

## Madagascar – out of time?

### Introduction

This activity uses role play to examine conflicting demands on an ecosystem which contains an endangered species, the gentle lemur, as well as important sources of livelihood for several groups of local people.

### The activity

Through discussion and debate, students explore the issues surrounding the human/wildlife conflict using a case study of Lac Alaotra – the largest freshwater lake on Madagascar. Students can consider ways of resolving the conflicts between the local villagers and the endemic wildlife. Students should first watch the PowerPoint introduction to gain an overview of Madagascar, Lac Alaotra and the issues affecting the area, its wildlife and people. The presentation touches on other relevant subjects such as the creation of islands and the impact of this on speciation, succession in habitats and the role of organisms in the habitat, i.e. niches. The presentation should take no longer than 15 minutes and will provide students with the necessary background information to conduct the following role-playing debate.

Then students should either divide themselves or be divided into six groups:

- conservationists (local and international)
- Lac Alaotran farmers
- fishermen from the lake
- local government officials
- reed weavers
- local family members.

Students do not need the Student sheet if oral instructions are given. Each group of students should be given only the notes that relate to their group's interests. They should use them as a guide but not as a complete list of issues affecting their group's interests. Students could be encouraged to provide their own, additional points. They must analyse the

#### How Science Works

**Hb.** Decision makers aim to make evidence-based decisions, taking into account factors that include: technical feasibility, benefits expected, economic cost, risks to human health and well-being, risks to the environment. Cost-benefit analysis is the process of estimating the size of the costs and the value of the benefits as a way of determining the best policy option. A cost-benefit analysis should consider which individuals or groups receive the benefits, and which suffer (or pay) the costs.

**Hd.** Some decisions about science and technology may need to comply with national and international agreements, legislation and agreed principles such as sustainable development.

**He.** In practice much of the evidence available to decision makers is often uncertain. It is not possible to make accurate predictions about the future. The system may be too complex; some issues may not yet be well understood.

**Hf.** Decision makers are influenced by the mass media, by special interest groups and by public opinion as well as by expert evidence. Decisions about science and technology may be influenced by decision makers' prior beliefs or vested interests, which can affect their interpretation and evaluation of the evidence.

#### Science explanations

**Pg.** Complex patterns of interdependence and competition within and between species mean that changes that affect one individual or species can have extensive knock-on effects on other individuals or species.

**Pi** Some changes to ecosystems may lead to further changes that restore the system to stability; others can lead to irreversible disruption and large-scale effects.

**PI** Now, 65 million years after the most recent extinction episode, species are becoming extinct at a rate many times faster than ever before.

**Pm** Unlike the five previous episodes of extinction, this one is being caused by the activity of a single species.

notes and decide which activities around the lake their group think should be stopped and what alternatives could be employed. Guidance on how the group should approach this task is given on the Student sheet.

The role of cultural sensitivity in achieving local change is mentioned on the Student sheet but it would be worth highlighting this to groups as they have their discussions.

Groups should be given a total of approximately 30 minutes to formulate their arguments. There are additional teacher/lecturer notes about the issue that can be used to support the students as they develop their arguments before the debate. These can be given to the students if it will help them to develop their ideas. These notes should either be given to none of the groups or to all. Ideally, the presentation and preparation would take place in one lesson, giving homework time for groups to complete their presentation before the debate the following lesson.

A debate should then follow in which a member from each interest group is asked to be part of the chairing committee that will need to decide the final outcome. The remaining group members should then be asked to present their argument for the cessation of particular activities (and the continuation of others). After each group has presented their argument, time should be given for the other groups to pose questions. Once all groups have presented their case the committee will debate the issues to decide on a final decision that is a realistic, sustainable compromise, meeting both the people's needs and those of the local wildlife, in particular the critically endangered gentle lemur. This debate can be run as a 'fishbowl' debate – with the committee in a small group placed centrally – and the rest of the class sitting around the committee, listening and taking notes. The non-committee members could be given a specific task such as evaluating how well the committee communicate, and use evidence to support their argument.

The session could be concluded by noting that achieving a workable solution is a complex process. Without the support of the majority of the local population, conservation measures are unlikely to be effective. Nowadays conservation initiatives often involve local people in the decision-making process. Possible answers will be through legislation, finance, education and training. What should be clear is that a combination of solutions is probably required. Simply passing a law at a national level to ban the felling of trees in a particular area will have little impact if the local population has no alternative source of firewood known to them. Local initiatives must go hand in hand with action at regional, national and international levels.

### **Additional teacher/ lecturer notes**

#### **How the Durrell Wildlife Conservation Trust (DWCT) is working to overcome the problems at Lac Alaotra**

There is no definitive solution for solving the conflict between people and wildlife. What has to be recognised is that if people are part of the problem then they must also be part of the solution. This has been the approach of the Durrell Wildlife Conservation Trust in its efforts to bring back the gentle lemur from the brink of extinction. Whether they have to build a spirit hut to honour the ancestors or simply trust in the local belief that crocodiles possess good spirits and so will not hurt you, they endeavour to understand and respect local Malagasy traditions.

