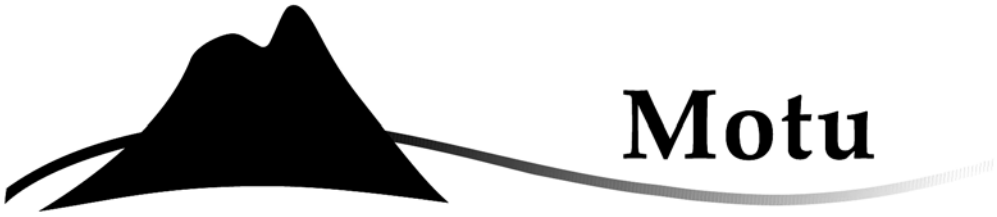

Migration and the Environment in the Galapagos:

An analysis of economic and policy incentives driving migration, potential impacts from migration control, and potential policies to reduce migration pressure

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Sra. Sonia Pisco—Landowner in Santa Rosa
Lorenzo Freire—Farmer who lives in Bellavista
Carlos Zapata—Inspection and Quarantine System Coordinator, Charles Darwin Foundation

[1] MIGAMA is the short name for the migration study, Fundación Natura and TNC (2000a).

Abstract

From 1974 through 1997 the Galapagos experienced very rapid population growth, around six per cent per year. Sustained at this level, the population would continue to double every 12 years. Increased population brings an increased risk of invasive introduced species, which endangers the fragile ecosystems. On 18 March 1998, a Special Law was passed to protect the Galapagos. This law severely limits migration to the islands. We discuss the environmental problems that motivated the law, describe the law, and discuss anecdotal evidence on its operation and potential to date. We then theoretically assess the implications of limiting migration and empirically assess the history and drivers of migration to Galapagos. In particular we discuss distorted incentives arising from subsidies and inadequate regulations that exacerbate migration pressure. Finally, we draw on our analysis to offer some short and longer term policy solutions and ideas on how existing capacity could be enhanced to implement them.

JEL classification
Q320, J610, O130, O150

Keywords
Galapagos, migration, environment, tourism, fish.

Contents

Table of figures

Tables

1 Introduction

The Galapagos Islands, a string of islands 600 miles off the Coast of Ecuador, have an array of unique plants and animals. Charles Darwin's work “The Origin of Species,” where he first proposed the theory of evolution, was inspired here by the differences among mockingbird and tortoise species across the many islands. During the 1990s large numbers of people have moved to the Galapagos Islands from mainland Ecuador in search of economic opportunities. Tourism is the main economic driver, yet the migration it induces threatens the future of tourism.

From 1974 through 1997 the Galapagos experienced very rapid population growth, around six per cent per year. Sustained at this level, the population would continue to double every 12 years. Increased population brings an increased risk of invasive introduced species, which endangers the fragile ecosystems. It also puts increased pressure on sensitive habitats through farming; commercial development, including extraction of materials (e.g. gravel) for construction; and overfishing. Today “Lonesome George” is the only representative of one of the subspecies of tortoises that gave the Galapagos their name. Other species are severely depleted, though active breeding efforts are now reversing many declines. Increased population also has non-environmental impacts: pressure on infrastructure (roads, water and electricity); pressure on social services (health and education); and rapid change in the local culture as new people with different life experiences enter.

Population growth is important but is not the only cause of environmental degradation. The environmental impact of any given level of population depends on the impact of each person: the types of activity, the way activities are done and the location of activities. Similarly, migration is an important cause but is not the only cause of population growth. Half to two thirds of population growth in Galapagos relates to immigration (3.5–4 per cent). Some of this is offset by emigration (1–2 per cent). The natural rate of population increase is between three and four per cent.

On 18 March 1998, a Special Law was passed to protect the Galapagos. This law severely limits migration to the islands. It limits permanent residents to those born in Galapagos, those who had lived there for more than five years before 1998, and their spouses and children. Temporary permits are only available for those whose employers can justify a need for their special skills. Fully enforced, this law would severely curtail migration and enhance environmental protection. Data from the 2001 census indicates that the rate of population growth has slowed, probably in large part because of the implementation of the Special Law. Population growth has fallen to 5.04 per cent annually between 1998 and 2001, which is only slightly higher than the rate of natural increase in the 1980s. Net migration has probably fallen to below 1.5 per cent.[2] This has been achieved despite the potentially enormous migration pressure arising from the economic crisis that affected Ecuador during 1999/2000.

When poverty comes into conflict with environmental protection, however, things are not so straightforward. In the short term it has proven difficult to administer the law effectively because of a lack of administrative capacity. This is now being addressed. In the long term, political and economic pressures are building up that could undermine or even overturn the law.

Migration pressure has been exacerbated for a long time by a series of subsidies (for energy, airfares, and shipping, among other things) for those living in the Galapagos. Standards of living are higher in Galapagos than in many parts of the mainland. The direct limits on migration created by the Special Law conflict with these strong incentives to migrate and create problems both socially and economically. Permanent residents have a privileged position in the labour market because outsiders cannot compete for their jobs. Anecdotally we hear that it is difficult to get some skilled labour and the cost of other labour has become extremely high. Clearly some locals benefit from this, but others simply suffer from higher costs. Over time the Law risks creating a problem similar to a "welfare society" because young people in Galapagos will grow up knowing they do not have to get training or work hard to have a reasonably comfortable lifestyle. Valuable tourism opportunities might be hindered by lack of local skill.

[2] The detailed derivation of these numbers is given in Section 3.2.

Ecuador is not a rich country. It needs to use its resources wisely to benefit all its people. Economically, it is almost certain that the best long-term use of the Galapagos is to preserve the islands for high-value tourism done in the most efficient way possible. Some observers claim that 10 per cent of tourists produce 75 per cent of revenue.[3] Improving the quality of the tourism experience is probably more valuable than increasing the flow of tourists. However, protecting this unique resource and gaining the maximum benefits from tourism requires far-sighted regulation and loss of short-term opportunities that provide immediately visible benefits.

We need to find ways to provide flexibility in the labour market while protecting the environment and bringing real benefits to the Ecuadorian people and particularly local residents who can most easily protect or threaten the environment. Effective regulation requires more than strong legislation. It must take into account the limitations in regulatory capacity, the interests of the local people and pressures that work against it. The best regulation has the support of the community that is regulated. Even though it constrains their behaviour, they recognise the benefits.

The first step in regulatory reform is to remove poor regulations that exacerbate the problem. In the case of Galapagos these are primarily subsidies that have outlived their historical purpose. The second step is to enhance those regulations that already exist so that they can perform their roles. Galapagos has many good regulations, including the Special Law. These can be fine-tuned and strengthened in many ways. Third, where the problem is one of local cooperation, strengthening local bodies that can educate, build trust and self-regulate is helpful regardless of the other forms of regulation used. Effective local bodies will provide useful information, will be effective participants in formulation and implementation of regulation, and can reduce opposition and obstructive behaviour.

[3] Interview with Fernando Espinoza.

Finally, when the institutional capacity is strong enough, new more sophisticated regulations can be implemented to allow more flexible, efficient compliance. After analysing the goals, underlying pressures, and current regulations, we suggest a range of possible ways to improve regulation and reduce migration pressure.

1.1 Previous literature

Here we highlight a few studies that we build on and discuss how our work complements and extends previous work. This is not intended to be a comprehensive literature review. Several qualitative studies have explored the causes of migration. Grenier (1994) surveys several different groups to understand the characteristics and experiences of migrants, tourists and conservation workers. He also looks at their motives for migration/visiting and their impacts. Ospina (2000a) takes a sociological approach to understanding the routes migrants take. He considers networks and their effects on migrants. His work finds that employers, private firms and the state directly recruit some migrants. The tourism and agricultural sectors are significant recruiters. Galapagos has followed the general pattern in Ecuador, with significant growth in government employment until the 1999 crisis. The process of devolution of power to provinces, strengthening of municipalities and creation of Galapagos National Institute (INGALA) have also increased state employment in Galapagos. Family networks are also important. People provide information and facilitate migration for their family members. These people find work once they arrive. Finally, some people move to Galapagos for adventure or to start a new life. They may know no one and have no job offers when they arrive. Ospina also considers the impact of migration on the culture of the Galapagos.

A second type of research models the economic structure of Galapagos and analyses the economic implications of policies. Taylor and Yúnez-Naude (1999) build a computable general equilibrium model of the Galapagos economy and look at the implications of different activities for GDP, labour demand and migration pressure. Taylor et al (2002) extend this model and apply it to analysis of ecotourism and its effects on Galapagos. We use some of these results later in our analysis.

Wilen et al (2000) study the likely economic benefits from the Special Law on the Galapagos Marine Reserve. They consider the impacts on fishing and on tourism. They include valuable information on the regulation of fishing and tourism. They find that the Marine Reserve is marginally beneficial for fishers in the long run. Short-run costs from having to cut fishing pretty much offset the present value of long-term benefits through sustainable catches. However, the Reserve has significant benefits for tourism. Tourists would be willing to pay on the order of US$3–4 million extra each year if marine species in Galapagos were protected.

A third important set of research summarises statistical information on key factors affecting Galapagos and gives information on current regulations. It also often offers policy recommendations. For example, Bremner and Perez (2001) survey the demographics of Galapagos with particular attention to gender, and look at the implications for resource use.

The MIGAMA report (Fundación Natura and The Nature Conservancy (TNC) (2000a)) is a crucial resource. It results from collaboration among a group of experts on Galapagos issues. It primarily draws on information from the 1998 Special Census. It summarises the demographic and socio-economic characteristics of groups characterised by their migration status: natives, new immigrants, older immigrants, and emigrants. It also surveys perceptions about the causes and effects of migration and summarises some of the visible effects of migration pressure. It includes summaries from extensive interviews of migrants working in specific sectors: agriculture, fishing, construction, tourism and commerce. These address why and how they migrated and their experience of migration. It has extensive recommendations covering issues ranging from migration control to fishing, rural development, control of introduced species, education, and emigration.

Each year Fundación Natura and the World Wildlife Fund produce a "Galapagos Report". These include focused updates on key issues of concern: migration, tourism, development of the quarantine system, the Jessica Oil Spill and so on. They provide excellent information on regulations and the operation of institutions and programmes, and a data archive. They are an invaluable resource on a range of issues.

The Galapagos Regional Plan was completed concurrently with this report. This plan was developed through an extensive participatory process. It outlines visions, recommendations and specific programmes for management of the marine and terrestrial ecosystems, for sustainable development, for human development and for improving governance. It allocates these responsibilities across sectors. Because of the wide scope of the plan, they are unable to develop either the justifications for the policies or their details in the Plan itself. In the areas where our concerns overlap, they identify similar pressures and problems to those we consider. Most of our recommendations are included in their list. Unfortunately resources are limited and the Plan does not prioritise these activities or provide detail on how they are to be achieved.

Our report focuses primarily on issues relating to migration, so has a much narrower scope. We approach the issues from an economic perspective but also draw more broadly from the study of public policy. Our work is complementary to the Regional Plan in that it addresses some of the same issues. However, we provide analysis to motivate and justify the policies we propose. We try to determine not only if there is a problem, but also whether the feasible policies are likely to be effective in addressing it. We assess the importance of different issues and hence the likely gains from addressing an issue. We develop policy recommendations in more detail and try to make our recommendations as concrete as possible. We prioritise policies and emphasise those that seem most feasible and most likely to have significant positive effects given the institutional constraints.

1.2 Structure of report

The report begins with some background on the environmental problems that motivate it. We then review the Special Law passed in 1998, which was designed to help address these problems. We describe the Law and discuss anecdotal evidence on how it is operating and ideas on how its operation could be improved. We then assess the empirical history of migration and population in Galapagos. We consider the levels of migration, where migrants come from and where emigrants are going to. In Section Four we review the theory of migration and the relationships between migration and labour markets. Why do people migrate and what happens if they are constrained from migrating? Section Five considers the specific economic and policy conditions in Galapagos that distort incentives to migrate so that too many people migrate and some economic activities are more developed than they would be if all the environmental implications were taken into account. We consider the effects of direct subsidies and of inadequate regulation of resource use. In Section Six we empirically analyse the patterns of migration and emigration to gain insight into why people move to and leave Galapagos.

By Section Seven we have a reasonably clear idea of the regulatory background and the theory and reality of migration to Galapagos. We then move on to consider policies that could reduce migration pressure without causing high economic costs or social pressures. We take into account the Ecuadorian context and existing regulations to come up with policy suggestions that range from short-term very pragmatic ideas to longer-term goals to aim for. In Section Eight we consider how capacity could be enhanced to allow existing and new ideas to be implemented effectively. We conclude in Section Nine.

1.3 Pressures placed by migration on the natural resources of the Galapagos Islands[4]

The flora and fauna of the Galapagos had evolved isolated from the presence of humans until the 17th century, when whalers and buccaneers started hunting enormous quantities of whales and giant tortoises. Since then, human activity has exerted pressure on the islands' natural resources and resulted in increasing effects on their environment. Each person that moves to the Galapagos poses new risks to its fragile ecosystems. This not only includes new permanent residents but also new immigrants seeking better job opportunities on the islands and the increasing number of visitors to the Galapagos National Park.

The Galapagos still retain 95 per cent of the biodiversity they possessed prior to the arrival of humans. This would appear to augur well for Galapagos biodiversity in the future. However, a scientific evaluation of ecological trends indicates that Galapagos ecosystems are changing quickly. The abundance and distribution of some species' populations are decreasing, a high percentage of species are threatened, and they are losing the ability to survive natural cycles such as the El Niño event[5]. If human activities—including mobility of people and products, over-exploitation and energy demands—continue their current pattern they will cause the loss of populations, species and sub-species.

Biodiversity loss and threatened species are hard to assess, mainly because little is known about population numbers and the distribution of some species, as is the case of most terrestrial invertebrate species. There are many accounts of declines reported, with percentages higher than 50 per cent for some orders. In the case of the marine environment, the main factors hindering the assessment of biodiversity loss are the difficulty of establishing a reference point for a pristine state and the limitations in the study of specific taxa.

[4] This section was primarily written by Susana Cardenas.
[5] Charles Darwin Foundation (CDF) and World Wildlife Fund (WWF) (2002) and Estación Científica Charles Darwin (2001).

Furthermore, biodiversity losses, and specifically extinctions, are usually a long-term result, taking place in large chronological periods. However, it is possible to describe the current status and identify changes through comparison of measures or indicators related to the main activities which impact on those ecosystems.

This section will compare a series of trends in biodiversity and environmental indicators. These will then be related to our knowledge of population trends and patterns of spatial distortion, with an emphasis on human activities that cause a direct or indirect effect on the islands' environment. What local people do for a living affects the environment and local labour market. For example, if fishers dominate immigration, and fisheries are under stress, clearly fisheries regulation is a key problem.

1.3.1 Biodiversity Status[6]

Research suggests that Galapagos has lost more species per square kilometre in the past 400 years than most other island groups.[7] There is no doubt that contemporary extinction in all groups of plants and animals has been caused mostly by humans and is mainly due to the aggressive effect of introduced species and over-exploitation. There is no strong evidence of extinction in some groups of animals and plants; however, some species have gone unrecorded recently on islands where they were formerly recorded, with records only on islands that have not been affected by introduced species. This is the case for some endemic terrestrial isopods, spiders, scorpions, native ant species, weevils, and scarab beetles.

[6] Data in this sub-section comes from Bensted-Smith (2002), based on an International Workshop of conservation biologists in may 1999, where some specific measures for evaluating general criteria regarding species, communities/habitats, landscape/habitat extent, processes and alien species were established in order to create a biodiversity vision for the future.
[7] Bensted-Smith(2002).

Extinction levels are low for terrestrial biodiversity, around 1.5 per cent of total initial biodiversity, and there are no recorded marine extinctions caused by humans. However, the rates of threatened and endangered species are high, especially for vertebrates and invertebrates where 50 per cent and 60 per cent of native species are threatened, respectively (Tables 1 and 2). For both the terrestrial and the marine environments, there have been changes in abundance and distribution of some species. In the first case, these changes depend on the vegetation zone, which has been altered mainly by introduced species. For the marine environment, a high-level of exploitation of some target species has had an effect on the species' abundance and its population structure, for example sea cucumbers after fishing periods. For some marine species, a reduction in population is more visible. One of the threats with small populations is that they are less liable to overcome environmental variations such as the El Niño event, which seems to become stronger and occur more frequently over time.

Table 1: Summary of main biodiversity indicators for the terrestrial environment

Extinct Species as per cent of total diversity	1.5%
Diversity recognized as endangered	
Plants	24%
Terrestrial vertebrates	50%
Terrestrial invertebrates	60%
Change in abundance and distribution * [1]	0-90%
Species and population with unstable population * [2]	70%
Reduction in genetic and phenotipic variability *	60%

Source: Charles Darwin Foundation (CDF) and the World Wildlife Fund (WWF) (2002).
Notes: * compared to a baseline in 1534
1. depending on vegetation zone altered
2. caused by anthropogenic factors

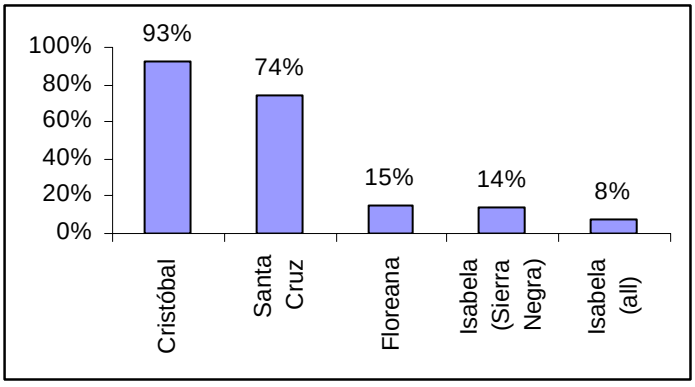
Table 2: Extinct, threatened and introduced species as a percentage of native species

	Vascular plants		Vertebrates		Insects	
Species	**#**	**%**	**#**	**%**	**#**	**%**
Extinct	3	1	10	9		
Threatened	85	16	54	51		
Natives	541		106		1616	
Introduced	600	111	25	24	300	19

Source: Bensted-Smith (2002).

The fact that 96 per cent of land is the National Park gives the impression that terrestrial habitats are well protected. However, the relatively small area that is not protected has a tremendous effect on the biodiversity of the islands. The biggest and highest islands have one of the most diverse of the four main types of vegetation, the humid zone. This is the zone that at the same time is preferred for agricultural and cattle-raising activities. San Cristobal has lost almost its entire humid zone and only about 25 per cent remains on Santa Cruz (Figure 1). Endemic plants such as Miconia shrubs and the giant Galapagos tree fern are at risk. Thus, seeking ways to protect the inhabited islands is a primary need for biodiversity conservation.

Figure 1: Humid highland cleared in populated islands



Source: Bensted-Smith (2002).

Indicators of biodiversity status show that there is a high pressure on native species, most of it by anthropogenic causes that will be discussed in the following sections. However, these indicators are limited to the extent of possible research on populations and species. It is still unknown if the reduction of genetic variability will make them more susceptible to high-extractive human activities and climatic changes.

1.3.2 Introduced species

Introduced species are the key threat in the Galapagos. These are related proportionally to an increasing population: more movements of people and shipments of goods to, from and within the islands. Mobility has even been subsidized, a fact which could have promoted its increase in recent decades. Now that transport subsidies have been reduced, it will be interesting to monitor variations in the rate of human mobility in relation to travel prices.[8]

Humans bring species accidentally with these movements, or on purpose, for agricultural and ornamental activities. Residents spread introduced species around the islands through development; new roads facilitate the dispersal of introduced species. Tourist movements are better controlled.

Introduction rates of plants, vertebrates and insects are extremely high compared to their natural establishment rates: 10, 1.25 and 1.2 thousand times respectively. As Table 2 shows, there are around 600 alien plants, 30 introduced vertebrates and 300 invasive insects to date. Although the number of introduced vertebrates is low compared to other groups, their impact is higher; one single species, such as goats, can affect several native species. These numbers could be even higher. Not all areas have been evaluated and there is a high uncertainty about the number, especially for invasive plants and invertebrates.[9]

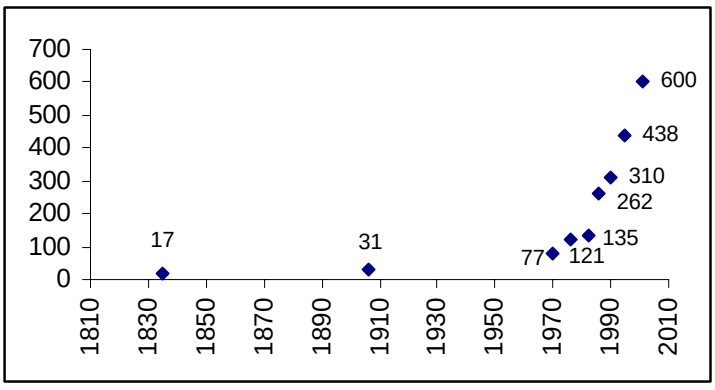
[8] See Section 5.1 about subsidies.
[9] Bensted-Smith (2002).

The main general causes of alien species introduction are the changes in natural ecological processes that contribute to population declines and extirpation of native species. Invasive organisms affect natural ecosystems through predation and by outcompeting natives, altering habitats´ structures, and serving as disease hosts and transmitters. The effect of disease vectors and pathogens is still unknown and is therefore an increasing threat.

Both introduced animals and plants have an advantage over native species. For example, humans have introduced some of them for agricultural purposes. The fact that they are adapted to pastures helps their distribution. A study carried out by Mauchamp in 1997 determined that 75 per cent of the introduced plants at that time were brought to the islands for crops.

Mauchamp graphed the growth in the number of invasive plants since the colonization of Galapagos, and he suggested that it parallels population growth.[10] Although the increased number of recorded introduced plants is a result of an increase in research efforts during recent years, there was a true change in the introduction rate in the mid-twentieth century when migration and agriculture expansion were high (Figure 2).

Figure 2: Number of introduced plants in the Galapagos



Source: Mauchamp (1997) and Charles Darwin Research Station (CDRS) database cited in Fundación Natura and WWF (2001).

[10] Cited in Fundación Natura and WWF (2001).

Another issue related indirectly to introduced species and human needs is the availability of water resources. In the upper zone of inhabited islands, a high percentage of precipitation comes from rain condensation. The presence of introduced mammals, such as goats, and human activities, such as pasturing livestock, has reduced the native forest and, therefore, condensation.[11] Since population is increasing and there are few water sources, the availability of this resource will be a critical issue in the future.

The impacts of introduced species cannot be controlled fully through the inspection and quarantine system and the eradication programs, but may be reduced or mitigated. Quarantine controls have been more effective (higher levels of inspection) since 2000 because the pilot project ended and the system was implemented definitively during this year.[12] It relies on more human resources; in addition to the airport luggage inspection that was the only inspection conducted prior to 2000, boat cargo is now inspected in the Caraguay wharf in the port of Guayaquil, from where around 75 per cent of boat cargo to Galapagos originates.

A list of allowed and restricted products was issued in January 2000. During 2002 804 confiscations were made; most of them (47.8 per cent) took place in Baltra airport and 68 per cent were prohibited products. An analysis of confiscations by category of residency indicates that residents bring most risky products to Galapagos (74 per cent), followed by foreign tourists (17 per cent) and domestic tourists (nine per cent).[13] The role of residents is particularly significant when you consider how few residents there are on flights relative to tourists (less than a third in most years). This would suggest that the residents´ dependence on products from the continent contributes widely to increasing the probability of new alien species introductions.

[11] Hamman et al (1977) and Laweson and Estupiñan (1987). Both cited in Hamann (1991).
[12] Zapata, Carlos cited in Fundación Natura and WWF (2001).
[13] Zapata, Carlos cited in Fundación Natura and WWF (2001).

Although the inspection and quarantine system has been improved in recent years, there are still some issues that need attention. There is not a systematic and thorough control in either departure or entry sea ports; one reason could be the lack of permanent base facilities in airports as well as ports and the lack of defined and approved regulation involving the participation of the Army and other sectors, such as tourism operators. Nor are there the necessary sanitary conditions in ports or cargo boats; there are no freezers and no adequate fumigation on boats. Actual control is based on visual/manual observation by inspectors; there are no x-ray machines or sniffer dogs specialised in identifying risky products in ports. There is inspection of movements within the archipelago and trade of goods between islands, but its level is low and should be reinforced. Finally, residents and tourists are more informed than in previous years. However, since September 2000, the effective operation of the system and its continuity depend on a division of the Ministry of Agriculture, which has had problems with personnel and strikes lately that could cause mistrust of the system by community members and a reduction in their involvement.[14]

1.3.3 Overexploitation

Overexploitation, meaning a non-sustainable extractive use of natural resources, has been another important threat imposed by humans on Galapagos ecosystems.[15] Some terrestrial and marine species have been extracted in large quantities, not only for local human consumption but also as a trade source. Any increase in the population exerts more pressure for consumption. Likewise, immigrants from the mainland are attracted by the lucrative trade possibilities of some target species. Thus, a strong relationship is established between population, labour force, and the extractive use of some species.

[14] Carlos Zapata, personal interview with S. Cardenas.
[15] Bensted-Smith (2002).

Prior to 1990, the overexploitation of tortoises was serious. All populations of tortoises on all islands were exploited, and most were reduced by more than 60 per cent. However, efforts to prevent predation and promote reproduction in captivity have been effective. Other vertebrates that have been overexploited are hawks, doves, and ducks.[16]

In the terrestrial realm, few native plants are of direct use to humans, but trees have been used, principally for timber. The exploitation rate for some wood-tree species is higher than their regeneration rate within the national park. Not only has the fast population growth accelerated the need for these resources, but also a higher standard of living and the economic growth in the islands have increased the population's demand for new boats and houses.[17] *Matazarno* and the endemic *guayabillo* are examples of species that have been affected by human activity.

The extractive use by quarries of mineral resources, such as lime and gravel for paving and construction, has had an effect on certain species, including *Bulimulidae* snails and plants.[18] The scarcity of some of these non-renewable resources, mainly used for construction purposes, will result in the identification of other extraction sites or increase dependency on mainland products, thereby increasing imports and the risk of introduced species.

