ conservation programs and serve as a regulator for zoological species ex-situ centers in general'[4].
2.3 Technology characteristics/highlights: *Few bullet points, ie. Low/high cost, advance technology; low technology*	This is a medium to high cost technology, as conservation is carried out outside the species habitat, often in an artificial environment. It may require special facilities to be created for some species. It would require the identification of species that could become restricted by climate change. For reintroduction it will be important to identify new habitats. Zoos, botanical gardens and seeds banks are available in Sri Lanka but these may need to be expanded or upgraded. In some situations, ex-situ conservation will need to be carried out until global warming is reversed may be the only chance of survival for some species. Ex-situ collections should have sufficient diversity to allow adaptation[5].

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

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

[5]Noss, R. F. 2001. Beyond Kyoto: forest management in a time of rapid climate change. Conservation Biology 15:578–590.

2.4 Institutional and organizational requirements: *How much additional capacity building and knowledge transfer is required for the adaptation option to be implemented.*	There are separate Departments for Botanical Gardens and Zoological Gardens. The Plant Genetic Resources Centre is the main seed bank in the country, and mainly concentrates on crop genetic resources[6]. Captive breeding, mechanisms such as egg and sperm banks, and other new approached may be required and can be obtained through technical assistance. Capacity building may be required to improve existing mechanisms, and for the introduction of new mechanisms.
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. Some forms of ex-situ conservation have been established for some time in Sri Lanka, including a zoo, botanical gardens and seed banks. Ex-situ conservation has also been identified as an important climate change adaptation strategy by global experts, with views being published in international peer reviewed journals[7].
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 are currently no negative impacts in the current climate for ex-situ conservation as some activities occur at present. The Biodiversity Conservation - Framework for Action, and international peer reviewed papers also support ex-situ conservation – in many cases as a last resort to save species. However, if large numbers of wild species are removed from the wild, it can threaten wild populations. Ex-situ conservation should also be carried out before it is too late and irreversible.

[6]MuthukudaArachchi, D. H. and Wijerathne, P. M. 2008.Country Report on the State of Plant Genetic Resources for Food and Agriculture – Sri Lanka. FAO. http://www.fao.org/docrep/013/i1500e/SriLanka.pdf

[7]Mawdsley et al. 2009. Op. Cit.

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.*	Ex-situ conservation will ensure survival of certain species that may not survive otherwise. It includes commercially important seeds, which could have direct economic impacts. This activity will need to be carried out continuously and will have to be an annual budget. Improving current ex-situ programs and introduction of new mechanisms, including preparation for future ex-situ conservation activities can generate considerable number of jobs – and especially utilize the expertise of veterinarian, biologists and conservationists.
4. COSTS	
4.1 Cost to implement adaptation options: *Cost measures*	It is estimated that this activity will cost Rs. 100 million annually. This is based on the assumption that a budget increase of 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. Cost will be for prioritizing species for ex-situ conservation (based on information, level of threats and models), training and capacity building, establishing facilities/upgrading existing facilities, implementing ex-situ conservation.
4.2 Additional costs to implement adaptation option, compared to "business as usual"	There are already certain seeds banks, botanical gardens and zoos in the country – but these would need significant upgrade, and the creation of new facilities if ex-situ conservation is to be carried out.
5. DEVELOPMENT IMPACTS, INDIRECT BENEFITS	
5.1 Economic benefits: **Employment** - *Jobs* **Investment** - *Capital requirements*	**Employment:** • Ex-situ conservation, its the expansion, upgrade and creation of new facilities will provide employment opportunities during the construction and preparation process, and for day to day activities. It will require support staff but also scientists and veterinarians. **Investment:** • There will be medium to high capital requirements to upgrade existing facilities, and create new facilities for ex-situ conservation.
5.2 Social benefits: **Income** – *Income generation*	**Income:** • Certain ex-situ conservation programs, especially those associated

and distribution **Education** – *Time available for education* **Health** – *Number of people with different diseases*	with zoos, botanical gardens and aquaria can generate significant income from tourists and local visitors. In fact they can draw in larger visitors, as carrying capacity is not an issue, and due to the location and ease of visiting. **Education:** • Zoos, botanical gardens and aquaria are excellent learning platforms for students of all ages and adults. It gives an opportunity to learn about both native and exotic species, and the ability to see a wide variety of species and obtain information, and usually have excellent interpretation centers. • They also provide information on threatened species and importance of conservation, and play an important role in obtaining support of biodiversity conservation in general. **Health:** There are no obvious health benefits from ex-situ conservation, but can contribute to good mental health and relaxation, as it is a recreational activity.
5.3 Environmental benefits: *Reductions in GHG emissions, local pollutants, ecosystem degradation etc.*	The main environmental benefit would be that this mechanism would contribute to the viability of threatened biodiversity, and genetic diversity.
6. LOCAL CONTEXT	
6.1 Opportunities and barriers: *Barriers too implementation and issues such as the need to adjust other policies*	**Opportunities:** • This will be the last resort of saving certain species[8]. • It may allow the re-introduction of species[9]. **Barriers:** • Ex-situ conservation is expensive. The upgrade and creation of new facilities will require considerable funding for both establishing and operation. • It is unlikely to be a viable long-term strategy for any more than a few species[10].

[8]Mawdsley et al. 2009. Op. Cit.

[9]Noss, 2001. Op. Cit.

[10]Mawdsley et al. 2009. Op. Cit.

	• Under extreme climate change scenarios it may not be feasible to reintroduce captivity-bred species in to the wild[11].
6.2 Status: *Status of technology in the country*	There are botanical gardens, zoos and seed banks in the country – and the first two attract many local and foreign visitors. However there is opportunity of improving ex-situ conservation in the country, especially in the case of zoos. More advanced ex-situ facilities maybe required for the conservation and captive breeding of certain species, sperm and egg banks, advanced seeds banks may be other necessary mechanisms.
6.3 Timeframe: *Specify timeframe for implementation*	Ex-situ conservation is a mid to long-term strategy and needs to be carried out continuously.
6.4 Acceptability to local stakeholders: *Whether the technology will be attractive to stakeholders*	It is unlikely that local stakeholders will not accept ex-situ conservation as it can bring in conservation benefits and also income and job opportunities.

[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/**

[11] Mawdsley et al. 2009. Op. Cit.