By training local staff they have had an added insight into local lives. This understanding enabled them to realise that simply trying to stop rice cultivation was not a realistic option. A more likely solution is to develop local understanding of sustainable agriculture, enabling the people, the wildlife and the land they both need to co-exist.

In Madagascar, beliefs and traditions are passed from generation to generation in song and dance. So this has been the medium used to convey the message that conserving the lake ecosystem is vital to long-term productivity of the surrounding land. Meetings were held with local village leaders and as a result village festivals (fetys) have been run all around Lac Alaotra, highlighting the value of their reed bed resource. These fetys attracted local and national government officials and prizes of tools and textiles were awarded to the best performances. As well as raising local and national awareness the festivals have developed a sense of pride in their unique habitat amongst the local population

However, raising awareness and pride is only the first step. Without practical solutions to the problem of food production little will be achieved. Working with the farmers, the DWCT has been able to suggest more efficient ways of using the land for rice. Some villagers have gone as far as to plant new reed beds, holding a reed planting ceremony each year, thereby giving the process of succession a helping hand.

Changing attitudes and lifestyles takes time. DWCT are moving in the right direction but the gentle lemur is not yet 'out of the woods', or rather 'into the reeds'!

Like the world at large, Madagascar is being shaped by humans and their desire to survive and prosper. Ultimately humans will only prosper if we recognise the need to develop the world in a sustainable way. The global ecosystem is a complicated machine, with us as a highly influential cog. If the machine is to continue working we need to begin to recognise the impact we have on the rest of the working parts and ensure that this impact is for the good and does not simply bring the world to a grinding halt.

### **Additional background notes**

- The Malagasy people are proud to have many children; at 6 years old they can start to work in the fields and at 8 they can care for the cattle (zebu).
- More rice is eaten per person in Madagascar than in any other country except for Burma. The Malagasy eat on average 0.5 kg of rice every day. Although rice accounts for 50% of the crops grown on the island they have to import rice from other countries in order to meet the demand.
- Although rice is deeply embedded in Malagasy culture it only arrived on the island in recent centuries. We do not know when the first people colonised Madagascar but it was around 1500 years ago and they came from the Indonesian/Malaysian region.
- Only 4.4% of the land is used for agriculture, partly because of the rugged terrain and partly due to the lack of suitable technology to utilise the land.
- Over 75% of the island has been deforested and little undisturbed forest is left.
- The average income is about \$200 per year. So although the cost of living is relatively low in Madagascar compared to western standards, more efficient machinery, fertilisers, new crop types, etc. remain out of reach for most farmers.
- Japan has 10 times the population size of Madagascar (which has a population of just under 16 million) on only 2/3 of the land, and yet has a per capita income 75 times higher than in Madagascar. This may be in part due to the chronic malnutrition that affects the majority of the Malagasy population.
- Only 10% of the rural population has access to clean drinking water.
- The average lifespan is 55 years of age.
- Unfortunately little of the revenue generated from national development schemes such as periwinkle harvesting makes it back to the local people who need it the most. There are many instances when money seems to have 'disappeared' when it involves some regional and national government officials. It is often the multinational companies who gain the most.
- Global warming is now apparently affecting the climate of Madagascar. This is particularly detrimental to the farmers who rely on the seasonal rains to fill their paddy fields. As the rains are now coming late or not at all, many farmers are losing a whole season's crops. Lack of rain also impacts on the lake itself.
- Mineral exploitation has already begun but there is the potential for greater expansion. For example, a subsidiary of the Rio Tinto mining company approached the government over the creation of a deep-water port and harbour at Fort Dauphin, in the south of the island. The company would pay for the construction and the Malagasy could also use the port to bring in large tourist cruise ships. This would provide revenue for this poor region. Clearly this option is attractive financially but how much of the revenue will filter its way down to the local people and what environmental costs will it involve?

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### **The fishermen from the lake**

- We need to catch fish to supplement our diet with protein.
- Our families are growing in size and so the amount of fish we need to catch has gone up too.
- We need to catch fish to sell in the local market so that we can purchase tools and basic commodities (cooking equipment, medicines, etc.)
- There seem to be fewer fish around and they seem to be getting smaller.
- There are many more fishermen around than before, many of whom have come from other parts of Madagascar affected by drought and poverty. These people are from different tribes and do not respect our way of life, our traditions and ways of using the land and its resources.
- The water is getting murky and we have seen dead fish around. This has only started happening in the last few years.
- The water is also getting shallower and many of the traditional fishing grounds have dried up.
- We would like to make money out of the few tourists who come here but we need to protect parts of the lake so there is something to see.
- We wonder if the reeds are important as spawning grounds and nurseries for young fish.