1.3.3.a Fishing

Regarding marine resources conservation, sustainable fishing is one of the biggest challenges. Fishing began as a formal commercial activity in the 1930s, and is now the second most important economic activity in Galapagos following tourism.[19] The appearance of new lucrative markets, especially for non-traditional products such as sea cucumbers and shark fins, had a great influence on the growth of this sector.

[16] Bensted-Smith(2002).
[17] Hamman (1991).
[18] Bensted-Smith (2002).
[19] Bensted-Smith (2002).

Not only have people working in other activities moved to fishing in specified periods, but the activity has also attracted recent immigrants from the continent. The overall result is an increased pressure on high-value species.

In ecological terms, overfishing not only affects the abundance and distribution of certain species, but can also have an effect on the population structure. Moreover, some species are strong ecological interactors and their population reduction or loss would cause imbalance and effects in the rest of the marine ecosystem. At the same time, altered marine ecosystems would be less able to withstand other pressures such as oil spills and the El Niño event.

Fisheries in Galapagos have increased and diversified. The number of registered artisanal fishers has increased from nearly 100 in the early 1940s to 1950s to around 956 in 2002 (Table 3). This increase is due mainly to the use of new profitable practices and target species with high economic value in international markets. The numbers of fishing boats and species, 444 and 100 to date, respectively, have increased proportionally in relation to the number of fishers.

Table 3: Registered artisanal fishing boats and fishers in Galapagos

Year	**Number of fishers**		**Fishing boats**	
	Number	Annual per cent increase	Number	Annual per cent increase
1971	156			
1982	152	-0.2%		
1993	392	14%	101	
1996	455	5%	270	56%
1998	613	17%	197	-14%
1999	795	27%	254	29%
2000	682	-14%	417	64%
2001	921	35%	n.d.	
2002	956	4%	446	7%

Source: Personal communication with the Marine Resources Department, Galapagos National Park Service.

Migration generated directly by fishing differs across periods of fisheries development. The first important migration surge for the period 1982 to 1984 related to the lobster fishery. The second surge was the result of the sea cucumber fisheries starting in the 1990s. There is no accurate data on the participation of immigrants in fisheries in recent years; however, as sea cucumber fisheries are a lucrative activity, it is likely that they continue to attract people from the mainland.[20] The number of fishers monitored by the Participatory Research and Monitoring Programme of Fisheries indicates that many more fishers are active than are registered in Galapagos National Park Service (GNPS) records during recent years. [21] The difference was about 29.7 per cent in 1999[22] and 80 per cent in 2000 for sea cucumber fisheries (1229 fishers in 2000). In the case of lobsters, 1183 fishers were monitored during the 2000 fishing period, compared with the 682 fishers registered. Most of this difference could be explained by residents who leave their usual activities in order to participate as temporary fishers. However, it could also include temporary migrants.

During these migration surges, especially those that occurred before the Special Law was issued, migrants have significantly influenced the diversification of materials and techniques used in fisheries.[23] Large tuna fishing boats as well as migrants brought these new approaches from mainland Ecuador. The migrants came especially from the areas of Salango, Puerto Lopez and Puerto Cayo in Manabí Province. Isabela, a traditional fishing port, gives a perfect example of how techniques and materials have evolved. They now use diesel engines for transportation instead of traditional fishing boats moved by oars, and use a trident for fishing lobsters brought by Salango fishers in the 1980s. Improvements in fishing methods have also been motivated by higher potential incomes from fishing as target species have become more highly valued in recent years. As well as increasing the total number of fishers and boats, all these improvements have brought about an increase in total catches.

[20] Fundación Natura and TNC (2000a).
[21] A programme was started in 1997 by the Charles Darwin Station with the objective of generating a technical basis for the sustainable use of marine resources within the Galapagos Marine Reserve.
[22] Cited in Fundación Natura and TNC (2000a).
[23] Explained in depth in Fundación Natura and TNC (2000a).

One of the indicators marine scientists use to assess the reduction of species abundance by fisheries is the catch per unit effort. It is an estimation of the average catch per effective day of fishing and per fisher. If fishers obtain fewer catches per day of fishing, then fish stocks could be declining. This indicator shows that the Galapagos spiny lobster, sea cucumbers and the Galapagos grouper (the three most profitable fisheries) have declined significantly over recent years and show a typical pattern of overexploited populations.[24]

The sites located far away from ports in inhabited islands show higher levels of catch per unit effort both for lobsters and sea cucumbers, especially Fernandina, northern Isabela, Darwin, Wolf and Española.[25] This fact indicates a serious reduction in species abundance in coastal areas close to inhabited ports. In the case of sea cucumbers, 88.3 per cent of the total volume caught in 2001 came from western Isabela and Fernandina. There is a clear reduction on San Cristobal, where the percentages of total catches have diminished significantly: 26.4 per cent (1999), 12.6 per cent (2000) and 2 per cent (2001).

For both lobsters and sea cucumbers, the biological fishery indicators suggest that as well as the reduction in population density, there is overfishing in the sense that undersized individuals are frequently caught in violation of minimum size restrictions. The population structure is affected, which in turn influences future recovery and abundance of the species.

The fishing-monitoring programme managed by the Charles Darwin Station and the GNPS has defined regulations for lobster and sea cucumber fishing during recent years. These include size limits, trade controls, zones indicating allowed fishing sites, catch quotas, fishing calendars and sanctions. These actions have resulted in better resource management; however, high pressures have existed to violate regulations. In particular, total quotas, fishing seasons and size limits have been exceeded many times. The sustainability of target resources will be under extreme pressure if additional control measures are not undertaken and regulations enforced.

[24] Bensted-Smith (2002).
[25] J.C. Murillo et al (2002) cited in Fundación Natura and WWF (2002).

Not only is the increasing number of artisanal fishers and fishing boats alarming. According to the Special Law, only artisanal fishers registered in fishing cooperatives in Galapagos are allowed to fish in Galapagos. However, there is a continuous pressure from industrial fishers from the mainland, who are lobbying for fishing rights within the marine reserve. Illegal fishing is still out of GNPS control. Together with potential industrial fishing, it creates a stronger pressure on the islands' marine resources, which may increase the overall catches to a degree the ecosystem will be unable to replenish.

1.3.4 Other human impacts resulting from an increasing population

The more the population grows, the more difficult it is to manage and mitigate human-caused impacts including land occupation, increasing resource demands, and pollution caused by solid and liquid waste.

1.3.4.a Pressure on land

Further compounding the effects of population growth, people started abandoning rural areas and coming to ports. The main ports in the archipelago, Santa Cruz and San Cristobal, have developed rapidly and now there is little land available for future settlements in urban areas.

Santa Cruz exhibits the most critical situation. This island has grown tremendously in the last ten years (1990-2001), from 5,310 to 11,163 inhabitants, an annual growth rate of 6.7 per cent, with a high concentration in the urban area (86 per cent of the actual population). In the beginning of 2002, 600 new lots were legalized, and with these adjudications all the urban area assigned to human settlements is now occupied.[26] This will put a high pressure in coming years on the legal acquisition of new lots, an issue that will involve considering alternatives such as evaluating the occupation of rural areas and land use optimisation.

[26] Alfredo Ortiz, mayor of Santa Cruz, personal interview.

Some rural areas are already beginning to be urbanized and subdivided. This is happening in Bella Vista in Santa Cruz and also southern Isabela. Interviews indicate that residents in Puerto Ayora are more and more interested in acquiring land in rural areas. New private residential neighbourhoods are even now being developed.

Concern about the location of people within the islands is another relevant issue, although it is mostly a concern about residents. If Puerto Ayora becomes overpopulated, as is already happening, an alternative will be to move to other islands. As Table 4 indicates, during recent years, people already resident in Galapagos have considered Isabela to be an attractive island to move to. This interest could increase dramatically in the future. This location is critical, considering that Isabela has 50 per cent of the biodiversity of Galapagos and a lot of available land outside of the National Park compared to the other inhabited islands.

Table 4: Population and migration across the populated islands

Island of residence	Total population 1998	Per cent who are recent migrants (since 1993)	Per cent moving from other islands since 1993
San Cristóbal	5374	22%	1%
Isabela	1424	17%	6.5%
Santa Cruz	8513	27%	1%
Total	**15,311**		

Source: Derived from Fundación Natura and TNC (2000) Tables 17 and 18.

1.3.4.b Increased numbers of vehicles

The number of vehicles has increased significantly, with 88 new vehicles entering the islands in 2001, an increase of 54 per cent compared to new vehicles in 2000.[27] This could result in pressure for more development of roads. In addition to causing habitat loss and fragmentation, new roads would promote dispersal of introduced species. Also, the recent high level of vehicular traffic causes the death of several hundred birds a week in Santa Cruz. Land iguanas have been killed by buses on Baltra Island.[28]

1.3.4.c Resource demands

Population growth increases the demand for natural resources. Most non-renewable resources such as water, soil, and construction materials are limited and they are becoming scarce in the islands. Dependence on resources coming from the mainland—for example fossil fuels—puts the environment at high risk of possible contamination and potential for introduced species.

According to the Regional Plan, the last inventory of water resources in Galapagos in 1989 indicates that permanent sources of water for human consumption exist in few islands, especially Floreana and San Cristobal, which has a fresh water lake. In general, fresh water cannot accumulate on the surface due to the islands' geology. Rainwater usually settles deep in the highland areas where rain is more abundant. Because of fast population growth, especially in Puerto Ayora, where some of the fissures that were sources of water are now polluted, there may be severe water supply problems. Moreover, this situation may worsen if highlands suffer more from introduced species and habitat alteration caused by agriculture.

[27] Cardenas (2001) and Fundación Natura and WWF (2002).
[28] Bensted-Smith (2002).

With regard to energy consumption, increasing numbers of vehicles and boats, both for fisheries and tourism, as well as new residents consuming electricity, have heightened the demand for fossil fuels.[29] This increasing demand is satisfied through resources from the mainland, and their transportation, unloading and storage put the islands' fragile ecosystems at higher risk of possible accidents. The state subsidy policy has favoured increasing the use of these resources from the mainland, as will be quantified and discussed further in Section 5.

Oil pollution is a much larger threat, not only to marine ecosystems but also and principally to island birds and mammals, especially for flightless birds, such as penguins and cormorants. A recent well-known example is the Jessica oil spill of 200,000 gallons of diesel and bunker fuel in 2001. This accident caused widespread pollution, although its effects were controlled due to favourable environmental conditions and immediate rescue actions. If subsidies for fossil fuel are not reduced or eliminated and the use of renewable and less-contaminating energies is not promoted in the islands, the increasing demand for fossil fuel imports will continue to raise the probability of new fossil fuel accidents with severe effects on human health and the environment.

1.3.4.d Pollution and waste generation

Waste generation in the islands has increased with the growth of economic activities such as tourism and commerce, as well as a rise in population. In 1997-1998, the waste production per day per person in the three inhabited islands was higher than the national average (Table 5).[30] If per capita waste generation has stayed constant on each island, total waste will have risen by 33 per cent by 2001.[31]

[29] Some estimates of last year's consumption and distribution by sector can be found in Cardenas (2001) and Fundación Natura and WWF (2002).
[30] Fundación Natura and WWF (1999).
[31] Author's calculation using population data from the 2001 census: 5567 for San Cristobal, 1615 for Isabela, and 11,163 for Santa Cruz.

Table 5: Waste production in Galapagos in 1998

	1997–1998	1997–1998
Island	**kg/day/person**	**ton per year**
Santa Cruz	0.8	2,375
San Cristóbal	1.3	2,034
Isabela	0.6	284
National average	0.4	

Source: Data on Fundación Natura and WWF (1999).

This particularly causes concern because although the level of municipal waste collection is high in the islands, no appropriate waste management program exists to ensure a low impact on the environment. Most of the solid waste is organic and is disposed of in open areas assigned for this purpose. These areas are a short distance from the main ports, 4 km from Puerto Ayora and 3 km from Puerto Baquerizo. Other waste is incinerated without treatment. The current means of solid waste management helps to spread disease and introduced species. Increases in solid waste generation, directly related to population growth, will raise the need to seek out new solid waste disposal sites.

There is localized coastal pollution near developed ports. Although it is small, it constitutes a threat to humans and marine biodiversity.[32] It consists mainly of pollution generated by households (particularly organic waste) and littering in port areas, a local issue that relates directly to human settlements and their growth, in addition to being an aesthetic problem.

1.3.5 Agriculture

Agriculture is another human activity that has affected the Galapagos environment since the islands were colonized. As emphasized in Section 1.1.1, clearing the land for agriculture and pasture activities has altered one of the most diverse zones in the inhabited islands: the humid zone (see Figure 1). This land is attractive because the seasonal availability of rain makes it suitable for crops.

[32] Bensted-Smith (2002).

The amount of land converted to agricultural use increased by 31 per cent between 1974 and 1986 (18.6 to 24.4 thousand ha).[33] The results from the last national agricultural census in 1999 show that Galapagos has 23.4 thousand ha under agricultural use. This may indicate a reduction in agriculture on the islands.

As the population has grown, the flow from rural areas to ports has also increased and large agricultural areas have been abandoned. This rural-to-urban migration took place, among other reasons, because of more lucrative job opportunities near ports in industries such as fishing and tourism.[34] Large portions of arable land were abandoned, and consequently many hectares are underutilised. The Agricultural Census in 1986 shows that 49 per cent of the islands' agricultural land was used for pastures and 40 per cent was abandoned. In 1986, the area of agricultural land used for pasture in Santa Cruz was quite high compared to the technically recommended area: 10.2 thousand as opposed to only 2.7 thousand ha.[35] An agricultural evaluation for Santa Cruz in 1996 showed that this situation has not changed.[36] According to a recent agricultural market study carried out by the Araucaria Program for the Galapagos[37] in San Cristobal in 2000, 43 per cent of the total 8016 ha assigned to agriculture was abandoned.[38] As discussed earlier, some is being used for residential development.

Both abandoned and underutilised land represent a high risk to the islands' terrestrial environment because they favour seed dispersal of introduced species, which may lead to the potential expansion of these species into national park areas. A study on Isabela demonstrated that abandoned land helped the dispersal of *guayaba* and *more*, two of the most aggressive invasive plants.[39]

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[33] Ingala (2002), Regional Plan (draft).
[34] Ingala (2002), Regional Plan (draft).
[35] This statement is based on a map analysis of soil potential use produced by PRONAREG (the 'Programa Nacional de Regionalización' which is part of the Ecuadorean Ministry of Agriculture), and ORSTROM (the Institute Français de Recherche Scientifique pour le Développement en Coopération) as cited in Fundación Natura and WWF 1996-97.
[36] Fundación Natura and WWF (1997).
[37] Araucaria is a specific program of the Spanish Agency for International Cooperation together with the GNPS and the Ministry of the Environment.
[38] Fundación Natura and WWF (2001).
[39] Fundación Natura and TNC (2000a).

One of the main objectives of agricultural promotion in Galapagos has been to supply products for the local market and in this way reduce the risk of introduction of alien species brought by the increased traffic of cargo boats. The amounts of food transported by cargo boats has increased greatly. In 1984, 520 tons were transported to the islands, versus 2,242 in 2000, an increase of 4.3 times.[40] Several causes have brought about the continual ineffectiveness and decline of agriculture, including: lack of water (dependent on rainy and mist season) and non suitability of soils; lack of appropriate sustainable techniques and technology; high labour costs; low availability of raw and primary resources; lack of organization among producers; and deficiencies in the marketing and trade of products. Currently, some programmes and studies funded by international NGOs are working to improve agriculture on the islands.

If there were a limit on imports to promote self-sufficiency in agricultural products, local producers would have control over prices and could raise them because they would be the only suppliers. Monopoly pricing would start in the islands. The system would then require a process or procedures to establish price control for agricultural products so consumers would not be affected, and some competition from imports would certainly be needed.

The limited labour force for this agriculture is crucial as a potential driver of migration to the islands. Owners of farms in the rural area of Bellavista on Santa Cruz affirmed that residents are not interested in working in agriculture, so they need to bring in people from the mainland. They pay the migrants low salaries relative to what they would need to pay locals and thus maintain their profitability. This situation is currently happening and could be a serious problem in the future if implementing self-sufficient agriculture on the islands becomes a priority.

[40] Fundación Natura and WWF (2001).

It would be valuable to study whether self-sufficiency in agriculture is a good goal for the islands. One alternative would be to invest heavily in quarantine facilities to reduce the risk from imports. It may be that some products impose an especially high risk and imports of these could be banned and if possible these crops could be grown locally. If it is decided that self-sufficiency is a goal it would be necessary to evaluate the principal and real needs in order to achieve sustainable and efficient agriculture. Perhaps the best solution would be to make a strong investment in appropriate technology instead of hiring new migrants to work on the land, which creates an even higher pressure on and demand for natural resources.

1.3.6 Conclusion

Reconciling the short-term economic aspirations of a growing population with the ecological standards for a healthy environment is difficult. However, Galapagos still has the opportunity to develop in a sustainable way. Regulations for the application of the Special Law, which will contain important and specific guidelines for development, are still being developed and could play a crucial role.

Humans have affected the environment of Galapagos in many ways. Considering that we are an introduced species on the islands, it is important to address and mitigate the effects we have on the environment. All the environmental impacts are strongly related to population growth. These pressures on natural resources are the responsibility not only of immigrants but of the whole resident community. However, immigration stands as an important cause of population growth in the islands. In addition, some argue that recent migrants are not committed to the real sustainable use of natural resources and concentrate on short-term profits. In the following sections we will analyse drivers of migration in the archipelago and what policies might be established to control population growth and mitigate its effects on the natural resources of Galapagos.

2 The Special Law of the Galapagos

2.1 Description of the Special Law, March 1998

2.1.1 The Law

Here we summarise the key aspects of the law relating to migration and labour markets. Aspects relating to fishing, tourism and education are discussed in the relevant sections later. The Special Law requires a regulation before it can be fully implemented. The regulation relating to migration control is still being finalised.[41] The law defines three groups of residents: *permanent residents, temporary residents* and *tourists and transients*.

2.1.1.a Migration Controls

Permanent Residents

People can become permanent residents through birth, residency or marriage. The children of permanent residents are permanent residents. Any person (Ecuadorian or foreigner with permanent residency in Ecuador) who was resident in Galapagos for five years at any time before 1998 is eligible for permanent residency. Those who were living in Galapagos in 1998 when the law was passed may apply for permanent residency when they have stayed for five continuous years. Spouses of permanent residents become permanent residents and maintain their residency even if they later divorce.

Permanent residents are able to work in any job in Galapagos, including being a member of a fishing cooperative.

[41] INGALA is coordinating this process with help from Price Waterhouse.

Temporary Residents

Employers can apply for temporary residency permits so that they can employ people who are not permanent residents. They need to show that the special skills they need in their employee are not available among the permanent residents. Initially employers could put any limitations on application for temporary permits without having to justify them (e.g. very specific language requirements). This is changing now so that they have to define qualifications for a job more broadly (they must always require the same qualifications of all applicants for the same type of position). An INGALA Committee on Qualifications and Residency Control reviews all these applications after an initial review by INGALA staff.

The spouses (partner in recognised union) and children of temporary residents also gain temporary residency. Children born in Galapagos to temporary residents may be permanent residents. The law is currently ambiguous on this. Temporary residency permits can be renewed indefinitely.

Temporary residents can work only on the activity that originally motivated their entrance to Galapagos. The employer is not responsible if they employ an illegal worker. Illegal workers are deported. According to the regulation (Article 61), employers should pay INGALA a guarantee equal to 30 times the minimum wage. If their employee does not leave Galapagos within 15 days of completing their contract this money should be forfeit. This regulation does not seem to be enforced, however. Anecdotally, tourism companies seem to comply with this but many others are able to ignore it. In many cases temporary workers move from one employer to another and no employer is held responsible.

As a transitional process, the law states that the Qualification and Residency Control Committee must set up a process so that people can requalify for residency. Within 90 days of the regulation implementing the law being passed, the old identity cards legally expire. The Regulation was issued on 11 January 2000, so Galapagan residents should have been requalified by April that year. This was not possible for political, technical and financial reasons.[42] The requalification process for permanent residents was completed at the end of 2000. Compared to the total cards issued up to 1999 by the Governor's Office (Gobernación), this process eliminated 2028 people previously qualified as permanent residents. From the beginning of 2001 a new registration process for all residents began. This process will give all residents a special identification card and will allow electronic control at the airports.[43] Currently, according to the INGALA database on residents, most of the permanent residents have been issued with cards (17,567 in the three islands). More time is needed to issue cards for all temporary residents; only 292 temporary residents have a valid card so far.

Tourists and Transients

Tourists and transient visitors can enter Galapagos and stay for ninety days as long as they have a return ticket and a control transit card issued by INGALA. INGALA retains the tourist's return ticket in many cases as an extra control measure. Under exceptional circumstances this ninety-day permit may be renewed for total of 6 months per year. Tourists and transients are not allowed to work for profit while they are in the Galapagos.

[42] Fundación Natura and WWF (2001).
[43] Previous identification cards were easy to duplicate.

2.1.1.b Other key provisions

Labour Markets

All employees who are permanent residents are organised in cooperatives (Article II of Title X Chapter 1). The aim of this was to tighten control over work permits. The law also requires that wages in Galapagos are at least 75 per cent higher than the minimum for that job in the mainland (Title X). This is true in the public and private sector, and workers do not pay social security tax on the extra 75 per cent. According to Fundación Natura and WWF (1998 p. 33), the comparison between the minimum wages stated in the mainland and those in Galapagos varies depending on the profession; some wages in Galapagos are even higher than required, but others are lower.

Subsidies

According to the Law, permanent and temporary residents receive a 50 per cent discount on air and sea transportation fares on all routes to Galapagos. They also receive a 30 per cent discount on cargo transportation fares on maritime routes. For in-depth discussion of how these and other subsidies actually operate see Section 5.1.

2.2 How it works in reality?

In reality the Special Law is not working exactly as envisaged yet. There are still serious problems with enforcement. Before the Law there was no complete register of people who were residents and it has proven to be difficult to identify people who are eligible. Some cheating and use of influence has probably given permanent residency status to people who do not qualify.

On temporary residency the system is operating, but some people expressed concern that the law is being interpreted differently across the different islands. Probably more importantly, many temporary workers stay after their permits expire and the authorities find it difficult to locate and deport them. These illegal workers seem to be supported or at least tolerated by locals in many cases. They are often relatives or employees of permanent residents who want them to stay. Finally, some employers (but not all) expressed frustration with their inability to get the staff they need in a timely way to do their work effectively.

On the positive side, now that the law has been in force for more than three years, locals are beginning to believe that they can control their future and they are being more active in planning and control. Serious efforts are underway to strengthen the implementation of the law. We discuss those below.

The Law is under serious pressure, however, and this pressure is likely to grow. The primary source is the labour market. People want to come to Galapagos and other people want to employ them. The Law constrains this movement. As the economy grows further and tourist demand continues to increase this pressure is likely to get much more intense. Political pressures are also simmering and may intensify as living standards of those living in Galapagos and those on the continent continues to diverge and inequality grows within the Galapagos. In the following sections we discuss these effects in more detail.

2.2.1 The effects of the Special Law on local labour markets

Tourism is the major driver of the Galapagos economy. Tourist numbers in Galapagos have continued to rise steadily since 1997. In 1997 total tourist numbers were 62,809; by 2000 they had risen to 71,560.[44] Most of this growth is foreign tourists, who also contribute the most financially. Many of those who provide services to foreign tourists are based on boats offshore but local infrastructure and services are still used to a certain extent.

[44] These data come from Table 4.1 in Annex 4 of Fundación Natura and WWF (2001). They are from National Park data.

With new restrictions on employment of temporary residents, e.g. guides, more of the services will be provided locally in future. On Galapagos, the Park and the Research Station are the largest employers.

In the same period employment growth has been limited. This means that demand is outstripping supply of labour, thus pushing up wages in tourism and other areas where the increased prosperity flows on (e.g. construction and local retail). This effect on wages may have been offset temporarily by the legal requirement to have wages in Galapagos 75 per cent higher than the mainland minimum (which would have reduced labour demand), but continuing economic growth could quickly outstrip this limitation.

Taylor et al (2002) use their model of the Galapagos economy to estimate the impact of a 10 per cent rise in tourism on local wages and/or migration pressure. They also simulate the effects on local production and prices.[45]

This demand for labour is not for all labour but for labour in specific sectors. Many of those who work in tourism need very specialised skills: languages, the ability to effectively interact with people from different cultures, and biology. In contrast, the supply of labour from permanent residents tends to be relatively low-skilled. Twenty-three per cent of residents (temporary and permanent) over 24 in 1998 had completed University, but very few speak a second language.[46] Among those locals who have written qualifications, anecdotal evidence suggests that the quality of their education, i.e. their skill level, is often low. It can be hard to get local people with special skills, such as top quality secretaries.

Where local skills are not available (and that can be shown to the satisfaction of the Qualifications and Residency Committee), employers can hire temporary residents from outside. Even this, however, involves at least a 15-day lag to get a new employee. This delay is a real problem in tourism, where staff such as chefs are needed very quickly.

[45] See Table Six, Taylor, Yunéz-Naude, Dyer and Ardila (2002).

The imbalance between the skills demanded and supplied leads to low wages in low-skilled sectors and hence growth in these sectors. In particular, many local people have moved toward fishing (not diving for lobster, which is skilled work) on at least a part-time basis. This creates environmental pressure of its own.

An unintended consequence of the requirement in the Law that workers belong to cooperatives is that this makes it easy to form cartels to push up local wages for specific occupations. By using the cooperatives to limit the supply of skilled labour and lobby against the entry of temporary workers, who would push down wages, permanent residents could raise their wages. Anecdotally, some services have now become very expensive in Galapagos (e.g. skilled construction workers). Residents, and particularly small employers who cannot easily recruit staff from outside Galapagos, have to pay the higher local wages. Anecdotal evidence suggests that the uneven rises in wages and costs are creating more inequality among residents of Galapagos, which creates some social pressure and resentment.

As in any country with high living standards and where poorer people are protected by a social welfare structure (here preferential access to local jobs), local residents do not have to accept jobs they find unattractive.[47] It can be difficult, and will become increasingly difficult, to find people to do manual jobs such as cleaning and agricultural labour even when there are unskilled people around. People will not accept this work even if they are not really qualified for more skilled work. Local residents have little incentive to gain skills as long as they can get good work without the skills because of their privileged status. At the same time, local residents oppose entry of too many temporary residents where they might be in competition. Temporary residents take some of the best jobs and lower wages for others. The concerns about high costs or low quality of some local services make locals want freer labour markets at the same time that they want to protect the employment prospects and high wages of locals.

[46] Fundación Natura and TNC (2000a), Table 22.
[47] This problem arises in many European countries where unemployment is high and menial work is largely done by immigrants. This creates serious social pressures and problems with racism.

2.2.1.a Effect of migration restrictions on the composition of the population

The Special Law reduces migration from the continent to Galapagos. Living standards are already higher in Galapagos than on the continent. The difference in living standards between what a Galapagan resident can expect in Galapagos and if they move to the continent is only likely to increase. This will further discourage emigration. Immigration is now limited to spouses, existing permanent resident living elsewhere and those lucky enough to get temporary residency permits. The population of Galapagos is likely to become more stable than it was before 1998. This has some advantages in developing local institutions and environmental consciousness but may also have serious disadvantages in a world where the flow of ideas and skills is increasingly important for economic success and a vibrant healthy society. Recent research finds that intangible knowledge (which cannot be written down) is increasingly important and is effectively transmitted only through direct contact over a period of time. This is one reason why cities are increasingly attractive and why places such as Silicon Valley are so successful.

Two issues are primary. The first is the absolute levels of flows. The second is the composition of those flows. We discuss the levels of migration flows in Section 4.

Table 6: Characteristics of population, immigrants and emigrants

Variable	Galapagos Population 1982	Galapagos Population 1990	Galapagos Population 1998	Galapagos Population 2001	Emigrants (85–90) 1990	Recent Immigrants (93–98) 1998
Age						
Per cent of population under 20 years old	45%	41%	40%	37%		
Per cent of population under 30 years old[48]	68%	64%	60%	58%	64%	65%
Per cent of population under 40 years old	82%	81%	79%	77%		
Education[49]						
Very low skilled Per cent with 3 grades primary or less (over 6 years old)	24.2%	18.6%	15.6%	19.3%50	18.6%	11.2%
Per cent with University Education (over 6 years old)	6.3%	12%	15.1%	13.7%	18%	23%
Per cent with postgraduate degrees (over 6 years old)		0.8%	0.5%	0.4%	0.8%	1%

Table 6 shows a collection of data on the characteristics of people living in, migrating to and leaving Galapagos. We can see that overall the population of the Galapagos is getting steadily older after 1982. The age of immigrants and emigrants seems to be about the same (although we are comparing immigrants in the 1990s with emigrants in the 1980s). Both immigrants and emigrants are younger than the population as a whole after 1998 but roughly representative in 1990.

[48] Fundación Natura and TNC (2000a, Graph 2, Graph 3, Graph 4, Table 9, Table 13 and Table 54). The data is ultimately from census data collected by INEC.
[49] All education information ultimately comes from INEC. The information for 1998, except for the very low skilled percentage of the Galapagos population, was drawn from Fundación Natura and TNC (2000, Table 22 and Table 23). Information on emigrant education comes from Table 54 and on the population in 1990 from Table 60.
[50] 2001 Census education data considers population over five years old.

Looking at very low-skilled people, emigrants seem to be representative of the population as a whole in 1990. 18.6 per cent of those above six years old among both emigrants and the population as a whole have three years or less of primary school. In contrast, there are fewer very low-skilled people among immigrants than the population as a whole in 1998 (4.6 per cent relative to 7.9 per cent). Thus there appears to be a net outflow of people with very low skills.

When looking at the upper tail of the skills distribution, both immigrants and emigrants are more highly qualified than the population as a whole in both time periods and both measures (except postgraduate degrees in 1990). This could be partly to do with their age—younger people are probably generally more educated. It also appears that immigrants are better educated than emigrants so that Galapagos experiences a net gain in high-level skills through net migration. This may be simply because the emigrants are observed eight years earlier. If education levels are rising generally we would expect this to happen. The differences are marked, however, so may reflect a real effect.

These rough results are consistent with international experience that suggests that people who move are generally younger and more educated. It also suggests that migration has been a means of raising the skill level in Galapagos. If migration is limited this might have negative implications. Since 1998 the level of unskilled people in Galapagos has risen and those with university education appears to have fallen. This might be able to be partly offset by more intensive local education and training (see Section 7.4.2.a).

2.2.2 Political pressures

Generally Galapagans support the Special Law but not where the restrictions affect them personally. Local people feel they have made many sacrifices to protect Galapagos. They see the Law as creating new restrictions rather than recognising the benefits it confers on them. They cannot understand why they have to exert effort and bear losses to make it work. The benefits of the Law to local residents are not yet that visible. Some of the benefits will depend on adequate resolution of skills shortages that are pushing up prices for key goods.

In contrast the costs when local residents cannot help a family member or friend move to Galapagos, or they cannot employ someone they would like, are very visible and affect a few people strongly.

Some local politicians still favour immigration because they think migrants will vote for them rather than their opposition. This may well be true in the case where they facilitate entry for clearly defined groups. There may also be pressure from politicians at the national level who are more concerned about the well-being of Ecuadorians as a whole than that of locals. They could push to weaken the law so that more people can move to Galapagos from the continent. They could also push to allow industrial fishing and large-scale tourism in the Galapagos. The Law primarily benefits local residents. In the long run the Law should bring value to Ecuador as a whole by maximising the value of the tourist resource, but these gains are intangible relative to the immediate gains of increasing employment as well as tourism and fisheries output in a country faced with strong economic pressure.

People from continental Ecuador also put political pressure on the Special Law. There have been a few attempts to change the Law, in particular to allow industrial fishing. These have had support from some local politicians.

2.2.3 Illegal immigration and corruption

The same factors that create political pressure to “reform” the law make people more tolerant of those who bypass the law and allow illegal migration. Some locals suggest that there is no bribery, but lots of people use their influence to help their friends, relatives or potential employees avoid the law. People cannot see why they should not. They see the merits of the individual case but not the overall implications for the integrity of the system.

Direct falsification of documents is also a problem.[51] This is getting harder, with more sophisticated permit technology. One unusual situation may arise with the Ecuadorian Indian population. It has been suggested that Indians find that officials cannot distinguish among them easily based on their photos, so they can "recycle" temporary permits to allow several relatives and friends to enter Galapagos using one temporary permit. The new electronic identity cards are intended to reduce falsification and make the control process at the entrance ports easier.

A larger problem is that people enter Galapagos legally but then do not leave when they are supposed to. Enforcement and deportation are costly. There is currently no incentive for employers to help INGALA identify and deport temporary residents who have overstayed their permit. Requirements for transient visitors to have a return ticket are not always enforced. Entry and exit is not closely tracked, particularly when people enter through unofficial channels—e.g. cargo boats, the military plane, or fishing vessels. Overall there are still significant problems with institutional capacity. INGALA has a very limited budget for controlling migration ($250,000 in 2001). Some people have questioned whether INGALA is the right institution for this operational role. Most of INGALA's role is in planning, so migration control may not be its top priority. INGALA's role is, however, enshrined in the Law so cannot easily be changed. As we discuss in the next section, INGALA is working hard to improve its operational performance.

[51] Interview with Oscar Aguirre, Director of INGALA, January 2002.

2.3 How could the Special Law be strengthened administratively?

Parts of the Law, in retrospect, could have been written differently to make it easier to enforce and sustain. It is now impossible, however, to change the Law without the risk of opening up all aspects of the Law, incurring high costs and potentially making unfavourable changes as well. Some constitutional constraints also limit changes to the law and its interpretation. The general regulation to implement the Law was established in January 2000. The specific regulations on migration and fisheries are still in development. Some clarifications of the Law could be included in these regulations.

Enforcement of the Law has four main components: tracking the residency status of permanent and temporary residents, tracking the entry of all people to Galapagos, verifying the legal status of people in Galapagos, and ensuring that those who do not have legal status actually leave.

The first step is now well advanced. The process of identifying permanent residents is almost complete. Price Waterhouse have been contracted to analyse and find mistakes in the existing records in order to create a strong database to track both permanent and temporary residents. They are also creating a manual so that procedures for processing applications for temporary permits can be harmonised across the islands. The company CONTROLES will be in charge of developing a computerized system to control migration flows and IMPSAT Company will install the system and the equipment required.

Currently it is possible to enter the islands without being recorded. Airports are well monitored but it is still possible to enter on the military logistical plane and not pass through control points. In the past it was possible to get to Galapagos on cargo boats. We talked to all cargo boat companies and one said that in the past they used to transport passengers. In 1999 they carried around 100 foreigners, 50 people from the mainland and 70 Galapagos residents.

However, after the Jessica oil spill in 2000, these boats were more controlled and were not allowed to transport passengers because they are only cargo boats. They do not meet the requirements for transporting people. These problems are being addressed through more formal agreements with the Navy and the shipping companies. At present agreements between these people and INGALA are with individuals, not the institutions, so gaps emerge as staff turn over. Some people also enter on private yachts and fishing boats. These create gaps in monitoring of entry that still need to be filled.

Many people are already in Galapagos or enter Galapagos without being traced, or entered legally but have overstayed or are doing activities they are not authorised to do. They may not have legal status. INGALA does some random checking of people's status on the streets, but not surprisingly this is very unpopular. It raises many privacy issues and alienates locals as well as illegal migrants, thus reducing people's willingness to cooperate and support the effort to control migration. Another suggestion is to recruit tourism and transport operators to track transport of people among the islands. This would be particularly helpful to pick up people who land on one of the smaller islands and hence do not pass through migration control. It might face similar resistance and issues of privacy to the random checks unless done with discretion and caution. If it were limited to identifying people who travel from an outer island to Cristobal or Santa Cruz and who have not travelled in the other direction it might be sufficiently targeted to be acceptable. People identified in this way could be required to report to INGALA and a list of them could be given directly to INGALA staff to ensure they do complete the migration formalities. Identifying people in Galapagos who are working illegally requires cooperation from employers. It is not illegal to employ someone without legal residency status so employers are currently under no obligation to help INGALA. They might want to keep a worker or might have become friends and be unwilling to report them.

The final problem is ensuring that people leave Galapagos when their temporary or transient permit expires or if they are found not to have legal status. One good idea to encourage employers to make sure their temporary workers leave would be to require all employers who employ a temporary resident to pay a significant guarantee when the person enters. This would be refunded when they have been proven to leave. This idea would not require a change in legislation; it could be included in the regulation. For illegal entrants who are identified a problem is that it is expensive to deport them. The one-way airfare is $100 for an Ecuadorian national. Currently INGALA has identified many illegal residents but the residents do not have enough money to pay the airfare and INGALA cannot afford to deport them. Two approaches would reduce this problem in future.[52] The first would be to have migration control points in Guayaquil and Quito to ensure that people do not arrive in Galapagos without the appropriate papers. The second is to enforce the requirement that all tourists and transients have a return ticket when they enter Galapagos.

2.4 How pressure on the Special Law can be reduced

The rest of the paper focuses on estimating the underlying pressures on the Special Law, understanding their causes and identifying possible solutions. Section 7 gives more detail on the range of policies that could help to reduce these pressures. They can be roughly grouped in four: policies that directly make the migration control more flexible, reducing skills shortages and allowing legal means of entry to those who strongly want to migrate; reducing or redirecting subsidies that currently make migration to Galapagos very attractive; regulating externalities caused by those in Galapagos (e.g. land use, fishing, and tourism); and raising the level of skills and education of those in Galapagos, thus reducing skill shortages and inequality that leads to social pressures.

[52] If part of the problem is that some INGALA staff can be influenced by bribes or simply encouraged to not enforce the law, paying attention to their pay levels, job satisfaction and levels of training might help provide them with the incentives to strongly enforce the law.

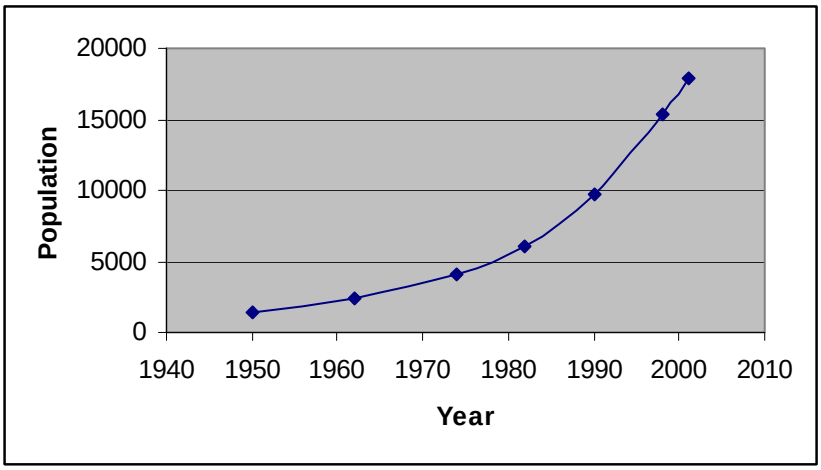
3 Empirical review of migration patterns

For those concerned about environmental pressure in the Galapagos several aspects of human presence are important: people present, people entering Galapagos and goods transported to Galapagos.

3.1 Total population at each point in time

The largest group of people present at any point in time is the resident population. They demand services such as waste and sewage disposal, water and electricity, and they use land directly. They also create a demand for goods to be transported to the islands. The resident population of the Galapagos has been growing steadily since the early 1950s.

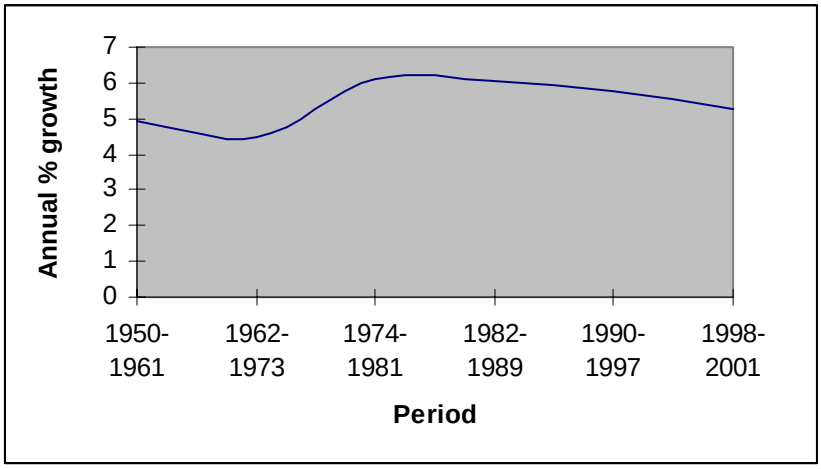
Figure 3: Resident population in Galapagos over time



Source: Population Census data from the Ecuadorian Institute of Statistics and Censuses (INEC); excludes tourists.

The annual rate of growth has slowly increased in the period since the 1950 as a whole, other than a reduction in the growth rate in the 1960s.

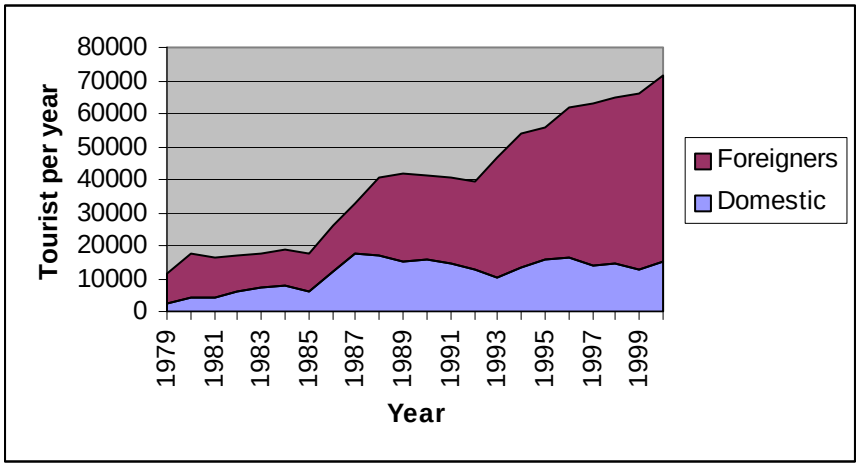
Figure 4: Resident population growth rate in Galapagos



Source: Population Census data from INEC; excludes tourists.

Tourists and transient visitors also use services and cause environmental pressure. They also induce increased supplies of food and other goods to Galapagos. Figure 5 shows that tourist numbers have grown rapidly since 1979, with rapidly increasing numbers of foreign tourists since the mid 1980s. By 2000, total tourist numbers exceeded 70,000. How big an environmental impact are they likely to have relative to residents?

Figure 5: Ecuadorian and foreign tourists since 1979



Source: Fundación Natura and WWF (2000 and 2001).

A Fundación Natura study (De Miras 1995, cited in Fundación Natura and WWF 1996) suggests that visitors from Ecuador stay three days on average and foreign tourists stay four days. If we apply these numbers to the data we find that on an average day in 2000 there are around 743 tourists.[53] Tourists make up only four per cent of those present at any point in time so they will have a small direct impact. Their greater impact is on the resident population they help to employ and support. Because they spend more than local residents per day, they may also have a disproportionate impact on goods imported to Galapagos, though many of their supplies go straight to tourist boats and do not enter the islands.

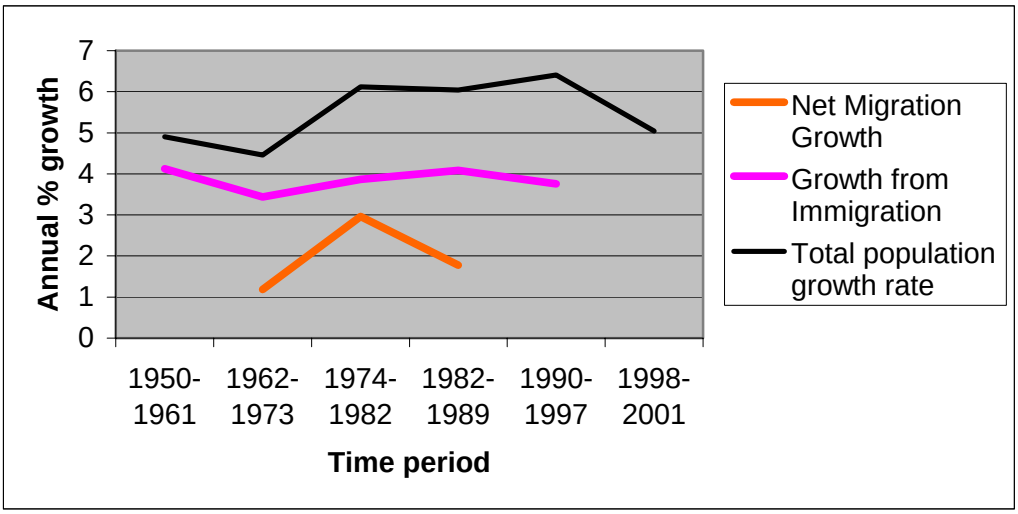
3.2 Migration across time and by origin

Migration plays a major role in population growth. Another part of the population growth documented above is clearly natural increase resulting from births exceeding deaths. Figure 6 shows the relative roles of immigration, emigration and natural population increase in total population growth. The middle line gives the growth resulting from immigration of people born outside Galapagos. The number of immigrants in each period is either taken from the MIGAMA report or estimated by comparing the number of people living in Galapagos who were born elsewhere at the time of each census (data from INEC).[54] It is an underestimate because some previous immigrants will have died between censuses. It also excludes immigrants from other countries. Between 1993 and 1998, three per cent of immigrants came from other countries. In 1998, 1.3 per cent of the Galapagos population and 2.16 per cent of immigrants who had arrived since 1950 were born outside Ecuador. The growth rate from immigration seems roughly constant. Of course that means that the number of immigrants was growing rapidly up until 1998.

[53] The 1998 Galapagos Census suggests there were slightly more than our methodology but their number clearly depends on the time of year. In 1998 we predict 670 while the census reports 772.
[54] All the data used in this section is provided in an Excel spreadsheet, galapagos_data.xls. See Appendix A.

The lower line gives net migration's contribution to growth, i.e. immigration net of emigration of people born in Galapagos. Emigration each period is measured by the change in the number of people born in Galapagos who are now living elsewhere in Ecuador. It is again an underestimate because it ignores people who leave the country and people who die after emigrating. It also does not include people who moved to Galapagos from somewhere else and later left Galapagos again. These people are incorporated in the immigration numbers, which are really net inflows of people born outside. The difference between the lower and top lines is an estimate of natural increase.

Figure 6: Contribution of migration to population growth since 1950



Sources: Fundación Natura and TNC (2000), INEC (1994), Census population data 1950, 1962, 1974, 1982, 1990, 1998, 2001.

In the years where we can estimate net migration growth, it accounts for 30–50 per cent of population growth. Natural increase is clearly an important part of total population growth. Emigration is also important. Addressing immigration alone addresses only a part of population growth.

Table 7: Immigration, emigration and population growth

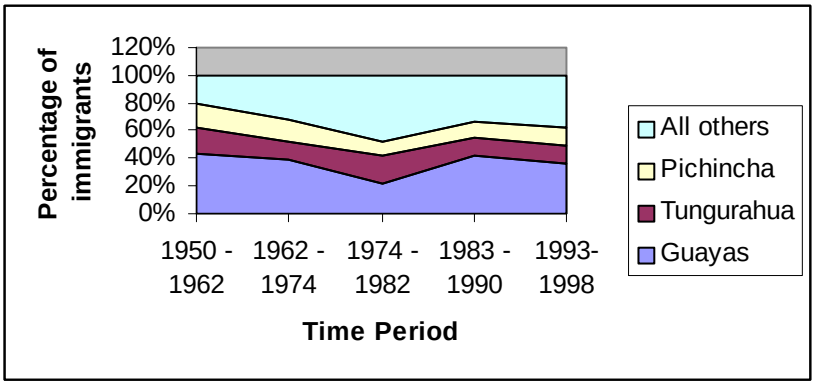
Time Period	Total population growth rate	Loss through emigration	Growth from Immigration	Estimated Natural Rate of Increase
1950–1961	4.9%		4.1%	
1962–1973	4.5%	2.3%	3.4%	3.4%
1974–1982	6.1%	0.9%	3.9%	3.1%
1982–1989	6.0%	2.3%	4.1%	4.2%
1990–1997	6.4%		3.8%	
1998–2001	5.04%			

Sources: Fundación Natura and TNC (2000), INEC (1994), Census population data 1950, 1962, 1974, 1982, 1990, 1998, 2001.

3.2.1 Where do immigrants come from?

In terms of sheer numbers, three provinces, Guayas, Tungurahua and Pichincha, provide most of the migrants to Galapagos. Their total share has fall somewhat since 1950 but they still contribute more than 60 per cent. Of these, Guayas is by far the most important.

Figure 7: Source of immigrants from major provinces over time



Source: Fundación Natura and TNC (2000) Tables 6, 7 and 14; INEC 1994. Data represents migration relative to place of birth, not place of residence five years before.

To a certain extent their dominance simply reflects the fact that they have large populations. As we see in Table 8, Pichincha contributes a lower percentage of its population than Loja or Esmeraldas. Guayas and Tungurahua, however, not only provide a high percentage of total immigrants but immigration is also the highest as a percentage of the population in their province. Emigration from other provinces to Galapagos is certainly not simply a function of population. We explore other causes of migration in Section **6**. We hope this will shed some light on why people come to Galapagos.

Table 8: Place of birth of immigrants to Galapagos

Province	**Per cent of migration to Galapagos by province, 1950–1998**	**Average per cent of province migrating to Galapagos, 1950–1998**	**Per cent of internal emigrants from Galapagos going to province, 1962–1990**
Guayas	35%	0.045%	25%
Tungurahua	14%	0.093%	3%
Pichincha	12%	0.026%	47%
Manabí	7%	0.016%	3%
Loja	6%	0.035%	5%
Esmeraldas	3%	0.033%	3%
El Oro	3%	0.027%	6%
Los Ríos	3%	0.016%	3%
Cotopaxi	2%	0.016%	1%
Chimborazo	2%	0.014%	1%
Cañar	1%	0.015%	1%
Azuay	1%	0.006%	1%
Rest of Ecuador	5%	0.015%	1%
Other Countries	2%		
Total	**100%**		**100%**

Sources:Fundación Natura and TNC (2000), Tables 6, 7, and 14; INEC 1994; Census data 1950, 1962, 1974, 1982, 1990, 1998.

3.2.2 Where do people go to from Galapagos?

As we see in Table 8, the vast majority of people who were born in Galapagos and leave go to either Guayas or Pichincha (where Quito is located). Guayas is the closest province and has Ecuador's largest city, Guayaquil. Quito is easily accessible at little extra cost and is the second largest city. These people are likely to be emigrating either for study or for urban job opportunities not available in Galapagos. This will reflect a larger flow of people leaving and then returning to Galapagos. With current data we cannot detect these gross flows.

3.3 Migration since 1998

2001 Census figures show population growth of 5.04 per cent (or 2557 people) in the period from 1998 to 2001. This is lower than earlier in the 1990s. We do not yet know how much of this is accounted for by immigration, emigration and natural increase. It suggests that the Special Law has not yet been successful in controlling population growth though it has slowed it and may have had a significant effect on immigration, which is the only thing it controls.

As Figure 5 indicated, the number of foreign tourists continued to rise from 1998 to June 2001. The events of September 11th, however, have recently reduced foreigners' visits to the Galapagos. The number of visitors decreased by 36 per cent between August and September 2001. In contrast, domestic visits decreased between 1998 and 1999, mostly due to bad economic conditions in mainland Ecuador. However, they rose again between 1999 and 2001. Overall, tourism has increased every year since 1998. This will have increased the demand for local services and hence increased migration pressure.

During 1999 and early 2000 there was an economic crash on the mainland. Ecuador suffered an inflation crisis, which led to a dolarized economy. The crisis and constantly increasing tourism will have made immigration attractive since 1998.

Emigration of the mainland labour force to European countries, especially Spain, reached its highest levels during this crisis. Maybe this reduced pressure that would have been placed on the Galapagos Islands. Maybe, however, it indicates that migration pressure was very strong during this period and could have resulted in strong flows to Galapagos if the Special Law had not been in force.