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### **Lac Alaotran farmers**

- Rice is our main food source and so we need to grow rice to feed our growing families.
- As well as eating it and selling any excess, rice is a vital link between us and our ancestors. We sometimes pour rum on the rice fields before we start work in honour of our ancestors.
- Rice is a sacred substance. We have constructed the Malagasy calendar around the stages of rice cultivation during the year.
- If we don't cut down the reed beds to make space for rice paddies (fields) then someone else will!
- Soil eroded from the surrounding hills washes down into our rice paddies and clogs them up with silt, so we have to cut down and burn more reeds to create new fields every season.
- We have a saying that goes 'Without the forest there will be no more water; without water there will be no more rice'.
- We must also burn the reeds and surrounding vegetation to make pasture for our cattle (zebu). Although we do not eat the zebu they are important in traditional ceremonies and are used as sacrifices, for example during funerals. We also use the cattle as dowries when our children get married.
- We used to leave the land fallow (empty) for a few years to help it to recover but now we have no choice but to cultivate it continuously.

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### Local family members

- We have to cut down the forest on the hill slopes around the lake in order to make charcoal for cooking.
- Selling charcoal to other villagers is an important way of making a living.
- More families are arriving from other parts of Madagascar. They are taking over our land and cutting down our trees for charcoal. They come from different tribes and do not respect our way of life. If we do not cut down the trees first then they will!
- We need clean water to drink and for washing and we can only get it from the lake. We now have to walk several kilometres to reach the edge of the lake as it is drying out.
- There has always been a dry season when it has been difficult to find water but now the climate seems to be changing and the rains come late, if at all.
- We need to have big families, as they are a sign of wealth.
- We do not want our children to go to secondary school because they are needed to help work the land and care for the livestock.
- We do not trust the government as many of the officials are corrupt and only interested in making money for themselves.
- Some of us have got together and made our own laws governing the use of the reed beds and we try to protect them from other villagers and outsiders. We call these local laws 'dinas' and they are supported by some local government officials.

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### Local government officials

- We would like to develop the land in order to improve the economy.
- Unless we can make more money we do not have the resources to improve basic needs such as healthcare and education.
- Malnutrition is a massive problem facing people throughout Madagascar.
- Most of our road network is unpaved and so gets washed away during the rainy season. This makes access to schools, hospitals and markets almost impossible for the local, rural population.
- One of our biggest problems is population growth. Today the island population is around 16 million. At the current rate of growth in 15 years this could have doubled, depending on whether or not population growth is slowed.
- We could sustain this population growth if we were able to farm the land more efficiently and find additional exports. Currently 70% of our export earnings come from agricultural products, such as vanilla and coffee, but we need to increase local food production in order to feed the growing population and to improve the economy.
- There could be many natural resources that are currently untapped. For example, the rosy periwinkle (*Catharanthus roseus*) grows commonly around villages and is used in traditional medicines. We now export 100 tonnes of it every year as an ingredient for fighting childhood leukaemia.
- A potentially large source of income for the island could come from extracting minerals, such as iron ore, petroleum products and semi-precious stones. We have been approached by large multinational companies who would like to exploit these resources.
- We have signed up to many international agreements, such as on conserving biodiversity, CITES and the conservation of wetlands. We even have a 15-year plan to conserve the environment and to provide basic requirements, such as education and healthcare for the people.

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### Reed weavers

- We need the reeds to provide the raw materials for making baskets, roofing material, hats and other household goods to use and to sell.
- Without the reed beds we would not be able to make a living.
- If we could get our goods to the markets, which are many miles away in the larger towns, we could make more money from this trade.
- We do not need to kill the reeds to get the material. We just cut the stalks and these will grow back in time.
- It is now becoming harder to find suitable reeds as the rice farmers burn it to clear land for agriculture.
- The reeds are also dying because the lake is becoming clogged with silt that has been washed off the bare hillsides.
- Because we do not have any rights over the reeds we cannot stop people cutting down unnecessary amounts. We have formed cooperatives to try to control the reed harvesting but people from outside the village still take them and the fishermen and farmers still destroy them.
- As the farmers and fishermen are finding it harder to make a living there is less money around to buy our goods.
- We need the reeds to make fish traps.