In the following subsections we consider drivers of future legal population growth. Population can grow because more permanent residents are born in Galapagos and because there is net immigration (immigration minus emigration). Immigration is legal for permanent and temporary residents, so migration depends on how many permanent residents there are outside the islands and how many of them move to Galapagos; how many new people outside Galapagos gain permanent residency; and how many temporary residents are allowed to enter.

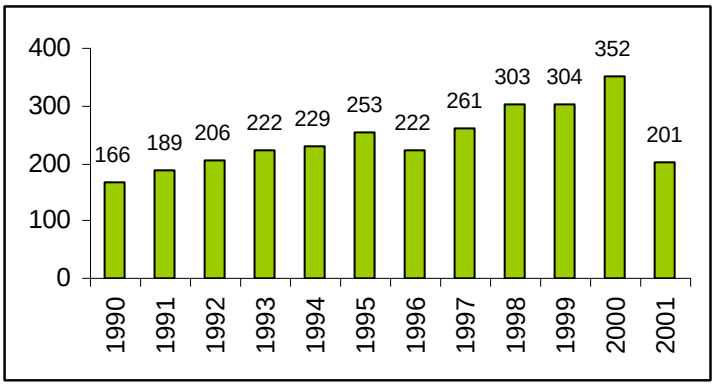
3.3.1 Population growth through increasing numbers of permanent residents

Permanent residency status can be gained by birth (when the child's parents are permanent residents); by marriage or free union recognized legally; or by right (residents who at the time of the Special Law's enactment had lived for more than five consecutive years in Galapagos). INGALA is using a database to track residency while the process of issuing identity cards is taking place, but the process is not yet complete, so the data is hard to interpret.

Data on births is relatively reliable though it excludes children born to permanent residents not living in Galapagos. It may suffer from variation in the definition of and accuracy of tracking of "permanent residents" over time. Figure 8 suggests that natural increase from permanent residents could be a small but significant source of population growth.[55] We have no data on deaths, which clearly partly offset this.

[55] This is preliminary data which should be validated when the registration process is complete.

Figure 8: Births to permanent residents living in Galapagos



Source: INGALA database, updated April 2002.

Unfortunately, it is difficult to assess the increase in numbers of permanent residents from other causes through time because the requalification process is incomplete and the data does not distinguish between those who are simply requalifying based on their long-term rights and those who have newly become eligible for permanent residency. By August 2002, 18,660 permanent residents had requalified (registered under the new system) in contrast to only 11,282 in October 2000 (Table 9). By October 2000, the new qualification process had eliminated 1728 cards issued by the Gobernacion before 1999.[56]

Considering that the number of newborns in Galapagos has been only 200–300 per year since 1999, this large increase in qualified permanent residents since 2000 may suggest that a lot of the increase in permanent residents is people who are eligible through marriage or "right". Most of the observed increase is probably due to the backlog in the requalification process. As the new qualification process is completed the numbers will rise even further.[57] Once it is complete, only genuinely new permanent residents (new marriages and new children) will gain permanent residency.

[56] 13,010 permanent residency cards were issued by the Gobernación before 1999. Source: Fundación Natura and WWF (2001).
[57] There was a deadline for requalification, May 2001, but it has been extended.

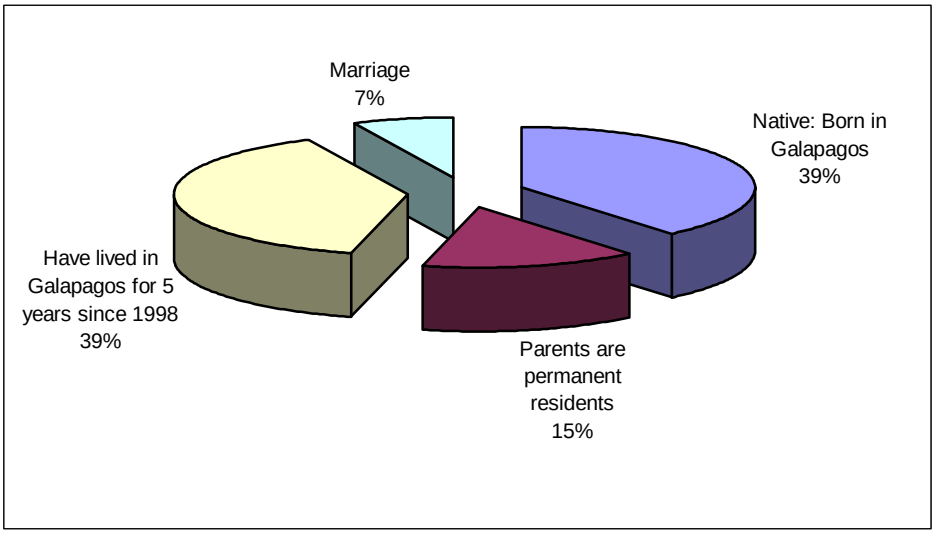
Table 9: Permanent residents requalified since 2000

Island	2000[a]	2002[b]
San Cristóbal	4392	6883
Santa Cruz	5640	9936
Isabela	1250	1841
Total	**11,282**	**18,660**

Sources: (a) Results of requalification process cited in Fundación Natura and WWF (2001).
(b) INGALA database updated 15 August 2000. Other data on this section is based on April 2002 update.

Based on current INGALA data, the main sources of eligibility for permanent residency are being native (39 per cent) and by right (39 per cent), both followed by those whose parents are permanent residents and only seven per cent by marriage (Figure 9). The future growth from births and marriages is likely to be on the order of 300 per year, as marriage is a small contributor.

Figure 9: Sources of eligibility for permanent residency



Source: INGALA database, updated April 2002.

3.3.2 Migration of permanent residents

Another potential source of migration since the Special Law is from permanent residents moving to Galapagos. According to the INGALA database updated to April 2002, 2128 permanent residents live outside Galapagos. They could choose to return to Galapagos. As people outside Galapagos become permanent residents (through birth, marriage or "right"), they increase the pool of potential legal migrants.

3.3.3 Migration through temporary residency

There is no reliable estimate of the number of temporary residents currently living in the Galapagos. We consider several indicators of the likely importance of temporary residents. The Gobernacion had issued 5798 temporary resident cards by 1999.[58] Some of these will have expired; others will be current. In August 2002, the INGALA database included 1325 temporary residents with new valid cards.[59] However, the process of issuing identity cards still continues, and a definitive number of temporary residents will be available only when this process is complete. INGALA staff currently estimate that there are around 2000 temporary residents.[60] Others believe the number could be as high as 4000.

Another source of indicative information is the number of job agreements authorised. In 2000, INGALA approved 1069 job agreements for temporary residency. The Special Law allows the spouses and children of those with job agreements to also have temporary residency status. This suggests that the number of new temporary residents in 2000 was much higher than 1069. Thirty-three per cent of these job agreements were for tourism, 15 per cent for Air Force and police and 14 per cent for conservation. In Santa Cruz, employers are most commonly in tourism and conservation, whereas in Cristobal, security institutions, tourism and the education sector employ the most temporary residents.

Government is a major employer. More than 800 people are currently working for various government (and NGO) institutions. The national park employs around 280 (212 temporary residents), INGALA employs around 110 (though some are on the continent) and municipalities employ around 250 between them.

[58] Fundación Natura and WWF (2001).
[59] Out of these 1325 temporary residents, 917 are living in Santa Cruz, 336 in San Cristobal and 72 in Isabela.
[60] F. Castro, personal communication.

In addition, the research station employs around 250 staff. This does not include the Provincial Council, representatives of government ministries, the military or employees of state-owned companies. When the families supported by these employees (if we assume three per household on average) are taken into account, these public institutions may directly account for more than 2400 residents. Indirectly these employees are relatively well paid and increase the economic attractiveness of the islands. Many of these are temporary residents.

By law, temporary residency of non-public employees must be renewed each year. We have no indication of how many of the 1069 people with job agreements have since left their temporary jobs. The requirement to renew temporary residency is unlikely to be enforced yet and does not apply to the many public employees. As there is increasing pressure to allow more temporary residents, this may be the major source of population growth in future.

3.4 How many people and how much cargo physically enters Galapagos?

Species introduction is the major environmental risk in Galapagos. The risk of species introduction relates most directly to the number of people and the quantity and type of goods that enter Galapagos. It also depends on the quality of the quarantine and inspection system, SICGAL. A higher resident population will tend to be correlated with higher numbers of trips to Galapagos and with higher levels of cargo.

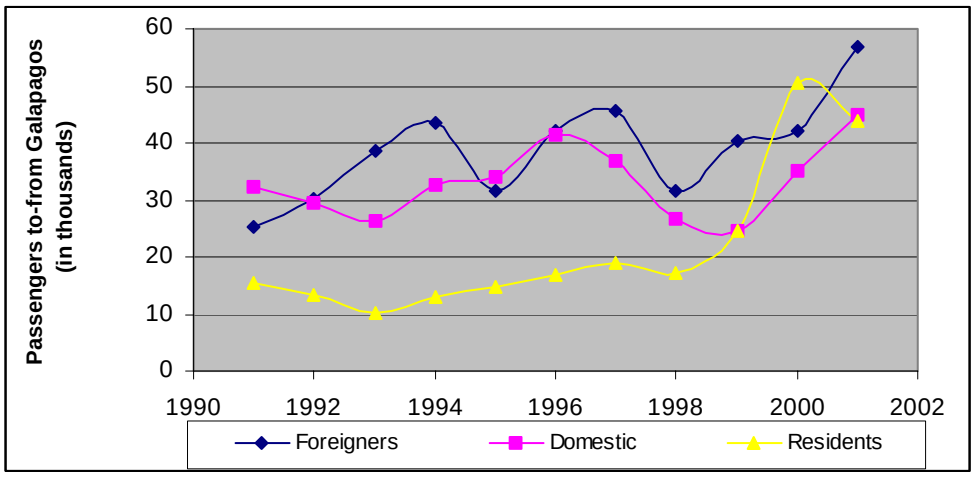
3.4.1 People

In 2000, 49 per cent of the products retained by SICGAL were associated with passengers (in hand luggage, checked luggage or clothes). This high percentage may reflect the more intensive inspections at Baltra and of air passengers but also suggests passengers impose a high risk. In 2000, 96,368 passengers flew into Galapagos (55,161 from Quito and the rest from Guayaquil).[61] Of these more than 25,000 were residents.

[61] Fundación Natura and WWF (2001), Table 4.3. These numbers include all trips on TAME (Ecuadorian airline that serves Galapagos) toward Galapagos. The resident numbers include only those trips directly identified as resident trips.

Thus, the average resident makes two round trips to the continent each year. We cannot separate trips by permanent residents from those by temporary residents. Total air trips have more than doubled since 1991 (not at an even rate) and residents have been responsible for a roughly constant share. Foreign tourists have been responsible for an increasing percentage of trips, while domestic travellers have decreased.

Figure 10: Passengers moved to and from Galapagos (in thousands)



Source: Fundación Natura and WWF (2001).
Note: The underlying data is given in Appendix 1. These numbers do not include passengers transported with special tariffs, group tariffs, promotions, or courtesy tariffs.

Some people enter Galapagos by boat. There are no reliable numbers for this and the information we have suggests numbers are small relative to air travel. Personal interviews with owners of cargo boats indicated that before the 2000 Jessica oil spill, two of the five cargo boats transported passengers sporadically. In 1999 the cargo boat *Virgen de Monserrate* carried approximately 220 passengers to the islands. Of these, 100 were foreigners, 50 nationals and 70 residents. Since 2000, cargo boats are not allowed to transport passengers because these boats do not fulfil new requirements for passenger transport. People also enter on private yachts and fishing vessels. Control at maritime ports should be enforced, as legal or illegal entry of passengers is still possible. Illegal entrants may pose an even greater quarantine risk.

3.4.2 Cargo

Cargo transport imposes significant risks. For example, it is known that mice were introduced through cargo boats. Four cargo boats currently transport a diverse range of products to the islands: *Marina 91*, *San Cristobal*, *Virgen de Monserrate* and *Paola*. Each of them goes once or twice per month to the islands.

Consistent statistics about the amounts of cargo shipped to Galapagos are not available. The General Merchant Marine Directorate (DIGMER) holds some data since November 2000 but neither all boats nor all months are included. Table 9 shows estimates of cargo amounts shipped to Galapagos between November 2001 and February 2002. If December is a typical month, annual shipments are around eight million kilos.

More data on the quantity and composition of cargo and trends in it over time would be useful. The quantity is likely to be closely related to the number of residents and tourists, which have both grown rapidly in the 1990s.

Table 9: Cargo amounts shipped to Galapagos, Nov 2001—Mar 2002 (thousand kilograms)

	November 2001	**December 2001**	**January 2002**	**February 2002**	**March 2002**
Virgen de Monserrate	148	246	163	245	
Cristobal	160	40		62	99
Paola	135	104	179	293	
Marina 91		309	182		45
TOTAL	**443***	**699**	**524***	**600***	**144***

Source: Data provided by DIGMER; * incomplete data

4 Theory of migration

In this section we outline the factors that drive migration. Our framework for thinking about migration is primarily based on economic theory. Two other academic disciplines contribute complementary work on migration:

1. Sociologists and social psychologists have concentrated on individual motivation for migration, including factors such as personal, family and community stress, as well as demographic influences, including family networks, age and gender.[62]
2. Geographers have focused on aggregate models of interregional population flows. They use mainly gravity models, which in their simplest form explain population flows between the two regions in terms of the two regions' population stocks and the distance between two regions.[63]

We address the problem by considering three questions. First, why are jobs and people located where they are? Second, what causes people to migrate? Third, what are the impacts of limitations on mobility? We then present a very simple model that provides an organising framework for our later analysis.

4.1 Why are jobs and people located where they are?

In an efficient world, people will be located where there are good economic opportunities and where it is a nice, or at least acceptable, place to live. People need to have jobs to survive, so they will be located where there is employment. At the same time, firms need to employ people, so they will choose to locate where there are people to employ.[64]

[62] Ritchie (1976) provides an overview of migration research from a sociologist's perspective (as cited in Greenwood, Mueser, Plane and Schlottmann 1991).
[63] Clark (1986) provides an overview of migration research from a geographer's perspective (as cited in Greenwood, Mueser, Plane and Schlottmann 1991).
[64] Krugman (1995) presents an equilibrium model of spatial location of firms and workers that is the basis of many of the ideas in the following section.

The Galapagos are isolated and small. This gives them many economic disadvantages. A major reason for employment in such a place is that there are natural resource-related opportunities that must be utilised on the spot if they are to be used. In particular tourism is a major opportunity and requires local services and inputs. Similarly, fisheries must occur onsite. Ecological/biological research provides another economic opportunity. It must also be done in the Galapagos. These factors lead to direct employment in tourism, fisheries and research.

If people live and work in Galapagos for these reasons they will require services themselves. Thus there will be flow-on employment in retail, health, education, and construction, among other areas.

How many people these activities will employ on site depends on the cost of on-site employment and the costs of doing parts of the activities elsewhere. For example, in tourism, clearly the guides, chefs and hotels need to be in Galapagos, but food can be grown and processed elsewhere and guides can live elsewhere when not working. In the extreme, as is clear in Galapagos, tourists, guides and chefs can actually live offshore on boats. Artisanal fishing requires that fishers live in nearby ports because the boats are small and hence fishing trips must be short. Industrial fishers could operate from the mainland through the use of factory ships and potentially never land at all. In research, researchers must be in Galapagos to collect field data or breed animals, but many of the other research activities could be carried out elsewhere. As an example of this consider the Antarctic research programmes, where only a skeleton staff remains over winter. Many research support roles can be largely carried out from afar with modern transportation and telecommunications.

Similarly, the services provided to people who have jobs linked to Galapagos can be provided either on or offsite. In the past many services, such as banking, insurance, specialist retail or health care, would have to be provided onsite or not at all.

Over the last 10 years increased tourism demand and increased access to international seafood markets will have placed upward pressure on the population in Galapagos. In contrast, improved transport and communications will have reduced the need to provide some services locally; goods and services can be imported more easily from the continent, which potentially reduces population pressure. The effects of the latter (improved transport and communications), however, is very small relative to the former.

Some people will choose to live in Galapagos even though their jobs do not require it. This will include retired people and some people who have extremely mobile jobs (e.g. artists or writers) and could live anywhere. They might choose to live in Galapagos because they like the lifestyle and amenities. As more jobs become mobile with the Internet, and retirees become more mobile, improved services and amenities in Galapagos could attract more of these people. If these people love living in Galapagos it may be socially efficient for them to live there.

If the costs of living and operating in Galapagos are subsidised, more activities that could have occurred elsewhere will occur in Galapagos and some activities that are not intrinsically linked to Galapagos may occur there.

4.1.1 Effects of government policies on the location of population

4.1.1.a Regulating externalities

An externality occurs when a person takes an action but does not bear the full consequences of it. For example, a fisher who collects a lot of sea cucumbers and then leaves Galapagos is not affected by the lower number of remaining sea cucumbers in the future. Other fishers bear these costs. A key externality in Galapagos is that every extra visitor (resident or tourist) brings an increased risk of introduced species. These introduced species can damage the environment, leading to reduced future tourism opportunities, which has costs for others (future tourists and tourism operators), as well as loss of biodiversity and ecosystem functionality. The visitors do not bear the cost of the risk they impose so do not take it fully into account. Externalities lead to inefficiency.

Government's role in regulating externalities can either increase or decrease population pressure. Where a lack of regulation leads to overexploitation of a resource, such as excessive tourism that damages sites or excessive fishing pressure, an efficient regulation can reduce the number of jobs in the industry and reduce short-term population pressure. By preserving the resource they will increase the longer-term population but within sustainable limits.

In contrast, if the externality makes life less attractive and productive in Galapagos, effective regulation of the externality can encourage migration. For example, poor management of sewage disposal can either raise the costs borne by local people for dealing with sewage or can lead to local pollution and hence reduce tourism, fishing and general quality of life. If the government can improve the sewage treatment infrastructure it can make tourism and fishing firms more productive and life more attractive.

4.1.1.b Infrastructure

National governments are often major providers of infrastructure because of the necessary scale of projects and the likelihood of natural monopoly. This infrastructure alters the costs and benefits of local activities. Government investments in infrastructure (roads, airports, port facilities) and long-term amenities (national parks) respond to current activity in different locations but also influence future location decisions. If infrastructure investments are higher than is justified by the economically efficient level of local activity, and are not funded out of local taxes, they will encourage additional migration.

4.1.1.c Central policies with "equal" effects across locations

Policies such as health and education that offer equal levels of social services in different places are effectively subsidising areas such as Galapagos where the cost of providing those services is higher. Providing health services for a small population has a much higher cost on a per capita basis than for a large population. If equivalent levels of health service are paid for by central government, a remote area such as Galapagos will tend to be heavily subsidised. This will encourage excessive population levels.

Education is similar, particularly at the post-primary level. Electricity supply and water supply are also more expensive to provide in remote areas. Equal access and prices across provinces implies high levels of subsidies to remote areas.

If local government provides these services out of local tax revenues no subsidy is involved even if the level of service is high. Local people will choose the level of service that is efficient for them. In the extreme, local governments can be thought of as yet another type of firm where people have to buy the package of services and local taxes offered when they choose where to live.[65] In Galapagos, local government (municipalities and the Provincial Council) provides many services including urban development (sewage, waste, water, parks, libraries), rural development, and roads. Local government also has some control over education and health. Little is locally funded.

Similarly, some central government policies may be inappropriate in isolated areas, for example, the complex bureaucratic infrastructure appropriate for a large province on the continent may be completely inappropriate for a region with fewer than twenty thousand people. If the bureaucracy were funded out of local resources this would be a drain on the province and would discourage population growth. If it is funded from central government it is not a direct drain. It will, however, reduce the efficiency of local government activities and will have a direct impact on population. A less efficient local government will make economic activities less productive and hence reduce total employment and population. However, it may also lead to less effective regulation of negative externalities, such as those that arise through subdivision of land, which will encourage population growth.

[65] This is explored in the Tiebout model (Tiebout, 1956).

4.2 What causes people to move?

Over time, the optimal number of people and the composition of skills employed in a location changes. To adjust to this change either people will move or wages will change. If more people are needed, people will immigrate and/or wages will rise. If fewer people are needed, people should emigrate and/or wages will fall. People move because they do not have the right skills for the jobs that are available in their current location, or conversely jobs that will fully utilise their skills are not available where they are. They take their families with them.

In addition, even without changes in the level of employment, if there are no restrictions there will be a continuous flow of immigration and emigration. Young people move to study or start a career. People also move because they prefer the lifestyle in a different place or for personal reasons such as marriage.

When people make decisions about moving, they weigh up the net benefits they expect to receive in the new location and compare those to the costs of making the move. Economic models are based on the view that people migrate in order to maximise personal or family welfare. More complex models take into account the fact that wages are not fixed across time so that people may move to a new job with the same or even a lower current wage but better future prospects. For example, studies have found that people who move into large cities do not immediately become better off but over time their wages tend to rise, possibly because they are in an environment where they learn from those around them.[66]

[66] See for example Glaeser and Maré (2001).

Another complication is that wages are uncertain and people don't really know exactly what sort of job and income they are likely to have in a new place unless they move to a specific job, and even then they may not stay in that job forever. People make decisions based on their expectations about their current and future wage prospects and based on their assessment of the probability that they will be unemployed.[67]

Potential migrants compare the current and future expected benefits to the financial costs of moving as well as the social and personal costs of having to create new social networks and become familiar with a new community. When the costs of moving are high they will be less likely to move and people will respond very little to changes that they do not believe are permanent. Some people are very attached to specific places for emotional and cultural reasons and are very unlikely to move.

Empirically, younger, more educated people move more often. They probably have more to gain both in the short run from putting their skills to better use and in the long run because they will be in the labour market for longer. They also face lower personal and social costs from being dislocated. People who own houses are less likely to move. People tend to be more likely to move if the two locations are closer and if culturally the two areas are "similar". Given that Galapagos is not close to anywhere, this might mean simply that those close to Guayaquil and Quito are more likely to move to Galapagos because the travel time is much shorter. Urban people might be more likely to move to urban areas.

We do some empirical analysis of the factors that drive immigration into and emigration from the Galapagos in Section 6.

[67] Herzog, Schlottmann and Boehm (1993) review empirical studies that treat migration primarily as spatial-job search. These studies focus on the uncertainty in wages and probability of employment in different locations.

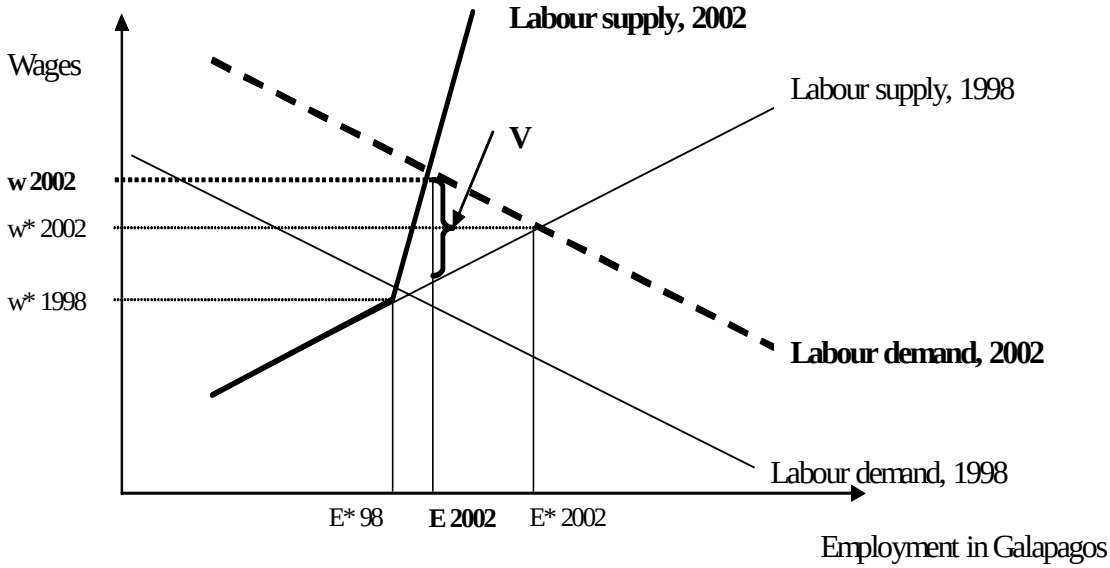
4.3 What are the impacts of limitations on migration?

Figure 11 illustrates the effect of a limitation on migration on the labour market. The 1998 curves for supply and demand are those of an unrestricted market. In 2002, the curves are for a relatively fixed population. Labour demand has grown, possibly because of a local economic boom. Labour supply can only expand in a very limited way through limited migration and through increases in labour participation by people already living in Galapagos.

The combination of the limitation on migration and the growth in labour demand creates latent pressure on migration. If mobility were unrestricted E*2002–E2002 extra people would be employed and a larger number would immigrate. The distance V indicates the amount a potential migrant would be willing to pay, and an employer would be willing to offer above the wage that they would have offered without the mobility limitation, if the potential migrant were allowed to enter the Galapagos. The higher is V, the greater is the pressure for illegal entry or for politically motivated changes to the migration rules.

Although we talk about employers and employees, this also applies to people who are going to be self-employed. For example, when there are more tourists there will be an opportunity for more taxi drivers and hence the existing taxi drivers will make more money and/or new people will become taxi drivers. If people are self-employed, the “wage” is the income they can derive from the activity.

Figure 11: Impacts of migration limitations on the labour market



This is only a figure with theoretical slopes on the lines. It tells us the direction of the effects but not their size. How large a distortion will restrictions on migration really create, and how much pressure will that put on the enforcement and upholding of the restriction?

4.3.1 How important is migration as a labour market adjustment mechanism?

When the supply and demand for labour are out of equilibrium in an area five things can adjust. The first is that people can move. This response was discussed above and is the focus of this report. Other mechanisms can also be important. Adjustments can come from:

1. Creation and destruction of jobs in existing firms
2. Migration of firms
3. Changes in the labour force participation rate
4. Wage adjustments.

The importance of migration as an adjustment mechanism varies across countries. In the US the population is highly mobile and it is very important. In European countries it is generally less so. For Ecuador as a whole, if we take the total number of people who changed province between 1985 and 1990, divide by five to estimate annual flow and then divide by total population in 1990, we find that around 1.3 per cent of Ecuadorians move between provinces each year.[68] In contrast, around 1990 in the United States 3.32 per cent of the population moved between states and in Western European States, between 0.54 per cent and 1.64 per cent moved.[69] When considering only Galapagos, in 1990 six per cent of the population had immigrated in the last year and three per cent had emigrated. Thus Ecuador has mobility comparable to Europe overall but much higher mobility with regard to Galapagos. Migration is likely to have been an important mechanism for labour market adjustment in Galapagos at least up until 1998.

If population cannot adjust through immigration (it can adjust freely with emigration) then it will have to adjust in one of the other ways. Labour participation rates will tend to increase over time for general development reasons (women become more educated and there is less work in the home; older people become healthier and able to work later in life) as well as because with higher wages working will become more attractive.

Firms can contract or move away if their activities are not particularly profitable in Galapagos and/or they can do their activities elsewhere. If this process is facilitated there will be less pressure on the labour market. The demand for labour will fall. If policies actively try to create new jobs or protect old jobs the pressure will be increased and wages and labour participation will need to rise still further. This would be counterproductive, although it will help some specific groups. A preferred policy would be to help people retrain when their existing jobs are lost so that they can move into the areas with labour shortages and higher wages.

[68] These data are taken from INEC (1990) Table P-25.
[69] Data extracted from OECD (2000) p 53.

If wages have a minimum level (as they do for temporary permit holders by law in Galapagos, see Section 2) wage adjustment is not possible. That is probably not limiting because wage falls are a substitute for emigration, which is not limited. Currently the pressures are for immigration in any case.

With effective controls on in-migration we can expect higher wages in Galapagos, higher labour force participation rates (e.g. more women working and later retirement), reduced work for self-employed people (because their labour costs will be so high), destruction of jobs within firms and firms moving away from Galapagos. The more we depend on high wages for adjustment the more social pressure will arise and the more pressure there will be to allow more immigration. Galapagos residents able to work in the sectors with rising wages will become increasingly privileged.

4.3.2 How much does it matter who moves?

In general young, educated people with higher levels of motivation tend to move. If immigration is limited, emigration will continue to involve those with higher skills while the composition of the population who move to Galapagos will be controlled by the rationing rules. If these rules favour those with a lot to offer Galapagos, for example young energetic people with good skills, the composition of the population may not change dramatically. If the rules lead to immigration (permanent and temporary) primarily based on family connections and networks, the skills of those entering the Galapagos may be much lower than those leaving and the population composition may gradually change. This new composition may not meet the needs of the sectors with a growing demand for skills. We discussed these issues in more detail in the specific context of the Special Law (Section 2).

4.4 Summary: Simple economic model of migration

The basis for our analysis of migration is a comparison between the patterns of migration that would occur if all migrants took into account all the effects of their decisions on everyone else in society, “social optimal”, and the real decisions actual migrants make, “private decisions”. The decisions are primarily different because of government regulation or lack of regulation.

We are interested in excessive migration pressure because it either has environmental effects, if the people can enter, or creates latent demand to migrate which leads to social, economic and political pressure because wages rise and employers have difficulty finding the skilled staff they need.

In earlier sections we have outlined various aspects of the migration decision. This section summarises the key elements of these decisions. We can use this simplified framework to identify key problems that lead private decisions to be socially problematic. In Section 5 we use this framework to organise and interpret information about subsidies and regulation (or lack of regulation) in key sectors.

4.4.1 Socially optimal decision making

A person/family (henceforth individual) should move to the Galapagos, i.e. it will benefit Ecuador and even the population of the earth as a whole, if their increase in welfare by moving to Galapagos is greater than the increase in costs they impose on society.

$U_{iG} - U_{iO}$ > social expenditure on i_G – social expenditure on i_O

U_{iG} is well-being (utility) of individual i in the Galapagos (G), while U_{iO} is the same individual's well-being if they lived in another place. Similarly social expenditure (health, education, water and sewage, energy subsidies, and so on) on individual i in the Galapagos is compared with the expenditure the same person will attract in another place O.

The person's well-being depends on the wage they receive, the cost of living and also the economic and non-economic amenities associated with living in a particular place.

U_{iG} = U ($wage_{iG}$, prices of consumer $goods_{iG}$, amenities)

Amenities include proximity to national parks, climate, public services available, and other characteristics of life in a particular place. Different people will value these things differently.

"Social Expenditure" = per capita spending on health, education, water, sewage and other public infrastructure

- – taxes paid by the individual for these services
- + subsidies on all consumer goods and wages
- + external effects on the environment
- + external effects on other fishers, tourism operators etc.

Public expenditure should not include spending on conservation that is not sensitive to the interests of the local population but aimed at national or even global benefit.

If all individuals took these things into full account when making their decisions the level of migration to the Galapagos would be optimal and no policy change would be needed. Unfortunately private decision makers usually face a different and much simpler decision.

4.4.2 Private decision making

In the absence of a strongly enforced law restricting migration, an individual (person or family) *will* move to the Galapagos if they are better off in Galapagos than where they come from:

$$U_{iG} > U_{iO}$$

If there are net subsidies that favour life in the Galapagos, more people will move to Galapagos than we would like. We want to measure the size of the distortion between the private and social decisions.

$$\text{Distortion} = \text{Social Expenditure}_{iG} - \text{Social Expenditure}_{iO}$$

Then we can try to find ways to minimise the social distortion with a particular emphasis on reducing it for those who are considering migrating rather than those already resident in the Galapagos. In Section 6 we provide an empirical assessment of the distortions in migration pressure that arise from subsidies and from inadequate regulation of externalities. In Section 6 we assess the extent to which these subsidies affect observed migration.

5 Economic and policy incentives currently shaping migration

In this section we identify sources of spatial distortion that encourage people to move for inefficient reasons. These include subsidies to energy, education, transport or other goods where these subsidies are available to residents in the Galapagos but not on the mainland.

They also include inadequate regulation of activities such as tourism or fisheries so that the return received by those taking part exceeds the return to society. For example, if a fisher can receive a good short-term return but the stocks are being diminished, society is subsidising the fisher because future generations (or even fishers in a few years) will bear the costs of their actions.

5.1 Distortions from subsidies[70]

Subsidies were initially introduced to ensure a minimum standard of living in what was then a very backward part of Ecuador and to compensate residents for the long distance to the mainland and for National Park restrictions. When they were introduced, if anything, the government wanted to encourage more people to move to Galapagos. More recently, Galapagos has become an attractive place to live and concern has shifted from having too few people to having too many people. The subsidies, however, continue to encourage migration.

The cost of providing services, such as health, education, electricity and water supply, is higher in a remote area such as Galapagos because of its isolation and lack of economies of scale. Therefore if the central government offers equal levels of services in different provinces, they effectively subsidise the cost of living in the islands. As well as promoting migration, subsidies also encourage activities that create environmental externalities, such as risky transportation of fossil fuels.

[70] Susana Cardenas was the primary author of this section.

This section will show the main clearly identifiable subsidies in Galapagos, their relationship with possible causes of migration and their effect on the environment. It will include an estimate of the size of each subsidy per unit of the subsidised good and in total terms, as well as considering how the subsidy has changed over time. Data analysis for this section depends on the subsidy type. For some subsidies it was possible to get a time series whereas for others we found only a pair of years or a single period. We discuss subsidies for transport, energy (fossil fuel and electricity) and public services.

5.1.1 Transport (travel subsidies)

In this section we mostly discuss air transport. The Special Law provides a discount for residents who use cargo transport, but cargo transport is carried out by private companies and the discount is not fully enforced so we do not discuss it further here.

Air travel to and from Galapagos is heavily subsidised. Article 3 of Law 151 (4 May) specifies that since 1992 permanent residents are entitled to a 50 per cent discount for both marine and air transport both within the islands and to the continent. Title 7 of the Special Law confirms this.

The travel subsidies are probably designed to provide assistance to people living in remote areas. The indigenous residents of the Amazon region have also received travel subsidies since 1997. Their subsidy is around 75 per cent of the national tariff for defined routes.

Travel subsidies are the main direct benefit for residents. They encourage migration and encouraged people to claim residency status even before the Special Law.[71] The subsidies also encourage residents to fly to the continent more frequently. This increases the risk of species introduction.

[71] Fundación Natura and WWF (1998).

According to the Law, residents of the Galapagos should pay only 50 per cent of the airfare paid by other Ecuadorian citizens. Table 10 shows that this has been the case only since 2002. Before that, the subsidy fluctuated between 66 and 75 per cent, with the level depending on the pressure exerted by locals for lower fares. Until 2000, permanent and temporary residents both received the same subsidy. In 2001 an attempt was made to differentiate the subsidies with a subsidy of 50 per cent for temporary residents and 73 per cent for permanent residents. Since 2002, the subsidies have been equalised again.

Table 10: Percentage subsidy on air tickets relative to Ecuadorian citizens' price

Year	Price for passenger from continent (one way)	Price for Galapagos Resident	Subsidy
			Per cent
1996	71.21	25.87	63.67
1997	77.07	38.42	50.15
1998	80.70	27.71	65.67
1999	74.14	19.49	73.71
2000	60.00	15.12	74.81
2001	64.65	17.50	72.93
2002	70.90	35.45	50.00

The subsidy is defined relative to fares paid by Ecuadorian citizens. If we consider that the true opportunity cost of the flights by residents is the fare paid by foreign visitors, the subsidy would be much higher. By this measure, Ecuadorian citizens are also subsidised.

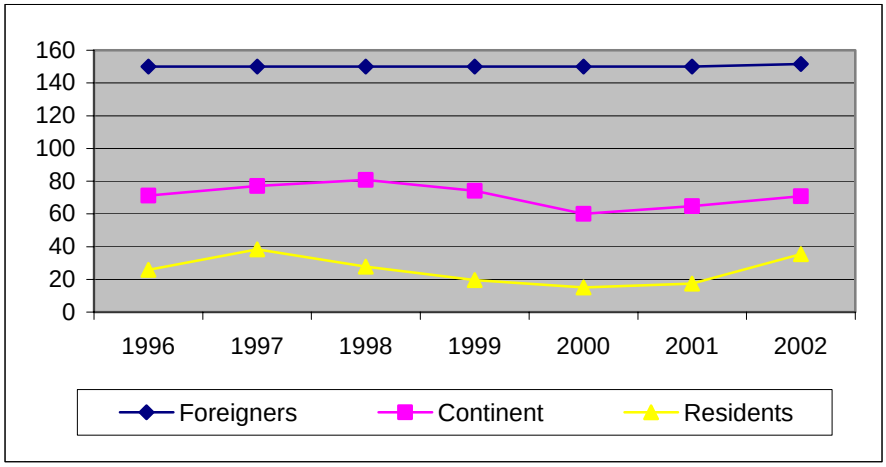
Even the fares paid by Ecuadorians to Galapagos seem to be highly subsidised relative to other flights in Ecuador. Comparing the airfares to the Islands with other internal airfares, we find that the fare from Guayaquil to Galapagos (90 minutes) is less than both the fares from Quito to Guayaquil (30 min) and from Quito to Machala (45 minutes). We also see that the airfares for flights within the continent have risen more than fares to Galapagos in nearly every year.

Table 11: Airfares to Galapagos relative to other airfares within Ecuador (US$)

Year	Guayaquil to Galapagos (90 minutes)	Per cent growth	Quito to Guayaquil (30 minutes)	Per cent growth	Quito to Machala (45 minutes)	Per cent growth
1997	77		33		42	
1998	81	5	46	41	52	23
1999	74	-8	42	-9	42	-19
2000	60	-19	40	-4	45	6
2001	65	8	44	11	50	11
2002	71	10	49	11	56	12

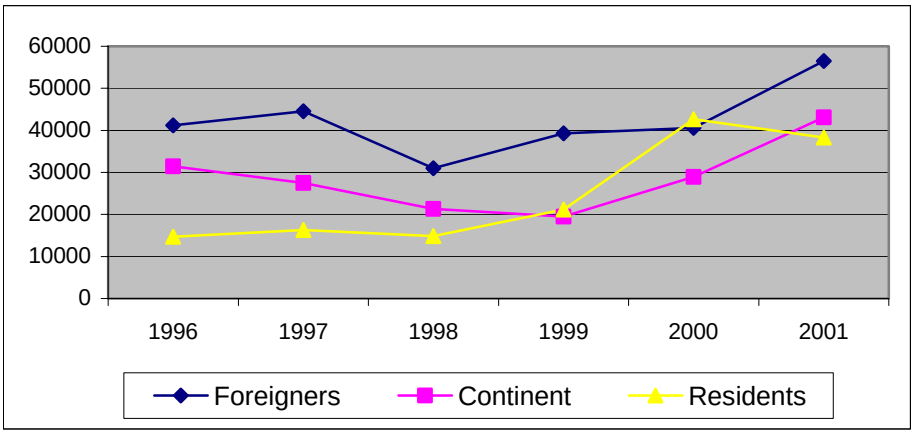
Airfares converted at average annual exchange rate.

Figure 12: Airfares to Galapagos (US$)



The airfare paid by foreign visitors has stayed constant at $150 from 1996 to 2002, while the airfares of Ecuadorians have varied (Figure 12). The number of foreign visitors has risen every year. The fare paid by residents fell from 1997 to 2000 and in the same period the number of flights by residents rose; when the fare rose in 2002, the number of flights fell (Figure 13). We do not see this relationship for Ecuadorian citizens, however, possibly because of the economic crisis.

Figure 13: Number of flights (adult passengers) between Galapagos and the continent



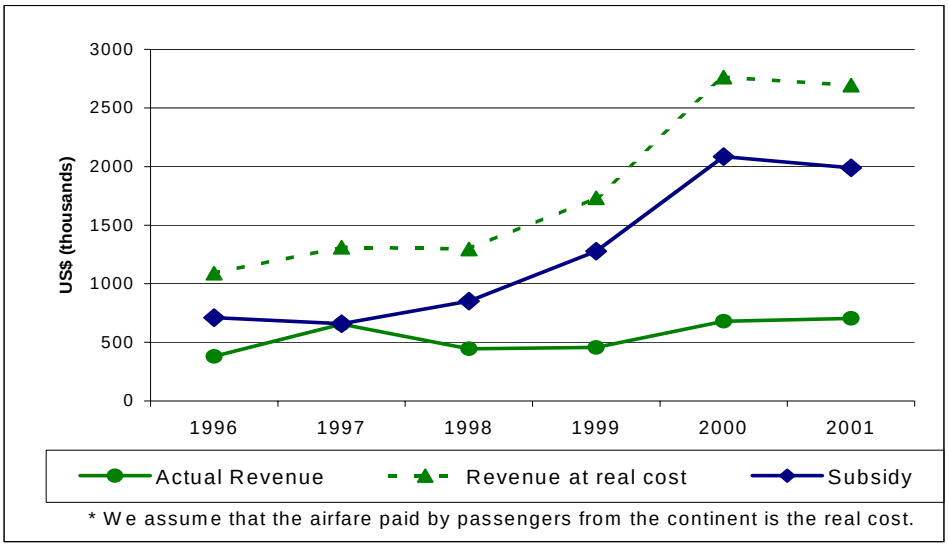
In total, the annual average subsidy for air travel in the period 1996-2001 is US$1.26m. The calculations are given in Table 12.[72] The subsidy level has grown every year up to a maximum in 2000. It increased by 63 per cent in 1999 alone. This is largely driven by the increase in the number of flights by residents. Since 2001 the level of the subsidy and the number of flights have both decreased so the subsidy fell slightly, 4.54 per cent.

Table 12: Estimated annual air travel subsidy

Year	Number of passengers from and to Quito	Number of passengers from and to Guayaquil	Airfare to Quito	Airfare to Guayaquil	Approximate Revenue	Potential revenue at real cost	Estimated Subsidy	Annual growth
	Thousands $	Thousands$	$	$	Thousands $	Thousands $	Thousands $	Per cent
1996	2.5	12.2	N.D.	26	380	1,091	711	
1997	3.0	13.3	48	38	654	1,313	658	-7
1998	4.8	10.0	35	28	445	1,297	852	29
1999	7.9	13.3	25	19	456	1,733	1,277	50
2000	13.8	28.9	18	15	679	2,764	2,085	63
2001	13.6	24.7	20	18	704	2,694	1,990	-5
					Total for Period		**7,572**	

[72] We extended the revenue analysis in Fundación Natura and WWF (1998) using the total revenue collected by the airline TAME excluding VAT and airport tax. We assume that the real cost of the flights is the fare paid by Ecuadorians from the continent and include only adult passengers, no half fares, and no seasonal or special fares.

Figure 14: Air travel subsidy (revenue at real cost minus actual revenue)



If we had calculated the total subsidy using the foreign airfare as the true cost, the total subsidy would have been nearly three times higher. If residents had paid the same fare as other Ecuadorians, they would have paid 200 to 400 per cent more than they actually paid.

Although fewer seats are available for residents than for other Ecuadorians or foreign visitors, the benefits from the subsidy are evident. In response to increased subsidies, the number of flights by residents increased every year until 2000. Now the subsidy has been fixed at the level specified in the law and the number of flights has also stabilised.

5.1.2 Energy Subsidies

5.1.2.a Fossil Fuels

All fossil fuel consumed in Galapagos is subsidised because the cost of its transport from Guayaquil to Baltra and among the islands is born by the state. The idea was to provide benefits to the isolated citizens who would face restricted access to fuel.

Until 2 July 2001, everyone in the islands benefited from this subsidy. Large tourist companies are the major consumers of fuel. They consume 60 per cent of all diesel and are the second largest consumers of gasoline.[73] Since July 2001, they must pay the cost of fuel transport including an eight per cent mark-up.[74] The remaining subsidy mostly benefits local residents. It subsidises fuel used for generating electricity and direct purchases of fuel from gas stations.

The subsidy reduces the cost of living in Galapagos, thus encouraging migration. In addition, the subsidy promotes activities that use fossil fuel intensively. It discourages use of alternative, less risky fuels. Increased population and economic activity in Galapagos, which are encouraged by the fuel subsidy, and the direct effect of the subsidy on fuel consumption per person, has led to continuous growth in fuel demand. This increases the risk of fuel spills and environmental damage.

In the Galapagos, diesel, gasoline and LPG are sold through retail outlets. Petrocomercial, the state petroleum company, is the only diesel and gasoline retailer. In contrast, on the continent there are several private retailers (Texaco, Shell, Mobil). LPG is sold by Petrocomercial but also by private distributors. The prices charged by Petrocomercial are lower than private companies for all three fuels, and LPG is explicitly and heavily subsidised. Petrocomercial charges the same prices nationally. The retail price in Galapagos does not include the cost of transport.

DIGMER specifies transport costs per unit of different products (fuels, appliances, food, construction materials, etc.) from Guayaquil to Galapagos and among the Islands. Diesel and gasoline are brought once or twice a month in the Army ship *Taurus*. LPG is transported in private ships such as the *Paola*, *Cristóbal*, *Virgen de Monserrate*, and *Marina 91*. The prices they charge to Petrocomercial are those defined by DIGMER. The average subsidy per gallon of diesel and gasoline was 14 cents between 1995 and 2000 (in current US$). The average subsidy for LPG was US$1.91 per 15kg cylinder (Table 13).

[73] Cardenas (2001).
[74] Article 5 of Decree 1610 published in Official Register No. 359 of 2 July 2001.

Table 13: Value of subsidy per unit of fuel transported (US$)

Year	Diesel and Gasoline	Gas
	$/gallon[75]	$/cylinder(15 kg)
1995	0.195	1.83
1996	0.172	2.71
1997	0.148	2.54
1998	0.080	2.11
1999	0.140	1.37
2000	0.106	1.23
2001	0.138	1.61
2002	0.169	

As well as absorbing the transport cost, Petrocomercial bears the costs of port delays. These delays depend on the conditions for loading and unloading. In 2002, the daily cost of delays for *Taurus* was $515.97. One estimate of the annual subsidy for fuel transport, not including the costs of delay or of interisland transport, suggests that from 1995 to 2000, the state bore $508 thousand annually or $3.05 million from 1995 to 2000 (Table 14).

The value of the subsidy increased every year, primarily because of increases in fuel consumption (Table 14). Consumption rose because of increased tourism, increased electricity production and growth in the vehicle fleet. From July 2001 the level of subsidy reduced because of a regulation that requires large tourism operators to bear the transport costs of the fuel they use. Because local tourism operators purchase their fuel through local retailers they continue to benefit from the subsidy.

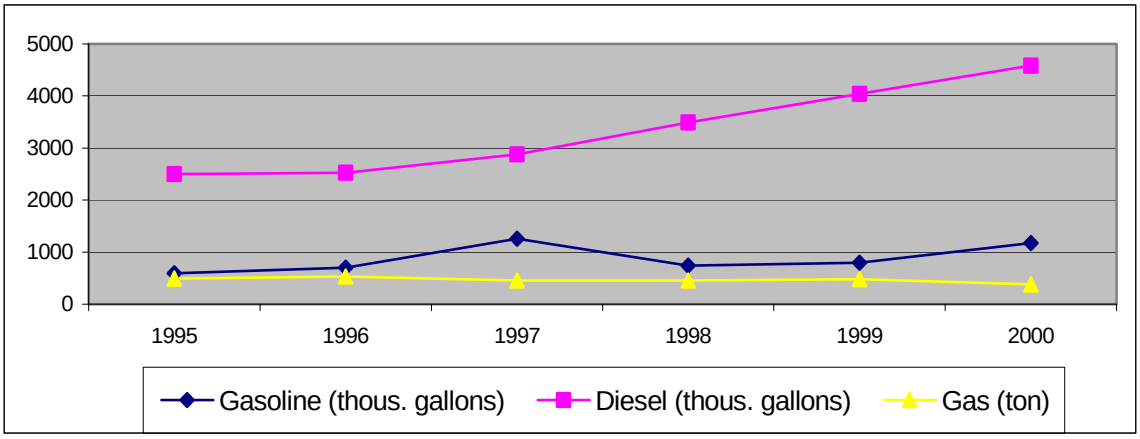
[75] The fall in the subsidy in dollars arises because of the fall in the value of the sucre. Consumers may have perceived an increased price if their salaries and price expectations did not keep pace with inflation.

Table 14: Subsidy for transport of fuel to Galapagos

Year	Fuel Type		Estimated Transport Cost					Total Subsidy
	Gasoline	Diesel	Gas	per gallon	per ton	total gl	total tons	
	Thousand gl	Thousand gl	ton	$	$	Thousand $	Thousand $	Thousand $
1995	590	2,498	493	0.20	122	487	60	547
1996	703	2,525	528	0.17	181	435	95	530
1997	1,254	2,881	452	0.15	169	427	76	503
1998	738	3,490	458	0.08	141	279	64	344
1999	793	4,043	477	0.14	91	566	44	610
2000	1,173	4,582	379	0.11	82	486	31	517
			Annual Average			447	62	508
			Total Period 1995–2000			**2,679**	**371**	**3,051**

Source: Volume data from Petrocomercial

Figure 15: Volume of fuel sold annually by Petrocomercial



The government subsidises delivery of fuel to final users on the continent also. However in the case of LPG, between 1996 and 2001 the cost of delivering fuel by sea to Galapagos was 817.7 per cent more than the average cost of delivery by land on the continent. Given that the retail prices are the same, LPG is much more heavily subsidised in Galapagos.

Table 15: Comparative gas subsidy: Galapagos relative to continental Ecuador

Year	Continent	Galapagos
	Thousands of sucres per ton	
1996	79.8	576.7
1997	76.0	676.7
1998	86.0	766.7
1999	96.0	1086.7
2000	262.5	2050.0
2001	547.5	2683.3

5.1.2.b Electricity subsidy

Electricity is generated from diesel in Galapagos because it is not connected to the national grid. In contrast the primary source on the continent is hydroelectricity. Electricity generation creates environmental risk because of the use of fossil fuel. Electricity demand is rising.

Since 1997, The Ecuadorian Electrification Institute has controlled electricity provision and established retail prices. Fundación Natura and WWF (1998) shows the financial deficit from electricity production in Santa Cruz between 1990 and 1996. The government paid this.[76] Through the process of privatisation, the firm ELECGALAPAGOS was created in 1998. It generates, distributes and retails electricity in Galapagos. The National Energy Control Centre, CENACE, sets the regulated prices for generation, distribution and transmission based on information provided by the regional companies. In Galapagos electricity is subsidised in several ways.

[76] Ospina and Erickson, cited in Fundación Natura and WWF (1998).

Electricity Generation Subsidy

Electricity prices do not cover the costs of operation and maintenance of electricity generation in Galapagos. The subsidy per kwh of electricity is the difference between the cost of generation (estimate by ELECGALAPAGOS) and the retail price set by CENACE. In 2001, the subsidy was 5.86 cents (11.39 minus 5.53) per kwh. This shortfall is covered by FERUM, the Fund for Rural and Marginal Urban Electrification.

During the period 1998 to 2002, the total subsidy to Galapagos from FERUM was $5.18 million. This represented 5.38 per cent of the total FERUM subsidies in Ecuador. Table 16 shows that the subsidy has increased substantially nearly every year.

Table 16: Annual transfers from FERUM for Galapagos and Ecuador

	Galapagos		Total Ecuador	
Year	**Dollars Thousands**	**% Growth**	**Transfer Total FERUM**	**Galapagos/ T. Ecuador**
1998	407.67		9953.849	4.10%
1999	813.42	99.53%	21468.865	3.79%
2000	802.21	-1.38%	13316.507	6.02%
2001	1316.76	64.14%	21154.195	6.22%
2002	1840.45	39.77%	30367.553	6.06%
Total Period	**5180.51**		**96260.97**	**5.38%**

FERUM is funded from 47 per cent of resource rentals paid by oil extraction companies and payments to the state for the right to transport crude oil; and since 10 October 1996, 10 per cent of the revenue from commercial and industrial consumers. Very little of FERUM's funding originates in Galapagos because the industrial and commercial sectors are small. FERUM covers only operating and maintenance deficits. Other costs (transmission and distribution) are included in the electricity price. All residents, firms and institutions in Galapagos benefit from this subsidy.

Another electricity subsidy is that, as we discussed above, fuel is subsidised. In an average month, ELECGALAPAGOS consumes 26 per cent of the diesel used in Galapagos.[77] Final prices also involve cross subsidies from high electricity users to low users. These do not especially benefit Galapagos.