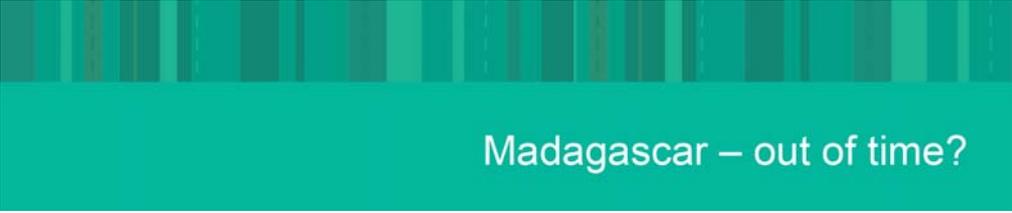
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### Conservationists (local and international)

- The Lac Alaotran gentle lemur is endemic to the reed beds that encircle the lake. It is found nowhere else in the island. It is known locally as 'bandro'.
- The gentle lemur eats the reeds and marsh grasses almost exclusively (95% of its diet).
- The main threats to the lemur's survival are burning and cutting of their reed bed habitat to make way for rice fields and for fishermen to gain access to fishing grounds, and the hunting of the lemurs themselves for food or 'sport' by the local people. Young lemurs are also taken by local villagers as pets.
- The lemur is listed as Critically Endangered by IUCN. Thirty percent of the population has been lost within the last 5 years. There are estimated to be only 5000 lemurs left and these are living in a fragmented habitat with little chance to move between reed beds for breeding and foraging.
- There are only three main populations left around the lake, two in the south and one small one in the north.
- The lemurs are highly territorial and families will defend their territory from other family groups or lone adults.
- Although the government has signed up to many international agreements it does not put the resources in place to enforce them. The illegal destruction of the forests and harvesting of the wildlife continues unchecked.
- Village leaders and regional government officials have put local and regional laws in place. Some have worked with the villagers, playing an active role in protecting designated areas – such as certain reed beds – from exploitation. However, 'raids' from other villages means that protection of these fragmented habitats is limited.
- Although the reed weavers may not intentionally kill the reeds, they do cut the reeds when the stalks are green and so they remove many of the plants' nutrients. If the rains do not come then the cut plants are unable to obtain the moisture they need to regrow and so they die.
- If the reed beds go then not only do we lose the gentle lemur but the entire lake ecosystem that depends on the reed beds to maintain it.

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## Madagascar – out of time?

### Introduction

This activity explores a case study about Lake Alaotra in Madagascar. The problem is set out in a PowerPoint presentation about ways in which human–wildlife conflicts can be reconciled.

Around Lac Alaotra – the largest freshwater lake on Madagascar – there are conflicts of interest between the local villagers and the endemic wildlife. The critically endangered gentle lemur and the local people depend on the reed beds around the lake for their survival.

Achieving a workable solution to resolve the conflicts is a complex process; without the support of the majority of the local population conservation measures are unlikely to be effective. This approach of involving local people in the decision-making process reflects the way in which many recent conservation initiatives have been implemented. In this activity you will have to consider the concept of sustainable development and a range of options for implementing such development. These include legislation, financial incentives, education and training, and the role of individuals in that development.

### The Activity

First, watch the presentation on Lac Alaotra to gain an overview of some of the issues surrounding this problem.

The class will then be divided into six groups:

- fishermen from the lake
- Lac Alaotran farmers
- local family members.
- local government officials
- reed weavers
- conservationists (local and international)

Each group will be given additional notes relevant to their group. You should use these notes to develop your group's argument. You will need to cover the following points:

- Identify activities/behaviours that are impacting on the lake (e.g. lemur hunting, deforestation, rice cultivation, reed harvesting, reed burning, fishing).
- Identify the behaviour that you feel is the one that you would like to see change, remembering the needs of your particular group. Bear in mind the role of cultural sensitivity in achieving local change. It may be biologically possible for farmers to grow potatoes instead of rice but should we or could we persuade the local community to make that change?
- Agree the activity/behaviour that it is a priority to change.
- Suggest alternative(s) that could be employed. The alternatives need to be workable and explained in a way that will get the acceptance and/or support of the other groups.

**Making decisions**

A debate will then follow in which a member from each interest group is asked to be part of the chairing committee that will decide the final outcome. The remaining group members will be asked to present their argument for the cessation of particular activities (and the continuation of others). After each group has presented their arguments, time will be given for the other groups to pose questions. Once all groups have presented their case the committee will form a 'Fishbowl' to debate the issues and reach a final decision that is a realistic compromise. The compromise must be a sustainable solution meeting the needs of the local people, the wildlife, and in particular the critically endangered gentle lemur.

**Useful website for more information**

The Ramsar website <http://www.durrellwildlife.org/> explains the history around international legislation to protect wetland areas, for example Lac Alaotra. It gives examples of protected wetland areas including some in Madagascar and if you type 'Lac Alaotra' into the search option you will be able to view details on the activities run by the local people, with the help of the Durrell Wildlife Conservation Trust, to promote the development of a RAMSAR <http://www.ramsar.org/> site around the lake (wetlands designated as internationally important under the convention on wetlands signed in Ramsar, Iran in 1971). You will also be able to see photos of some of the festivals run to raise the profile of this fragile ecosystem.