Potential Subsidies for Renewable Energy

FERUM also has a fund for renewable and non-conventional energy in marginal, isolated rural areas. Renewable energy is attracting increased attention in Galapagos. One project being currently developed involves a hybrid system, wind and solar energy, to provide electricity in Floreana (one of the inhabited islands).[78]

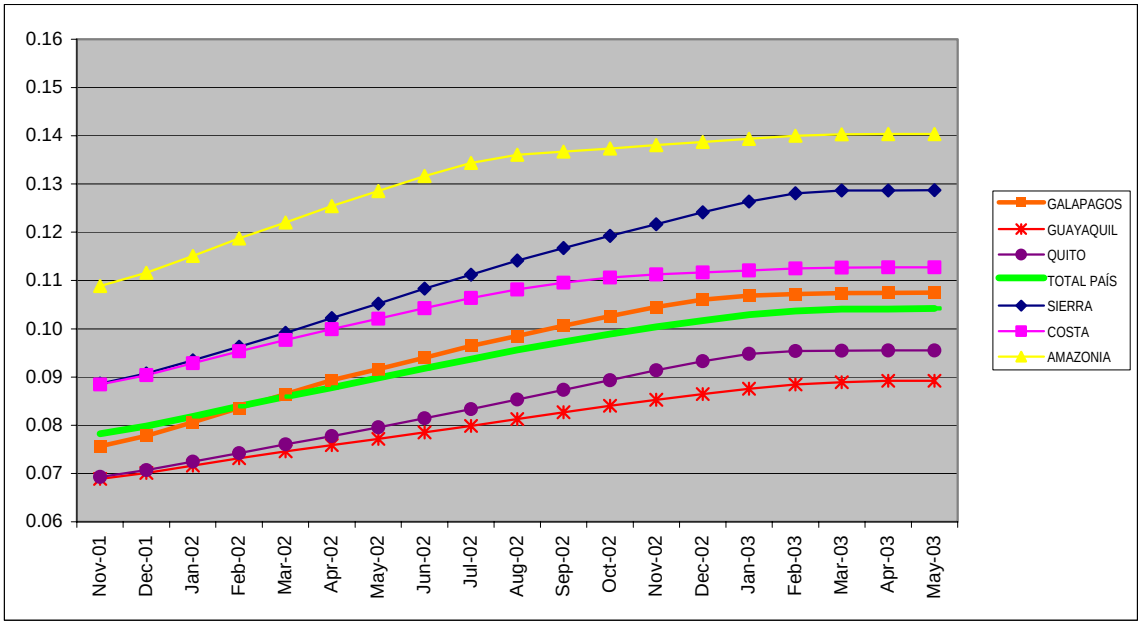
Use of the provisions for subsidies for renewable energy from FERUM would not be an increased subsidy to residents unless it leads to electricity prices that are lower than they would be when electricity is generated from diesel. Instead, renewable energy would directly reduce the risk of environmental damage currently caused by electricity production. If all electricity were produced in a clean way, any subsidies that lower electricity prices would continue to encourage migration but would no longer lead to perverse incentives that directly damage the environment.

Comparison with Continental Ecuador

In Figure 16, we see that electricity prices in Galapagos are gradually rising relative to the country as a whole. However, the price is still lower than all areas except Quito and Guayaquil despite higher generating costs. This is because these higher costs are borne by FERUM while the Galapagan residents benefit from lower distribution costs from the generator to the end-user.

[77] Cardenas (2001).
[78] This project is being coordinated by the Spanish Agency for International Cooperation.

Figure 16: Expected average electricity prices by region and major city[79] ($/kwh)



Source: Consejo Nacional de Electrificación (2002).

5.1.3 Subsidies for Public Services

Another subsidy derives from the difference between public expenditure and revenue generated from local residents. If subsidies allow a higher level of public services than would have been possible if they were locally funded, or if they increase overall economic activity in the islands thus creating more jobs, they will encourage migration. Subsidies are provided through direct provision of services and through subsidies to municipalities.

5.1.3.a Central government: Incomes and expenditures at provincial level

Around 30 per cent of central government expenditure is transfers to the provincial level for health, education, public works and other activities (including conservation). On the other hand, 20 per cent of the income of central government comes from identifiable payments from provinces including VAT, targeted sales taxes and income tax.[80]

[79] These may not be actual prices because of political and economic adjustments during the year.
[80] Albornoz (2000).

In general, provinces receive more from central government than they pay directly.[81] The difference between transfers to provinces and provincial tax payments is not an absolute measure of subsidy because some other income comes from states. It is, however, an indication of relative levels of subsidy across provinces.

Table 17 shows that Galapagos gets the highest subsidy per capita by far. Government expenditure is four times the average, while tax payments are in the middle of the range. This high level of subsidy allows Galapagos to enjoy a level of services similar to other provinces despite its high costs of provision resulting from isolation and lack of economies of scale. The isolated Amazon provinces also receive high subsidies and have very high levels of expenditure relative to the taxes they pay.[82]

[81] The difference is made up through other forms of taxes, such as income tax, and other sources of revenue.
[82] Amazon provinces: Morona Santiago, Napo, Pastaza, Zamora Chinchipe, Sucumbíos.

Table 17: Primary expenditures and taxes collected per capita, 1997–1998 ($)

Province	Primary expenditure*	Taxes collected	Subsidy
Galapagos	691.93	11.92	680.01
Morona Santiago	300.46	2.47	297.99
Pastaza	210.10	5.92	204.18
Loja	184.67	6.18	178.49
Bolívar	167.34	2.65	164.69
Zamora Chinchipe	164.02	1.81	162.21
Napo	141.41	2.61	138.80
Azuay	136.61	61.32	75.29
Carchi	136.58	6.47	130.11
Chimborazo	136.54	5.16	131.38
Esmeraldas	127.78	7.22	120.56
Cañar	123.82	4.98	118.84
Imbabura	121.48	22.40	99.08
Pichincha	118.59	175.61	-57.02
El Oro	116.80	7.07	109.73
Cotopaxi	114.04	7.55	106.49
Manabí	111.50	11.02	100.48
Sucumbios	106.05	6.40	99.65
Guayas	104.11	103.39	0.72
Tungurahua	103.12	34.10	69.02
Los Ríos	99.65	2.91	96.74

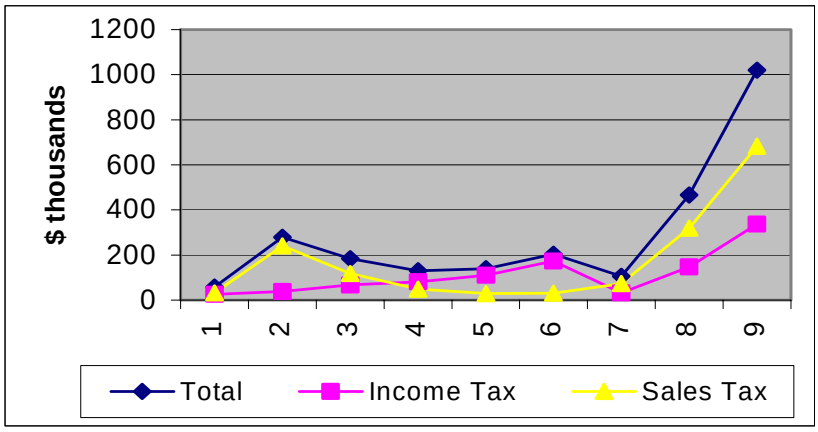
Source: Albornoz (2000).
* Primary expenditure does not include debt or interest payments

A large part of the high expenditure by central government goes on wages because the Special Law requires that public servants are paid 75 per cent more in Galapagos than in the continent. In addition, a significant part of the central government spending is for conservation services. These do not directly raise the quality of life in Galapagos. Many of the benefits are for people outside Galapagos who care about conservation. Thus the higher expenditure does not necessarily correspond to higher quality services.

Tax Collection

The level of subsidy through public finances is reducing as the level of tax collection rises at a provision level. We see in Figure 17 that between 1993 and 1998 the average annual revenue from VAT and income taxes was only $157,000. The rate of tax evasion was high; as the economy grew the level of tax collection did not.[83] Tax collection in Galapagos has improved significantly since 1999. Revenue rose by 340 per cent and 119 per cent in 2000 and 2001 respectively.

Figure 17: Revenue from sales and income tax in Galapagos



5.1.3.b Revenue raised by provincial and municipal governments

Here we consider the income of municipal governments and how they depend on funds from central government and other external funds. From 1990 to 1997 Santa Cruz and San Cristóbal decreased their reliance on central government transfers. In 1990, 73.7 per cent of Santa Cruz's income came from central government; in 1997 it was only 36.4 per cent.[84] In general, transfers from central government have fallen and the revenue has been replaced by park entrance fees. Municipality income from local sources has remained roughly the same.

[83] One distortion in the estimate of total taxes is that firms can pay taxes in a different location from where they operate. Some of the tourism operators in Galapagos pay taxes elsewhere.
[84] Londoño (1998).

Table 18: Municipal income by source (percentage)

	1998	1999	2000
Municipality of Santa Cruz			
Municipal Revenue*	26	26	28
Park entry tax**	32	57	52
Transfers to Municipality***	36	17	20
Other	6	0	0
Municipality of San Cristóbal			
Municipal Revenue*	6	10	6
Park entry tax**	21	52	63
Transfers to Municipality***	64	32	22
Other	9	6	9
Municipality of Isabela			
Municipal Revenue*	12	21	16
Park entry tax**	10	41	56
Transfers to Municipality***	59	32	28
Other	19	7	0

Source: Fundación Natura and WWF (2002).
* Includes taxes, fees, contributions, sales of goods and services among other things.
** Entrance fees for Galapagos National Park; paid by tourists.
*** Transfers for current expenditure and capital. Includes entrance fees.

The levels of municipal revenue, which rarely pass 25 per cent as a source of municipal income, suggest that the residents of the islands make small contribution to the provision of their services. The level of subsidy, whether directly from central government as in the past, or indirectly through the park entry fee, as now, remains high. To the extent that municipalities spend on conservation and provide services for tourists, use of the park entry fee is not a subsidy for resident services. We could not separate conservation spending and tourist services from other activities, however.

5.1.4 Summary

One estimate of the total level of subsidy for the province of Galapagos from 1998 to 2000 is given in Table 19. To calculate this we sum each of the subsidies considered in this section. In the case of subsidies through public finances, we have included the transfers from Central Government, the entrance taxes used by Municipalities and the expenditures by central government through local departments, municipalities and the provincial council. These are offset by the taxes paid at the provincial level.

The state subsidy is around $15 million annually. Only one to three per cent of this is recouped through taxes. Per capita, each resident of Galapagos is subsidised around $1,000 per year (1998 $). The per capita subsidy is a significant percentage of GDP per capita in Ecuador (76 per cent in 2000). It may, however, overstate the total subsidy to the extent that government payments are for conservation services.[85]

Table 19: Estimate of total annual per capita subsidies (in thousand $)

	1998	**1999**	**2000**
Travel subsidy [1]	852	1,277	2,085
Fossil fuel subsidy [1]	344	610	517
Electricity subsidy [2]	408	813	802
Public Finance subsidy [3]	12,996	10,288	9,000
Total Subsidy (TS)	16,598	14,987	14,404
Taxes raised in Galapagos (Tx)	203	106	466
% Taxes over total subsidy	1	1	3
Effective Subsidy (TS-Tx)	**16,394**	**14,881**	**13,938**
Effective Subsidy per capita ($)	**1,071**	**924**	**825**
GDP per capita ($) [4]	**1,619**	**1,109**	**1,079**

Notes: 1. Estimated in this study
2. FERUM amounts assigned to Galapagos
3. Source: Fundación Natura and WWF (2001), includes revenue from GNPS visitor fees
4. Source: Banco Central del Ecuador
Population Data: 1998 (15,311), 2000 (16,885)

[85] On the other hand we have only included easily identifiable subsidies.

The level of subsidy decreased a little from 1998 to 2000. The total level of subsidy has fallen steadily since 1998, though some individual categories of subsidy have risen. Both the travel and fossil fuel subsidies have fallen significantly since 2000. The level of public finance subsidy has fallen and has also moved from direct government transfers to payments through the park entrance fee. The level of tax collection rose from 1998 to 2000 so the effective subsidy has fallen even further.

In summary, the services enjoyed by the Galapagan population and the activities they engage in receive high levels of subsidy. The level of subsidy is falling and the tax collection rates and charges for services are rising, so the effective subsidy is falling. If the effective subsidy continues to fall the pressure for migration from subsidies will continue to diminish.

Another source of economic distortions that encourage excess migration is external effects on the environment and on other users of natural resources that are not borne by those who are involved in tourism or fisheries because of poor regulation. This is addressed in the next section.

5.2 Distortions arising from inadequate regulation of externalities

In this section we will describe the operation of the fishing and tourism sectors, current regulations and perceived problems.

Suppose two rival fishing groups are taking sea cucumbers from the same area. In the short term it is profitable to collect them until the cost of collecting and processing one more is higher than the price they get for them. If either group had sole control over the sea cucumber fishery, they would take fewer sea cucumbers than that each year because they want to maintain a healthy breeding stock for the next year, when they expect to be collecting them again. They would stop taking sea cucumbers even while it was still profitable, in the short run, to take more. They have an incentive to protect the resource because they will reap the future benefits.

When there are two rival groups, however, there is no point in either group holding back. They will expect that if they take fewer their rivals will simply take more and the total take will be the same as if they did not think about next year. This is worse for both groups. If they were able to communicate and trust each other they could agree to each take fewer cucumbers and in the long run both would be better off. If they cannot trust each other, both are better off racing to take as many as they can before the other does.

The problem arising here is known in economics as an “externality”. An externality exists whenever the welfare of some agent, either a firm or household, depends on activities under the control of some other agent. Each fishing group's welfare depends on what the other fishing group does. This leads to two inefficiencies. First, they jointly do not conserve as many sea cucumbers as they would want to for the next fishing season. Second, they fish too quickly. They may end up diving on days when the weather is unfavourable or working overtime.

If people using resources where they impose externalities on each other are unable to regulate themselves through cooperation and there is no regulation imposed by outside authorities several things will happen. In the short run, too much output will be produced (too much fish, too many tourist visits), the prices for the outputs will be too low, wages/profit for people working in these sectors will be too high, and people won't try hard to find creative ways to avoid or reduce their impacts on others. Too many people will want to work in the industry so the externality creates migration pressure. In the long run the resource will be damaged or exhausted, and output, wages and employment will fall.

Important externalities arise in Galapagos in fishing, in tourism where extra tourism operators may lower the quality of the tourism experience offered by existing groups (discussed further below), through people and goods entering the Galapagos imposing risks of introduced species, through disposal of solid and liquid wastes where these are not charged for appropriately, and through use of energy that increases the risk of fuel spills.

Externalities can be addressed through cooperation among competing users of a resource or those who affect each other, or can be addressed through regulation imposed and enforced by government. Which is appropriate depends on the nature of the externalities, the group creating them and the group affected by them.

Both fishing and tourism are basically dealing with “common property resources”. Research has found that several conditions will help groups of people find cooperative solutions to managing their resources without government intervention. The first key requirement is that the group of people able to use the resources is clearly defined and consistent over time. People need to be able to exclude outsiders; current users need to have the incentive to take into account the interests of future users. In Galapagos one problem with rapid migration has been that the resource user groups have been expanding rapidly and many of the newcomers do not intend to stay in Galapagos in the long term. Thus they are not that interested in the future management of the resource. The Special Law may help to stabilise the groups that need to cooperate.

If the group of people involved in using these resources is small and well defined, they may be able to self-regulate. This allows them to avoid the “tragedy of the commons” where people overuse a resource, thus destroying it even though they would all be better off if they could coordinate and trust each other to protect it.

In fishing, the group of people involved is defined by the fishing cooperatives. In tourism it is mostly defined by those who have licenses to take people into the National Park. Other people are involved in tourism (e.g. hotels and restaurants) but people will only come to Galapagos if they can enter the parks, so that is the ultimate limitation. The group of people who enter Galapagos as tourists and temporary workers is not clearly defined. New people are involved all the time. Permanent residents are a more defined group now and have common interests in dealing carefully with local issues such as land use and waste disposal. They are a large group, however, and difficult to coordinate. They are beginning to work to achieve their common interests through the INGALA and municipality planning process.

A group that agrees to coordinate to protect the resource they depend on has to make two basic types of decisions. How should the resource be optimally managed? This is a question of efficient use of the resource. For the fisheries it would include how many fish to take, when, from where and using what techniques. For tourism it would include deciding how many tourists can enter the park, where, when and with what controls on their activities. Deciding on optimal management is difficult but is primarily a technical question. The second important and often difficult question is, who should contribute what to protecting the resource and receive what benefits in return? This is a question of the distribution of net benefits and there is no technically correct answer.

The second issue really relates to the ability of the local users to design a management system that brings the greatest possible benefits to the user group as a whole. This is largely a question of whether the necessary information is available and credible, whether they receive competent advice and whether the ordinary users have confidence in their leaders and advisors so that they accept a well designed management plan. If the plan is poorly designed, or is perceived to be poorly defined, the users will not support it.

Third, it is important for the users to be able to contribute their knowledge to the process and to feel that their views are adequately represented in decision-making. This will raise the quality of decisions and also make users more willing to support the plan and contribute voluntarily to its enforcement. Users must support the plan and recognise that enforcing it is in their interest. If they do not feel the rules are in their interest they may undermine them or allow others to.

Any plan that requires people to make individual sacrifices for collective benefit requires monitoring of individual behaviour. It is important that people are observed if they break the rules and also that others have confidence that they would be observed. People are more likely to comply if they believe that others are complying also. The key question then is, who monitors behaviour? They must be people who are trusted by the users. If the users are unhappy with their behaviour they need to have some recourse to punish the monitors or replace them. This reduces the risk that monitors will be corrupt, will misuse power or will simply be lazy. In many cases the monitors will be other users.

Once monitors think they have identified a transgression, there often needs to be a process to decide whether the rules really have been broken and how serious the transgression was. Monitors may be mistaken or biased or there may be special circumstances they did not take into account. This calls for a conflict resolution mechanism. All resource users, including, as far as possible, those who are punished, must consider judgements fair. This creates and maintains trust in the system so users will continue to support it and help the monitors identify future problems as well as helping to enforce any punishments.

The form and intensity of punishment when a user is caught breaking the rules is important. It is tempting to make sanctions very high to strongly discourage rule breaking. In many cases, however, people break rules by mistake or because they are in particularly trying personal circumstances. Other users might understand and sympathise with the person who breaks the rule and may see that in different circumstances it could happen to them too. They will not want to impose strong penalties on others when they know they would strongly resent if they were imposed on them. If punishments are too severe, people will be tempted to forgive transgressors rather than impose the punishment. This will lead to weakening of the system as a whole because it sets a precedent for allowing people to break the rules with no consequences. It is better to identify how seriously the rules were broken and to what extent the user could not avoid breaking the rule. Small unintentional violations should receive small punishments; serious, intentional violations should be heavily punished.

One final requirement is that the legal system allows resource users to use the legal system to enforce contracts or to create their own “legal” systems. Otherwise even a good, commonly agreed upon set of rules cannot easily be enforced.

Evidence from the study of other local commons which succeeded or failed to self-regulate suggests that having a good management plan, effective monitoring and sanctions graduated to match the level of transgression appear to be necessary but not sufficient. Clear definition of the user group is clearly important under conditions where there is pressure from new potential users. The other characteristics, such as participation in decision-making, a mechanism for resolving conflict and legal support, appear to be valuable but not critical.

In some situations local groups will be able to self-regulate because the externalities are all within the group. Where they fail for whatever reason they may need help from government. The list of requirements above might help to identify the form of support from government that would be most helpful.

In one situation key to the Galapagos, local management alone will not solve the problems. The international community has a strong interest in the preservation of the Galapagos because of its unique ecosystems and biodiversity. Their interests are reflected indirectly through the interests of tourists and also through the activities of international agencies and non-profit groups working in Galapagos.

5.3 Tourism management

Tourists pose some risk of introduced species both when they enter Galapagos and as they move between islands. They can also damage ecosystems directly by walking on them or swimming in them. These effects are mostly well controlled, particularly for the richer tourists who generally stay on cruise ships and are always accompanied by guides, as we discuss below. The more important impact of tourism is probably through tourists' demand for services such as food, water and waste disposal and the local jobs they support. Here we discuss the ways that tourism is controlled and the extent to which tourists still impose costs on the environment that they, and the tourism operators, do not bear. We then discuss the extent to which this might lead to excessive migration pressure.[86]

[86] This section draws heavily on Taylor et al (2002) and Wilen et al (2001) to bring out the salient points relevant to our analysis as well as supplementing their analysis with some additional information.

Tourism is the engine of growth of the Galapagos economy. It employs 40 per cent of local residents and in 1999 had a value of around US$135 million for the economy of Ecuador and US$33 million for Galapagos.[87] Taylor et al (2002) estimate that tourism contributes 65.4 per cent of the Galapagos economy. Tourism has grown steadily since the late 1960s. In 1970 only 4500 tourists visited Galapagos.[88] In 2000 more than 70,000 visited. The composition of tourists has gradually moved toward higher spending foreign tourists and local economic benefits from these tourists has gradually risen. See Figure 5 for growth in tourist numbers since 1979 and the breakdown between Ecuadorian and foreign tourists.

The Ministry for the Environment (formerly the Institute for Forestry and the Conservation of National Areas and Wildlife), through the Galapagos National Park, is responsible for planning, authorising, and controlling tourism within protected areas. They can judge when violations of controls have occurred and set sanctions. All tourism operators who work within protected areas must have authorisation from the Ministry for the Environment. Since the Special Law all new tourism rights will only be given to permanent residents. Existing tourism operation rights will be maintained and recognised but they can be transferred only to permanent residents. The government just passed a new resolution about tourism control in the Galapagos.[89]

Multi-day vessels must be registered with GNPS. They pay fees per passenger day to the National Park based on the class of vessel. Total passengers are indirectly limited by controls on tourist vessels. In May 1999, 82 tourist vessels with a total capacity of 1689 passengers were registered with GNPS. This is only an effective limit to the extent that utilisation rates do not change significantly.

[87] These estimates are based on exit surveys of tourists conducted in late 1998 and 1999 (Wilen et al 2001). CDRS (1999) suggests a value of $100 million. For alternative numbers see de Miras (1995) cited in Taylor, et al (2002).
[88] Camhi (1995) cited in Wilen et al (1999).
[89] Conversation with Carlos Valle, WWF, November 2002.

In addition some smaller boats, including fishing vessels, offer scuba and day trips. Tourist boats operate with fixed itineraries to avoid overcrowding. Every vessel must have a licensed tour guide for each 16 people. Since March 1998, all new tour guides must be permanent residents.

Of course tourists do not have impact only within protected areas. Many stay some time in hotels on the mainland and eat at local restaurants. Their activities outside the protected areas are less controlled. The Ministry of Tourism is responsible for regulating minimum levels of quality in the tourism sector, for setting regulations (outside the Protected Areas) and for controlling the supply of services. Thus both the Ministries of Tourism and Environment have responsibilities for protected areas. Any new tourism infrastructure must be approved by INGALA. One of the conditions for approval is that it will have minimum environmental impact.

As an indirect control on tourism, the government limits the number of flights and hence seats on the government-owned airlines that are the primary means of reaching Galapagos. Over 98 per cent of the seats are filled, so this is a binding constraint (Taylor et al 2002). Quarantine regulations clearly apply to tourists as well. All tourists pay a tourist entrance tax, ranging from US$100 for foreign tourists over 12 down to only US$3 for Ecuadorian residents under 12, upon entering Galapagos. The revenue from this is shared between the National Park, the municipalities, the Provincial Council, the Marine Research and various other Ecuadorian bodies. Five per cent of the funds pay for the inspection and quarantine service. The other funds can be used for education, sports and health or tourist services as well as for environmental protection, so much of the tax does not directly offset the environmental impact of tourists.

Although a number of regulations control tourism, it seems likely that new tourism ventures could still have environmental impacts that outweigh their benefits unless significant care is taken in planning and control. Tourism ventures need to be chosen carefully to maximise their long-term economic and social benefits while minimising their environmental impact.

Tourism has enormous potential for local development as well as benefits for Ecuador as a whole. As a result many people have ideas of how to expand the tourist sector. These clearly need to be implemented with care to protect the environment and maintain the long-term value of the resource. The total level of tourist activity must be limited to a sustainable level, so that requires careful prioritisation of different tourism projects. Different tourism ideas have very different economic impacts. Some local people hope to create major tourist developments on Isabela. Clear environmental risks are involved here and they would need to be weighed against the economic value of these developments. Another idea is to develop a university to study the Galapagos. This would not employ many local people because of the specialist skills involved, so might require migration of more temporary residents. It would, however, directly benefit from the unique local resources. In terms of ensuring environmental sustainability and the perception of sustainability, environmental certification of tourism operations is now beginning with some outside involvement to increase credibility.

5.3.1 Tourism and migration pressure

As the major economic driver of Galapagos, tourism is also the major driver of migration. If migration is limited increased tourism development will lead to skill shortages and high local wages and costs. Taylor et al (1999 and 2002) create a model of the Galapagos economy that allows them to simulate the effect of an increase in tourism on migration (or wages if migration is restricted).

Table 20: Estimated effects on migration and wages of a 10 per cent increase in tourism

	Island		
Variable	**Santa Cruz**	**San Cristobal**	**Isabela**
Migration	5.02	1.28	1.71
Wage Labour	5.72	1.51	1.57
Family Labour	4.83	1.21	1.76
Wage (without Migration)			
Skilled Workers	9.16	0.00	2.61
Unskilled Workers	6.72	2.75	2.67

Source: Taylor et al (2002)

We see that a 10 per cent increase in tourism would lead to a roughly five per cent increase in the local workforce. If migration is possible this increased demand will be addressed through increased migration. If migration is limited wages could rise as much as six per cent for unskilled workers and nine per cent for skilled workers. This might be partly offset with active training of local people but often it is not easy to create these skills quickly. Prices would also rise significantly, particularly if migration were limited. Taylor et al (2002) also discuss some of the direct effects of increased tourism activity on water extraction and logging.

The increases in local wages, shortages of skilled labour and higher local prices will all put pressure on the Special Law. If this leads to loosening of the migration controls, extra tourists will mean more migration and more environmental threat. If tourists, tourist operators and the local labour force they induce do not bear the costs of the increased environmental threat they will not consider the environmental costs and the level of tourist activity will be too high. The type of tourist activity will also be inappropriate. Rather than focusing on high value tourism with low environmental impact to maximise the value of the tourism resource to Ecuador, this valuable resource could easily be wasted through low value, high volume tourism.

5.4 Fisheries management

Fisheries have environmental impact in three basic ways. First, from a purely economic standpoint, overexploitation of a fishery is inefficient and will cause social hardship in the long run as the stock is damaged. Second, fishing has effects on other species in the ecosystem through by-catch and changing the balance of the food chain. This is directly environmental damaging. Overfishing also could jeopardise valuable tourism activities if it damages the marine reserve. Third, if there is too much fishing activity there are also too many fishers. If fishing is not controlled appropriately it leads to excessive migration pressure.

Fishing is a smaller part of the Galapagos economy than tourism but is still significant. Taylor et al (2002) estimate that fishing activities contribute eight per cent of Galapagos' GDP.

On Isabela it contributes around 61 per cent of local GDP. Wilen et al (2000) give a good discussion of the history and current situation both legally and economically. Here we summarise key points salient to our analysis as well as supplementing their work with some more recent information focused on regulation.

In 1997, 613 fishers were registered in cooperatives (Wilen et al 2000). This had grown to 956 by 2002. This is partly to do with the requirement to be in a cooperative to fish sea cucumber or lobster so may not reflect real growth. On the other hand it may well underrepresent active fishers. For example, in 2000 around 80 per cent more people were fishing for sea cucumbers than were registered.[90] It is hard to know what has been happening to the numbers of active fishers. In the 1998 Census, 396 people fish as their primary or secondary activity. 245 of these are full time and 97 part time. Revelo and Herrera (1999) (cited in Wilen et al 2000) state that there were 180 fishers in San Cristobal, 160 in Santa Cruz, 165 in Isabela and 370 who are not local, making a total of 868 fishers. Interviews by Wilen et al (2000) suggest that in 1999 there were 400–450 fishers active throughout the year. 222 fishing vessels were registered with GNPS in June 1999. By the end of 2000, 417 vessels were registered. The total revenue from the "artisanal" fishery was estimated at around US$3 million between 1995 and 1997 (CDRS 1999, cited in Wilen et al 2000).

The fishing population is very diverse, including long-term local fishers, part-time local fishers, and short-term migrants from the continent with no interest in the long-term health of the fishery. There is relatively little cooperation among fishers across the different islands. A key feature of the history of the fisheries up to 1997 was strong resistance to controls, including violent protests. These were in particular responses to the complete closure of the sea cucumber and lobster fisheries in 1992 and subsequent stringent, though unenforceable, limits on sea cucumber. There is some evidence of overfishing. Fishers are compensating for lower catch-per-unit-effort by increasing their effort to maintain income.

[90] Fundación Natura and TNC (2000a).

The key risks in the fisheries are overexploitation of sea cucumbers and lobster, danger of industrial fishing in deep water and illegal shark fishing and by-catch. Fishing has also been a significant migration driver, with many people arriving in the early 1990s when the lucrative sea cucumber fishery took off. Fishing is dangerous and fishers do recognise the need to conserve the fish stocks. The fishers want alternative employment opportunities, especially for their children, so they may be open to policies that allow them to move out of fisheries.

5.4.1 Institutions

Since the Galapagos Marine Reserve was established as part of the Special Law, fishing activity within the reserve (40 nautical miles from the baseline of the archipelago) has been limited to artisanal fishing. Artisanal fishing is defined in management plans (see below). Industrial fishing is banned in the Reserve. Only permanent residents who are members of the fishing cooperatives are allowed to fish.

The Special Law of the Galapagos Articles 13-14 created an Inter-institutional Authority (Autoridad Interinstitutional de Manejo, AIM). Its role is to establish a Conservation Management and Sustainable Use Plan, which defines permitted and prohibited activities within the Galapagos Marine Reserve as well as the details of fisheries regulations (fishing calendar, amounts, sizes, species and forms of allowable fishing). It also authorises scientific research on the improvement of policies for conservation and marine fishing development. The authority includes representatives from government, the research community, and the tourism and fishing sectors. One person represents all four fishing cooperatives. As we will discuss below, it is not clear that this representative accurately represents the wishes of the fishing community. Thus while fishers are formally represented, they may not feel their views are adequately represented. In addition, not all decisions are consensus—AIM operates by majority vote. The Management Plan is coordinated by GNPS and must be submitted to the INGALA council for approval (Article 15).

Under the Conservation Management and Sustainable Use Plan required by the Special Law and negotiated with a range of stakeholders, Galapagos is zoned for different uses (Wilen et al 2000). Three basic zones are distinguished, *port* zones, *limited use* zones and *multiple use* zones. Limited use zones are coastal regions divided into sub-zones for "protection and comparison", extractive and non-extractive use (for fishing and tourism), non-extractive use and temporary special management sub-zones for recuperation or experimentation. In the multiple use zone both extractive and non-extractive uses are allowed.

There are no separate fish stock zones within the fisheries (e.g. for different sea cucumber stocks) partly because there is not enough information to know how to set them and partly because of the cost of monitoring compliance.

The second relevant institution is the Committee of Participation Management (Junta de Manejo Participativa—JMP) which organises participatory processes. They make local decisions by consensus and send these decisions to AIM for a final ruling.

The third important set of institutions is the four fishing cooperatives. Membership in these is compulsory for all fishers. A moratorium was imposed on entry to cooperatives from 1999 to 2003 after rapid entry in 1998. We were told that there is a consensus among the cooperatives to extend the limit on entry indefinitely.[91] The cooperatives are the formal representatives of fishers. They are primarily political bodies. In principle they could create their own regulations that would apply to all members. For example, cooperatives can in principle limit who gets quotas for sea cucumbers and boats. They are not marketing entities. Some specialist groups exist within the cooperatives. These could self-regulate but do not to date. They could, however, be advocates for regulations that would help them.

[91] Personal communication with Franklin Zavala—Cristóbal fisherman; former President of Cristóbal Fisheries Cooperative.

To date the cooperatives are not strongly organised. The elected representatives they send to JMP and AIM cannot engage in binding negotiations on behalf of their members. Many fishers are members only because it is a prerequisite for fishing. There is little or no organised cooperation among the four cooperatives, although they have overlapping interests. The leaders recognise the need to coordinate and cooperate but their members do not necessarily strongly support and trust them. In July 1999 a Boat Owners Association was established in an attempt to represent all fishers.

Since 1998 cooperatives have not protected their rights by limiting entry to the fishery or protecting the fisheries against illegal entrants. Partly this results from a belief that having a larger group gives them more political power. In addition, some may feel that if conservation pressures rise, fishers won't suffer, more international funds will become available. Thus their lack of attention to conservation may reflect strategic behaviour. Finally, however, their institutions may simply be inadequately developed to effectively protect their interests. Now migration is being controlled and as the fishing community becomes more limited and more stable because of limitations on entry to cooperatives and more effective and fair regulation led by AIM and the National Park, they may be able to develop stronger institutions.

The Director of GNPS is responsible for coordinating the process that leads to preparation of the Management Plan (Article 15 of Special Law). The National Park also manages marine research. They are responsible for coordinating conservation and sustainable use of the marine reserve. This role includes administering the instruments of policies and planning that the Management Plan requires.

GNPS has the power to enforce the provisions relating to the Marine Reserve. They hold the register of fishing boats. A moratorium on the number of fishing vessels was imposed in the Special Law for five years. However, existing boat owners can replace their boats with larger vessels up to a limit defined in the Management Plan.

Fishing is primarily controlled at ports and through controls on exports via airports. Export of dried sea cucumbers by boat is harder to control than lobster or whitefish (which need to be frozen or at least chilled) because there are many ports and many illegal opportunities for export.

5.4.2 Sea cucumber regulation

Sea cucumbers (Pepino de mar) are primarily sold to the Asian market. The industry took off in the early 1990s when they were highly profitable. Fishers could catch around 1,200 per day or 10,000 on a 12-day trip. All fishers collect sea cucumbers during the season. More diving accidents are associated with sea cucumber fishing than lobster. In 1999 alone, one person died and 29 needed to go to Guayaquil for decompression (Wilen et al 2000).

The sea cucumber fishery was officially closed in 1992 and opened in a limited way in 1994 with a three-month season and a catch quota (550,000). It has been characterised by conflict and high levels of illegal fishing. In 1994, despite the catch quota, around six million sea cucumbers were taken even though the season was cut short.

Current regulations are more complex but also involve more fisher participation. It is highly expensive to regulate relative to other fisheries. In 1999 a stringent monitoring system was introduced. Boiling is only allowed on boats or in ports and drying is highly restricted outside of ports. Catches are monitored at the port. No-take zones were established in 1999 with local fisher involvement.

In 2001 AIM set a limit of 4 million sea cucumbers for the season. They distributed individual quota for each fisher. The quotas were defined for only one fishing season. Quotas were allocated equally to all members of the cooperative, not based on historical catch. This meant that full-time fishers received no more quota than occasional fishers. Some quotas were traded but the market did not work well and some were not used. Some fishers feel that people paid too much for the quotas because it was difficult to assess their value in advance.[92]

[92] Personal communication with Franklin Zavala.

Now some of the quota trade contracts make the price depend on the fish price during the year. As a result of these problems, at least among some fishers individual quotas are not viewed favourably.

It is not at all clear that the quota system will be continued. Fishing seasons are still used but these are simply a method of limitation, not based on biological factors. Illegal fishing still occurs outside of the season. Up until 1999, sea cucumbers were the most profitable fishing activity other than shark fin fishing (Wilen et al 2000). Sea cucumbers are becoming less profitable partly because of overexploitation, which raises costs, and partly because of competition from Mexico, which is lowering international prices.

5.4.3 Lobster

Around 29 per cent of local fishers' income comes from lobster (Wilen et al 2000). Lobster requires more skill to catch because divers need local knowledge about where to get them. Diving is dangerous but not as dangerous as for sea cucumbers. Divers are well paid. Unlike sea cucumber, lobster must be kept cold until it gets to market. The vast majority is sold frozen, not fresh, largely because of the species involved. Around 600 fishers are able to catch lobster. The stock of lobster appears to be rising but this may be for climatic reasons (El Niño); the size is falling, which suggests overexploitation.

There has been a four-month lobster season since 1999 (before that it was 4-6 months, usually July through December). The dates of the season have changed from year to year because of the timing of negotiations with fishers, not for biological reasons. Tail size and taking egg-bearing females are also limited, though some leniency is allowed for undersized and gravid fish. Since 1997 agreements have been reached between fishers and the National Park on monitoring, sales and permissible methods of capture. Compliance, especially with size and gravidity limits, has been rising since 1997.

All exports must be registered and tracked. The only legal method of catching lobster is by diving (without scuba gear) and taking by hand without use of harpoons. Lobster divers don't use lobster traps. It is illegal to fish at night. No-take zones were introduced in 1999. There has been a total allowable catch quota but this has not been enforced.

5.4.4 Other species

5.4.4.a Inshore whitefish

The inshore whitefish fishery has been the backbone of the Galapagos fishing sector for decades. Recently they are of less commercial significance than lobster, sea cucumber and offshore fish. Whitefish are caught all year. The fishery is not so commercialised. A lot of the fishing is recreational or for local use. Cruise boats illegally catch fresh fish for their clients. There is a processing plant in Cristobal that allows export but other islands can't export whitefish because they can't process them. Most whitefish are sold locally for local consumption, and to tourist operators and restaurants. From January through March seco-salado (dried salted fish) is produced for continental Ecuador for an Easter festival. Currently there are no major conservation issues with most of these species, possibly because of technology limitations that limit exploitation. An exception is Bacalao, which has been exploited for decades. Its population shows signs of population decline.

5.4.4.b Offshore pelagic fisheries

The Galapagos has in the past been a significant source of tuna, caught offshore by industrial fishers. Tuna was worth more than $8 million annually pre-1997 (CDRS (1999) cited in Wilen et al 2000). The establishment of the Galapagos Marine Reserve had a big impact because it excluded most industrial fishers; few local fishers are capable of fishing for pelagic species. In 1999, only three local vessels were capable of catching tuna. In contrast, before 1998 around 16 industrial boats were regularly fishing in what is now the Galapagos Marine Reserve. More locals would like to be involved in this fishery but it requires significant capital and experience.

5.4.4.c Direct environmental damage

Overfishing is not the only cause of environmental damage. Longlining (Palangre) is a major concern because of its effect on birds, sharks and related species, and mammals. There are alternative methods but they are not yet widely used. Marine mammal by-catch is also a concern.

Illegal fishing continues to be a problem both of commercial species and prohibited species. In particular shark fin is a significant problem. Sharks are a considerable tourist resource as well as possibly being a key environmental indicator. Up until now the impact on tourism has been limited because most of this fishing occurs in the north and west, far from most tourism. Shark fin fishing is extremely profitable. The incidence of illegal fishing was considered to be increasing up to 1998.

5.4.5 Migration and fishing

In the past, fishing opportunities, especially during the boom years for sea cucumbers, have appeared to be a significant migration driver. Anecdotal evidence suggests, however, that the impact may not be as great as believed. Divers do come to dive for lobster and sea cucumbers but they want to remain divers so return to Salango or one of the other two key areas on the mainland. They are generally not permanent migrants.

General migration has had a big impact on fishing, however. The migrant divers create problems for local divers because they tend to have lower living costs; they do not live in Galapagos all year. They are now illegal because they are not members of cooperatives.

People who migrate because of tourism opportunities have then moved into fishing sea cucumber during the season because little skill is involved in collecting sea cucumbers and the profits are high. It is generally believed that there are currently too many fishers.

On the other hand, a total ban on new entrants into fishing may have adverse effects on the development of the fisheries. Migrants could come with good fishing skills and conservation knowledge. They can bring knowledge of new technologies, new methods, what is needed, where to buy it and how to use it. They can also provide sorely needed skills and contacts for distribution and commercialisation.[93] While fisheries regulation is inadequate, any increase in fishing efficiency, improvements in distribution etc. will lead to greater profitability and hence more fishing effort. This would be environmentally, and in the longer term economically, damaging.

5.5 Summary

We have established the extent and nature of subsidies to economic activities in Galapagos. These subsidies encourage increased economic activity and hence increased migration. Thus they directly conflict with desires to protect the environment.

In terms of regulation, and the possibility that migration is encouraged by inadequate regulation, we have considered two major industries, tourism and fishing. Both have direct and indirect impacts on the environment. Both are currently regulated in a number of ways by a number of institutions. It is likely, however, that environmental externalities still exist. Those working in the industry are unlikely to take full account of the environmental impacts of their activities, not necessarily because they are not conscious of environmental concerns but because the commercial realities they face conflict with their concern.

A sector we have not addressed is the research/conservation sector. The per capita impacts of researchers and conservation workers on the local economy may be even greater than the impact of tourism and fisheries because they are probably well paid relative to the average resident. Most of the expenditure on these activities goes on wages to people who live locally and therefore spend locally. Those who might care most about the environment may also be causing significant indirect damage.

[93] Interview with Enrique Ramos, January 2002.

This damage might be able to be reduced by limiting on-site researchers or compensating for the externalities they create through increased investment in conservation activities. Even conservation activities should take account of the indirect damage they cause and weigh this against the benefits they bring.

The next section will consider some empirical evidence on the drivers of migration. The following section will propose and discuss a range of approaches to reduce environmental and migration pressure while simultaneously being aware of the local political realities that require some protection of the well-being of local people.

6 Empirical analysis of migration drivers

6.1 Hypotheses

In this analysis, we consider the characteristics of the provinces that people immigrate to Galapagos from, and also the characteristics of the provinces that people from Galapagos emigrate to. This gives us insight into the kind of people who want to immigrate to Galapagos. We are not attempting to identify the causes of immigration or emigration. The data is quite weak and we focus on identifying meaningful correlations. In Section 4.4, we discussed a simple model of migration. People will decide to migrate if their well-being will be greater in another place, that is:

$$U_{iG}(wage_{iG}, amenities_G) > U_{iO}(wage_{iO}, amenities_O),$$

A person's well-being (U) depends on the wage they receive and the amenities associated with living in a certain place. In this section we consider the characteristics of provinces that may affect a person's well-being and cause people to immigrate to Galapagos. Are people coming from provinces with highly skilled workers that are in demand in Galapagos and thus will receive high wages? Are they coming from provinces with much worse living conditions, or are they more likely to come from provinces with similar conditions to Galapagos? We also consider characteristics of the places that people from Galapagos emigrate to. Do they go to places with greater educational opportunities, i.e. higher future wages? Do they tend to go to places with similar socio-economic conditions to Galapagos? Are they also going to places with high demand for skilled workers? The drivers of migration have been discussed in detail theoretically in Section 4; here we look for empirical evidence to support these.

6.1.1 Immigration

We expect that people coming to Galapagos come because of better wage opportunities, and better amenities available to them, and because of family and community links.

We expect that the people immigrating to Galapagos for employment reasons would have skills that are in demand there, e.g. tourism, fisheries, and research skills. So we expect more immigration from provinces with higher levels of education, i.e. a positive relationship. Also education may to some extent be correlated with greater mobility of the people, which would have the same impact. However, as highly skilled workers are more likely to be in cities this effect may be swamped in our analysis by the high number of unskilled people who also live in cities. So, once we have controlled for this effect using population density, we expect a positive relationship between immigration and education (negative with illiteracy).

Immigration is also likely to occur from provinces that have low employment to provinces that have higher employment, as people are more likely to gain employment or find better wage opportunities in higher employment areas. Thus we would expect that the lower the employment level in the province the more likely people would immigrate to Galapagos, i.e. immigration would have a negative relationship with employment.

In Table 22 we can see that employment is also positively correlated with education; the higher the education level the higher the employment level, and more educated people tend to be more mobile. This would lead us to expect that the higher the employment level, the more likely people are to migrate—the opposite effect to our wage opportunity hypothesis. To maintain the expectation that people would be more likely to migrate from provinces with higher unemployment, we must control for mobility. However, because we are measuring at the province level we cannot completely separate out the effects of mobility from those of employment opportunities. Consequently, inconclusive results may arise as a result of these two opposite effects.

People tend to migrate to places with population density higher than where they left. People usually migrate to areas with better employment and learning opportunities available to them and this is more likely in cities (Glaeser and Maré 2001). In the case of Galapagos, the population density is much lower than the national average population density (see Table 23) but it has many of the same characteristics that make cities attractive. Usually, isolated and sparsely populated areas have a demand for low-skilled and agricultural labour. Galapagos, however, has a demand for high-skilled labour (as well as low-skilled), similar to labour demands in a city. This leads us to expect that more people will migrate to Galapagos from large cities because cities are a good source of the skills needed in Galapagos. That is, we expect a positive relationship between population density and immigration.

In addition, in Galapagos there is a high density of attractive facilities, such as restaurants, and a high level of average education among the population (although there are some concerns about the quality); this makes Galapagos similar to a city. People are more likely to move to places that are culturally similar to those they left, leading us again to expect a positive relationship between population density and immigration.

Another driver of migration is the effect of amenities; we predict that people are less likely to move to somewhere where the amenities or social conditions are worse. In general, we expect that people are more likely to move from provinces with worse amenities to places with better amenities, improving the amenities that are available to them. For example, people are likely to move to places that have better healthcare facilities, less poverty, and lower crime. People would be more likely to come from poorer provinces with a lower number of health professionals, higher child malnutrition, and higher crime. Thus we would expect a negative relationship between the number of health professionals and immigration, and positive relationships for both child malnutrition with immigration and crime with immigration. However, we may not see these empirically due to the reduced mobility of poorer, less-educated people. If we could control for mobility properly, we would expect a positive relationship between poverty/worse relative amenities and immigration to Galapagos.

However, as before, we cannot completely account for mobility when measuring at the province level, so this may lead to inconclusive empirical results.

Subsidies may also reflect the quality/quantity of amenities available in a province. In the case of Galapagos, higher relative subsidies are reflected by better amenities, leading us to expect that migration flows from lower to higher subsidies, i.e. a positive relationship between immigration and subsidies. However, poorer provinces with worse amenities may also attract higher subsidies, as they are less able to be self-sufficient, leading us to the opposite conclusion. So this measure may lead to inconclusive empirical results.

We also expect that people would be likely to migrate to provinces that have a similar lifestyle, customs, and skills to where they came from. Coastal areas have more cultural similarities to Galapagos than inland areas. Anecdotal evidence suggests that a lot of immigration to Galapagos is made up of fishers. If this were true, we would expect that people would be more likely to migrate from coastal provinces than inland provinces, once other factors are controlled for. People in coastal provinces also have better access to Galapagos by means of boat, making it easier to move to Galapagos. This would also result in a positive relationship between coastal situation and immigration.

Generally, it is cheaper to move to places that are closer. The main source of transport to Galapagos is via airplanes. Thus we would expect that people are more likely to move from places that are closer to the airports that serve Galapagos in Ecuador, Quito and Guayaquil.

People also are more likely to move to places where they have family and community networks. We are unable to test for this with our data as we cannot separate this network effect from other factors that make immigration attractive; we cannot tell whether people are moving to Galapagos because they have good networks there or if people are moving to the same places as their family and/or people from their community simply because they are similar and hence find similar places attractive.

6.1.2 Emigration

We expect that the flow of people leaving Galapagos will be made up of working people moving to get better or different jobs to those available on Galapagos, young people moving to get training, and people moving for personal preferences or lifestyle choices.

We expect that people leaving Galapagos would be more likely to move to provinces with higher employment, where better wage opportunities are available to them. So we expect a positive relationship between emigration and economic activity. People moving for training would be more likely to move to provinces where they can gain further knowledge through interaction with educated people, i.e. provinces with higher levels of education, leading us to expect a positive relationship between emigration and education. Generally, population density is a strong attracting force for immigration, reflecting employment and educational opportunities that are more readily available cities. So we expect that people are more likely to move to the provinces with higher population density.

We also suppose that people would not move to somewhere where the amenities and social conditions are worse. So we would expect them to be more likely to move to places with better socio-economic conditions. This means they will probably move to provinces with lower child malnutrition and crime. As with immigration, we expect that the level of subsidies will produce inconclusive results.

People are more likely to migrate to places that have similar customs and skill demands to where they originate. So we expect that people from Galapagos would be more likely to emigrate to coastal provinces because of cultural, lifestyle, and skill type similarities.

People are also more likely to emigrate to closer provinces as closer locations represent a lower removal cost and also may have more cultural similarities. Closeness can be thought of in terms of accessibility; Galapagos can be accessed either via boat or plane, so we expect that people leaving would be more likely to move to coastal provinces or provinces that are close to Guayaquil or Quito.

As with immigration, with our data we cannot separate causal network effects from the coincidental similarity of preferences effects and so cannot analyse the network effect.

6.2 Method

We ran two separate pooled ordinary least squares linear regressions on gross flows of migrants with each observation being measured at the level of a province each year. The dependent variables, immigration and emigration, were calculated as a ratio of the population of the province of origin and destination respectively. Observations were weighted by province population size.

- Immigration = Immigration from province in the last five years / population of that province
- Emigration = Emigration to province in the last five years / population of that province

As explanatory variables, we considered the following population characteristics: employment, education levels, poverty, health, crime, subsidies, and population density. When using these for analysis of immigration to Galapagos, we considered the characteristics of the province migrated from relative to those characteristics in Galapagos.[94] When considering emigration from Galapagos, we used the characteristics of the province migrated to relative those characteristics in Galapagos.

- Relative Characteristic = Characteristic of province—Characteristic of Galapagos

[94] This has no impact on the significance of the relationship. It simply alters the constant, so can be thought of as a data normalisation.

We included time as an explanatory variable, creating dummy variables for each year. This was used to control for changes in migration pressure over time resulting from factors that we cannot measure.

Summaries of the data used in the immigration and emigration analysis can be seen in Table 21, correlations are given in Table 22, and characteristics of Galapagos versus the rest of Ecuador in Table 23. The province immigration, emigration, and population data was sourced from the 1974, 1982, 1990, and 1998 censuses. However, the emigration data are available only for 1974, 1982, and 1990. This provides 36 observation points for immigration analysis and 27 for emigration analysis.

Wage opportunity effects were represented using a measure of the economic activity of the province, that is, the percentage of the population that is economically active as a percentage of the total population. To test for education or skill characteristics of the populations we considered illiteracy, average number of school years, and number of university graduates. The illiteracy rate used here is illiteracy as a percentage of population. The number of university graduates is measured as a percentage of the population over six years old. For amenity effects we considered poverty, the healthcare availability, crime, and subsidies. The child malnutrition rate was used as a poverty measure, where child malnutrition is a percentage of children under five years of age. For health care we used the number of health professionals as a percentage of the population. For crime we used homicide data, the number of murders per 100,000 people. Subsidies were represented using the ratio of municipal income coming from local sources over total municipal spending. As this ratio increases, the subsidy decreases.

Economic activity, illiteracy, average number of school years, and the number of university graduates come from the 1974, 1982 and 1990 censuses. Values were extrapolated out to 1998 when used with the immigration data. Child malnutrition, and the number of health professionals, are sourced from *Sistema Integrado de Indicadores Sociales del Ecuador SIISE version 2.0* (CEPAR 2001).

Homicide data is available only for 1999 and is sourced from CORDES "Corporacion de estudios para el Desarrollo", Padilla (2001). For these variables, because of lack of data from any other year, we have assumed them to be constant over time.

Subsidies data is for 1990 and 1996. We averaged the rate over the two years and assumed that it was constant over time. The source of data for this is the Planning Office of the Ecuador Government, ODEPLAN (2000).[95]

We created a dummy explanatory variable for whether a province was on the coast or not to reflect the cultural similarities between coastal areas and Galapagos. We also considered distance to travel to Galapagos as an explanatory variable. We used distance from the two major cities, Guayaquil and Quito, as measures of distance from Galapagos, as most people would travel to these cities from their province and then fly to Galapagos, rather than travel by boat. To test for city effects we used the population density of a province. This was derived using the population and province area data.

[95] Oficina de Planificación de la Presidencia de la República del Ecuador.

Table 21: Data summary

	Variable	Immigration Mean (std dev.)	Emigration Mean (std dev.)
		1969–1998	**1969–1990**
Dependent variable:	immigration (residence five years ago) per 100,000 people	465 (307)	227 (140)
Explanatory variables:			
distance	distance to Quito or Guayaquil	97 (134)	102 (136)
	Number of coastal provinces	12	9
Explanatory variables relative to Galapagos values:			
	health professionals per 100 people	-0.21 (0.14)	-0.22 (0.14)
crime	homicide rate	5.9 (6.1)	5.7 (6.1)
education	average number of years of schooling	-2.2 (1.3)	-2.2 (1.4)
	illiteracy rate	8.4 (7.0)	8.2 (8.5)
	Per cent of population with university education	-2.1 (3.1)	-2.0 (2.8)
poverty	malnutrition	3.6 (6.0)	3.9 (6.2)
	population density	55 (32)	49 (26)
employment	Per cent of the population economically active	-14 (4)	-12 (3)
subsidies	average income/spending	17 (17)	16 (17)
	Total number of observations	**36**	**27**

Table 22: Correlations among explanatory variables

	Distance	Health professionals	Homicide	Years of schooling	Child malnutrition	Population density	Economic activity	Illiteracy	University education	Subsidies
Distance	1.0									
Health professionals	-0.6	1.0								
Homicide	0.0	0.1	1.0							
Years of schooling	-0.4	0.9	0.3	1.0						
Child malnutrition	0.4	-0.6	-0.5	-0.8	1.0					
Population density	-0.7	0.6	-0.2	0.5	-0.2	1.0				
Economic activity	-0.3	0.2	-0.4	0.0	0.2	0.2	1.0			
Illiteracy	0.0	-0.4	-0.2	-0.5	0.5	-0.2	0.4	1.0		
University education	-0.3	0.6	0.1	0.5	-0.4	0.6	-0.1	-0.7	1.0	
Subsidies	-0.3	0.1	0.2	0.0	-0.1	0.0	0.4	0.3	-0.1	1.0

Overall, we observe that indicators of economic opportunity and local amenities are better in Galapagos than on the continent in general (see Table 23). This makes Galapagos attractive as a place to migrate to.

Table 23: Mean socio-economic variables for Galapagos and the rest of Ecuador

	Variable	Galapagos	Rest of Ecuador
Health	health professionals per 100 people	0.56	0.19
Crime	homicide rate	8.5	12.9
Education	average number of years of schooling	9.2	5.7
	illiteracy rate	5.6	19
	% population with university education	8.0	3.2
Poverty	child malnutrition index	30	37
Employment	% of the population economically active	45	32
Subsidy	average income/total spending	9	25

6.3 Results

6.3.1 Immigration

Table 24 shows the results from our regression analysis using immigration as the dependent variable. We have a very small number of observations, which severely restricts the number of variables that we were able to test simultaneously. Consequently, we only show runs resulting in significant relationships.

Of all the skill/education measures, only illiteracy produced a significant regression result. A negative relationship was found between illiteracy and immigration (column one, Table 24), indicating that the higher the illiteracy in a province the less likely it was for people to immigrate to Galapagos from that province, or conversely the higher the literacy in the population the more likely people will immigrate to Galapagos. Thus the effect of higher mobility of more educated people seems to dominate the effect of the desire of people to move from provinces with fewer educated people to provinces with more educated people.

When testing for wage opportunity effects, no significant relationship was picked up between immigration and economic activity. This was true even after controlling for either population density or skill effects using any of the education measures. So, there is no evidence to suggest that people are more likely to immigrate to Galapagos from provinces with higher unemployment.

The second column shows the results from regressing population density against immigration. The population density coefficient is positive, indicating a positive relationship between immigration and population density of the province. This suggests that people were more likely to immigrate to Galapagos from provinces that had high population density, i.e. with large cities.

Column three shows the results from regressing the number of health professionals against immigration, controlling for population density. The health professionals variable produces a negative coefficient, suggesting that the higher the number of health professionals, the less likely that people immigrated to Galapagos. This is consistent with an amenity effect; people are more likely to move to provinces with better health services, improving the quality of amenities available to them.

The other amenity effects we analysed were child malnutrition, homicide, and subsidies. When we controlled for population density and the number of health professionals, we found a significant and negative relationship between child malnutrition and immigration (column three). This indicates that the higher the rate of poverty, the less likely it is for someone to immigrate from that province to Galapagos. In this case, the amenity effect is being swamped by the mobility effect, i.e. the people are less mobile in areas of high child malnutrition and so less likely to be able to move to places with better social conditions and amenities.[96] No significant relationship was found with either homicide or subsidies when regressed with immigration.

A significant relationship was not picked up between immigration and coastal location even after controlling for population density, accessibility using distance from major airports, or economic activity. Thus there is nothing to suggest that people are more likely to migrate to Galapagos from coastal locations.

As an accessibility measure, distance from airports produces a significant and positive result when regressed with immigration (see column four). Therefore, people are more likely to immigration to Galapagos from more accessible provinces. This may well, however, simply reflect the correlation between "distance" and population density.

[96] We were concerned that the regression might be dominated by the two largest provinces. However, when we drop the two largest provinces this relationship still holds.

When time was controlled for using time dummies, the significance of the explanatory variables disappeared; however, the coefficients on the explanatory variables remained similar. This implies that the loss of significance is due to the increase in the number of right hand side variables rather than the lack of a relationship over time between the population characteristics considered and immigration. Column five shows the relationship between time and immigrate; the coefficients increase with time until 1998, when there is a slight decrease.

Table 24: Immigration to Galapagos (five years) per 100,000 people

	1	**2**	**3**	**4**	**5**
Illiteracy rate	-16 ** (7)				
Population density (km^{-2})		5.1*** (1.4)	9.3*** (1.9)		
Health professionals (per 100 people)			-1700*** (500)		
Child malnutrition			-15* (8)		
Distance to Guayaquil or Quito				-0.68* (0.37)	
1974 dummy					*dropped*
1982 dummy					170 (160)
1990 dummy					380*** (150)
1998 dummy					330*** (150)
Constant	600* (80)	180** (90)	-360* (180)	530*** (60)	200 (120)
R^2	0.13	0.28	0.50	0.07	0.11
N	36	36	36	36	36

Note: Standard Errors are in brackets, *=10% significance, **=5% significance, ***=1% significance. Regression was weighted by population. Coefficients all rounded to two significant figures.

6.3.2 Emigration

Table 25 shows the results from regressions using emigration as the dependent variable. Again, we only show runs with significant coefficients because of the small sample size.

Employment became a significant explanatory variable when poverty was controlled for, using child malnutrition (column one). This indicates that people are more likely to move to places with higher economic activity, when the amenity impact of poverty is held constant. These variables are slightly positively correlated (see Table 22).

None of the education explanatory variables alone produced significant results when controlling for time. When accessibility was controlled for as well, using distance from major airports, the average number of school years did produce a significant result, with a positive relationship indicated. So, the greater the average education level in a province, controlling for distance, the more likely it was for some to emigrate there. This can be seen in column two of Table 25.

Regressing with population density as an explanatory variable did not produce a significant result, suggesting that people were not necessarily more likely to migrate to places where more people are concentrated, i.e. cities.

When considering amenity effects, we found a significant and negative relationship between child malnutrition, our poverty measure, and emigration when distance and time were controlled for (see column three). This suggests that the higher the child malnutrition rate, all other things constant, the less likely someone would have emigrated from Galapagos to that province. No significant relationship was picked up between either the homicide rate and emigration, or subsidies and emigration. So there is no evidence to suggest that people were more likely to move to areas with lower crime, or to areas with higher subsidies.

No significant relationship was found with emigration and cultural similarities as measured by coastal location. This was true even after controlling for city effects using population density. There is nothing to indicate that people were more likely to emigrate to provinces on the coast.

When analysing accessibility effects, the consistently negative coefficient for distance in all the regressions in Table 25 suggests that people were more likely to emigrate to provinces closer to major airports, i.e. provinces that were more accessible.

In these regressions the time dummies for each regression were positive and increasing with time, indicating that emigration increased through time.

Table 25: Emigration from Galapagos (five years) per 100,000 people

	1	2	3
Economic activity	22*** (7)		
Average school years per person		37*** (13)	
Child malnutrition rate	-15*** (3)		-5.8* (2.9)
Distance		-0.48*** (0.13)	-0.56*** (0.14)
1974 dummy	*dropped*	*dropped*	*dropped*
1982 dummy	100 *** (40)	-85** * (30)	85*** (35)
1990 dummy	250*** (40)	150*** (30)	150*** (30)
Constant	400*** (80)	270*** (40)	210*** (30)
R^2	0.73	0.82	0.79
N	27	27	27

Note: Standard Errors are in brackets, *=10% significance, **=5% significance, ***=1% significance. Regression was weighted by population.

6.4 Summary

People are more likely to immigrate to Galapagos from provinces with lower illiteracy rates, higher population density, lower number of health professionals, lower child malnutrition, and provinces that are more accessible. Illiteracy is both a wage/skill and mobility story. The lower the illiteracy rate in the population the more skilled people are on average, so the more likely they are to have the skills demanded in Galapagos and to be mobile.

The positive relationship with population density reflects both the availability of the types of skills demanded in Galapagos and the similarities in cultures between Galapagos and cities. The negative relationship with the number of health professionals suggests an amenity effect, with people being more likely to move to places with better healthcare amenities. The negative relationship with child malnutrition rates suggests a mobility effect, with people being less mobile in places with higher poverty.

In contrast to immigration, people from Galapagos are more likely to emigrate to provinces with higher education/skill rates and lower child malnutrition. People may be leaving Galapagos to get training that is not available to them there; thus they move to provinces with greater educational opportunities. They are also not likely to move to places with higher child malnutrition, or more poverty, as this would represent a decrease in the social amenities available to them. People are more likely to emigrate to provinces with higher economic activity, representing better wage opportunities, and to provinces closer to the airports, i.e. provinces that are more accessible.

7 Potential policies to address migration and environment

The overall objectives of this study are to find policies that will:

1. protect and enhance the unique environment in Galapagos
2. promote the welfare of people throughout Ecuador by making the best possible use of the resources in Galapagos
3. promote the welfare of the residents of Galapagos to gain their active support to create a sustainable future and to reward them for their efforts.

We are seeking policies that bring a net gain to Ecuador, a country that cannot afford to subsidise global environmental benefits on a large scale. We believe there are many opportunities for win-win policies, where nearly everyone benefits, rather than having to force change on some groups for the benefit of others. More efficient regulation can make everyone better off.

Any effective regulation must involve local participation as local people will necessarily implement and be involved in the enforcement of regulation. Local people often have the best information on the details that make a policy effective. The policies should be designed to minimise conflict. They must be simple so that good ideas will not fall down in implementation. Simpler regulations are also harder to manipulate and less vulnerable to misuse. Policies must take account of the limitations in human and institutional capacity in a very small community in a developing country.

In Sections 2–6 we analysed key sources of environmental degradation and the causes and effects of migration to Galapagos. We analysed the problems that simple limits on migration can cause in the labour market and how these could lead to significant economic and social losses and pressure and ultimately breakdown in the Special Law. We have also analysed the underlying distortions that drive “excessive” migration. These sections were intended to deepen our understanding of the root causes of the problems Galapagos faces. They allow us to project future problems and also identify possible ways to minimise and avoid those problems.

Our analysis suggests that the Special Law can have strongly positive effects on the environment and creates useful infrastructure. It also, however, creates problems of its own and needs to be complemented with additional efforts. Without further efforts to improve regulation, local wages for some occupations will rise steeply, putting increased pressure on illegal migration and efforts to subvert the application of the law. Local prices will rise, creating local resentment and increased inequality as only some groups benefit from higher wages. Skill shortages will intensify, limiting the development of the local economy and particularly of key sectors such as tourism. This will lead to loss of economic benefits both for local people and for Ecuador as a whole. Lack of flow of people into and out of Galapagos may create social stagnation.

Population control is only part of an effective strategy for environmental protection. Environmental damage may be slowed by limits on population but will not be adequately addressed. The economic activities that do continue in Galapagos will not necessarily minimise environmental impact. Flows of people across the islands could intensify environmental damage even with constant population. In any case, the Special Law controls migration but not total population. Effective policy needs to address four questions: How many people? Who? What do they do? How do they do it? Different policies will address different questions and complement each other.

The Special Law was the first step. It creates a basis on which other policies can be built. In this section we group potential complementary policies into four groups:

1. policies that directly control population
2. policies that reduce the migration pressure that arises directly from government subsidies
3. policies that reduce the excess migration pressure and adverse environmental effects arising from poor regulation of economic activities, including tourism and fisheries
4. policies that directly mitigate the environmental effects of economic activity and population growth and the adverse effects of migration control.

This section incorporates key proposals by other groups including MIGAMA, CDRS, and other local institutions and groups. We have not identified the source of ideas, partly because many are common across groups. It also includes new ideas that arise out of our analysis. We outline each possible policy and discuss its likely effectiveness in achieving our three goals, as well as the other, possibly unwanted, effects it might create.

7.1 Directly control population: Improve systems for controlling migration flow

The current problems with migration control are twofold. First, they have not yet been strongly enforced, so do not avoid illegal entry. Second, when they are strongly enforced they are likely to create problems in labour markets and distortions that lower welfare and create conflict. Some symptoms of this are already emerging as control tightens.

One obvious policy is to ensure that the migration controls included in the Special Law are actually enforced. We discussed efforts and possible future strategies to do this in Section 2.3. As long as controls on migration are part of a successful strategy, we need to be able to track entry and exit of people and their legal status. We also need to be able to control illegal entry and overstaying effectively. If we decide that migration control should be more flexible this should be a deliberate policy, not something simply carried out through lax control.

In terms of flexibility of migration control to avoid negative side effects, we need to think about the ultimate purpose of migration control. Migration control will be an essential part of overall population control and control of the entry of goods and people with their associated ecological risks. It may not be necessary to avoid migration altogether; however, our real targets are population growth and the level of entry of goods and people.[97] Population control could be achieved through higher emigration or lower rates of natural increase as well as through reduced migration.

[97] Even these are intermediate goals. The ultimate targets are environmental protection and human welfare.

Some people have suggested that Galapagos could absorb an ongoing increase in population of around 2.5–3 per cent.[98] The ability of the Galapagos to absorb new people in a sustainable way will clearly depend on the level of impact per person. This in turn depends on the quality of quarantine systems, regional planning and other local regulations. We discuss these further below (Section 7.4). A key strategic decision is the level of population growth the system aims to achieve. Currently this is not explicit but is determined by the number of temporary residency permits granted, natural increase (birth and marriage), and immigration and emigration of permanent residents.

Given a target level of population growth, three key issues arise. First, if we are going to let in some additional people as temporary residents, who should be let in and through what process? Second, how can emigration be encouraged and facilitated? Third, can natural population increase be reduced? Higher emigration and lower natural increase allow a greater flow of temporary residents.

7.1.1 Discretionary systems for control of temporary workers

The current system for entry of temporary workers is based on a system similar to the US working visa system. An employer must sponsor the entrant and show that they cannot employ a local person to do the same thing.

An alternative system for control of immigration that is commonly used for immigration between countries is a “point” system. Different characteristics of people, such as occupation, skills, wealth and age, are given different numbers of points based on the country's perceived needs. Only potential immigrants with high scores are able to enter.

[98] They usually talk about this as migration at this level but we suspect they are really intending an increase in population of around this level.

The advantage of this system is that the criteria for entry would be transparent. Entry would not be dependent on an employer's ability to use the immigration system. The criteria could be periodically revised with an explicit process to assess the needs of Galapagos. The disadvantages would be that in a tiny labour market like Galapagos, skill shortages will be extremely specific and general criteria are unlikely to supply the skills employers need. It is extremely hard to anticipate the needs of any labour market even in the very short term. The ability to respond to skill needs as they arise is an essential part of any system.

A compromise system could involve general guidelines on the types of people who would be considered coupled with the current system of considering applications by employers on a case-by-case basis. Each year INGALA could report back on the characteristics of those granted temporary permits relative to the guidelines. This would provide useful information and would increase the transparency of the system to ensure that no particular groups are exploiting the system to their advantage or, conversely, being left out. It might also suggest areas where local education could reduce the need for temporary workers if certain occupation and skill groups are persistently coming in on temporary permits.

These systems use bureaucratic processes that assess each application for temporary residency individually. They involve public servants in a discretionary process. Any discretion in decisions that confers considerable economic benefit on both the migrant and the employer invites corruption to let people in to meet the needs of friends and family. It can also be subject to the biases of local officials who have fixed ideas about the human capital needs of Galapagos. Local political pressure can be exerted to increase entry of certain types of people or limit others. This implies the need for higher level oversight, which is expensive. It also inevitably takes time, which can be costly for employers.

Two other approaches would make the process simpler and almost non-discretionary by forcing employers to make decisions about who they really need, and potential migrants to make decisions about whether they should really enter Galapagos, taking into account the true cost of immigration. One instrument, a "tax", sets a price for entry but does not fix the number of entrants. It would probably be primarily used for temporary residents. The other, a "tradable permit system", fixes a target for total population but does not set the entry price. This could be used for temporary and/or permanent residents.

7.1.2 Tax on temporary residents

The underlying problem with additional temporary residents (discussed in Section 4) is that each extra person puts additional stress on the environment and on local infrastructure. Thus we want to limit temporary residents to those who contribute more than the costs they impose. The key question is how to ration entry to Galapagos as a temporary resident.

One answer is to assess the environmental and social cost of an extra person for one year and require that all temporary residents pay that cost. Then they will choose to come in if they have a job opportunity that will pay a high enough premium or if they get personal value out of living in Galapagos. The distortion is corrected and the optimal number and mix of people would enter.

The level of the charge would need to change over time to reflect changes in environmental costs and the level of service provision that the new entrant would benefit from. If quarantine and land use planning systems are improved the environmental cost per person would be lower and maybe the tax could be lower. If in contrast the number of permanent residents is rising over time and pressure on the environment is increasing, the environmental damage caused by an extra person could be rising. If the subsidies to Galapagos residents (see Section 5.2) are reduced or made less accessible to temporary residents, the social cost an extra person imposes would fall and the tax could also fall.

Rather than simply relying on the tax as a control mechanism, basic safeguards could also be applied to avoid entry of people such as criminals, those with past history of environmental infringements or those who have previously breached migration control regulations.

Even if the tax were not applied at a level that covered the full environmental cost (which would be hard to estimate in any case), a low tax would reduce pressure for immigration and could complement the existing system of discretionary entry.

This has some similarities with a "guarantee" system where the employers of temporary residents pay a bond when the temporary resident enters Galapagos, which is refunded when they leave. This is already in the regulations for Galapagos but it is not currently enforced. The basic purpose of the guarantee is to enforce compliance with exit after the permit expires rather than to limit entry. The cost of putting up a bond in advance would deter some employers, however, so may perform the role of a low tax.

The proceeds of the tax could be used in a variety of ways. We will discuss the benefits of different options further under the later section on redirection of subsidies where similar issues arise (Section 7.2.2).

7.1.2.a Advantages and disadvantages of a "tax" system

The benefit of a tax approach is that it directly addresses the underlying problem of excessive migration while putting on the minimum possible restrictions. People are left to make their own minds up about whether to enter and pay the tax (or equivalently employ a temporary resident and pay the tax); no bureaucrat controls this decision. The government needs very little information to implement a system like this. They do not need to plan how the economy develops, an impossible task. Those who employers most want, and those who most want to live in Galapagos, will enter. Finally, a tax would raise revenue that could be used either for direct environmental remediation or for local infrastructure that benefits permanent residents.

At first glance a tax system where the tax might be actually paid by local employers may seem to disadvantage permanent residents. In fact the opposite is true. All locals and firms would benefit from the use of the tax revenue if it were directed to local infrastructure and services.

Most permanent residents will find that they have increased protection from temporary residents who could lower local wages. The only workers who will lose are those with unreasonably high wages because of artificial scarcity in the local labour market. People who had to employ these workers will benefit from a tax both in terms of quality of the workers and cost. In general the costs of services that are provided locally will be less distorted, so unreasonable costs for employing people with specific skills will be avoided. For example, if there is an acute shortage of construction workers, more construction workers will pay the tax and enter and the costs of construction will fall to more reasonable levels. If there is not an acute shortage of a particular skill or occupation, but some groups previously said there was and facilitated entry, then under a tax system those employed in that skill will receive higher wages because temporary migration would fall.

Employers will pay the tax only when the value of the temporary worker outweighs the extra cost. In some cases, where the worker is particularly keen to come to Galapagos, the worker might pay the tax themselves. The employer will face a much more flexible system with lower costs of dealing with INGALA and fewer delays. The employers who will lose are those who the previous system allowed to employ people who should not have entered, i.e. who imposed more costs than they provided benefits. Thus the only locals who lose are those who were gaining unreasonable returns from the previous discretionary system.

It is true that under a tax system poor people will be less likely to enter as temporary residents. This is not really because they are poor but because poor people tend to have less valuable skills. Their skills are less likely to address shortages in the labour market. Where poor potential migrants are willing to do work that no locals are willing to do, it might still be worthwhile for their employers to pay the tax. Employers may also find that if they offer to pay enough, local people may be induced to take these jobs. If a family in Galapagos strongly wants to facilitate the temporary migration of a family member or friend, they can choose to pay the tax on their behalf. If a social goal is to help poor people from the continent there are certainly better ways to do this than by allowing a very small number of poor people to enter Galapagos.

A tax on temporary residents was proposed in the original draft of the Special Law. The proceeds were to be directed to education and training. Because it was not included in the final draft a legal problem arises. Any new tax in Ecuador requires congressional approval. One option might be to require that employers of temporary residents contribute an equivalent amount of resources to the tax for local training or a fund for education and training. This would achieve a very similar outcome to the tax but might be more politically palatable.

Both the discretionary entry systems and the tax affect only immigration and emigration of temporary workers. They do not automatically respond to emigration or internal population growth and do not encourage and facilitate emigration of permanent residents.

7.1.3 Tradable residency permits

We will first outline a basic tradable residency permit system and discuss the benefits and disadvantages of such a system. Then we will discuss the practical and political feasibility of using at least some elements of this system in the case of Galapagos. We will discuss how the ideas could be introduced gradually or partially.

A pure tradable residency permit system would each year set a limit on the total number of permanent and temporary residents. This could be adjusted annually to account for natural population increase or to respond to increasing environmental concern. In contrast to the tax, where the key decision was how high the tax should be, the key decision here is the optimal number of people resident in Galapagos. Permanent residents would each receive a permit. Temporary permit holders might be required to pay for them. If the limit were greater than the number of people currently holding temporary or permanent residency status, extra permits could be sold and the revenue used for any purpose. If the optimal limit were below the current level of permits, the government would need to buy some of the permits back and some people would need to leave.

The holder of each of these permits would need to be clearly tracked. Every permanent resident would have one permit and each temporary resident would have to acquire one before entering Galapagos. INGALA could use their database for tracking.

Once ownership of each permit was established, any new person who wanted to enter would need to find someone to lease (temporarily transfer) or sell (permanently transfer) them a permit. Each entrant would be matched by someone who would leave so total population would be absolutely controlled. As with the tax, additional limitations could be put on new permit owners to exclude criminals etc. An additional restriction could be to allow someone to become a new permanent resident (i.e. allow people to buy permits rather than lease them) only if they have lived in Galapagos for a period of time already. The latter requirement might bring more social cohesion and make the new entrants more socially acceptable. Sales and leases would not be heavily regulated; they would simply need to be reported to INGALA and checked for legality before the transfer was finalised. The permit would not legally be transferred until it was reported, so people could not enter Galapagos without registering the permit transfer.

7.1.3.a Advantages and disadvantages of a "permit" system

A permit system would maintain the goals of the migration control system established under the Special Law but would be much more flexible. It would address the problems of shortages of skills and the risk of social stagnation from a static population. It would discourage immigration and encourage emigration but would provide a mechanism so that anyone who really wanted to immigrate could. They would not be as tempted to immigrate illegally.

Employers would be able to hire anyone they really want and would not have to use political processes or persuade bureaucrats to accept their applications for temporary permits. The government would not need to have information about skills shortages and make decisions about what type of people and skills Galapagos needs. If the total number of permits is about right in terms of the carrying capacity of the environment with current quarantine and environmental protection, then any person who decides to enter Galapagos and purchases a permit is bearing the true cost of their decision and hence will make a good decision for society without extra oversight.

Emigration would be totally voluntary. All permanent residents would have an unassailable right to live with their descendants in Galapagos. If they do choose to leave, either temporarily or permanently, they would be rewarded for the reduced impact on the environment.

One group of people who are most likely to leave are students and young people who want to study or develop their careers on the mainland. They would be able to lease out their permits to people who want to temporarily work in Galapagos while they are away. This would provide some resources to finance their learning experience. Those who are most likely to leave permanently are those who have permanent residency but are already not living in Galapagos; they simply want to keep their residency options open. The payment they could receive by selling their permit might make it worthwhile for them to give up that option. Leases and sales of permits by either of these groups will not reduce population much in the short run because neither of these groups were likely to be living in Galapagos anyway. Those who would not have lived in Galapagos might transfer their permits to people who really want to live in Galapagos.

Thus a permit system might allow some population growth until the limit on permits becomes binding. It would be good to do a little research to find out how large these groups of students and non-resident permit holders are likely to be. INGALA data suggests that currently 2081 permanent residents live on the Mainland and 47 live in other countries. If the optimal limits on population are close to the current population actually living in Galapagos when a residency permit system is introduced, it might be wise to buy back some of the permits so the system does not lead to growth in population.

In the longer term, people who are actually living in Galapagos may choose to leave. Those who are most likely to leave are those with skills that are not particularly in demand in Galapagos. They may choose to use the sale of their permit as capital to set themselves up on the continent. Existing families may move or this may happen over generations as some young people decide their future options are greater on the continent. Those with the weakest attachments to Galapagos are most likely to leave. These may be recent immigrants.

As with the tax system, a permit system could raise money that could be used for a range of purposes. If all permits are immediately distributed to residents or sold, revenue would be earned only when the permits are initially sold. Current permanent residents and their children would not pay for their permits. If the government does not sell all the excess permits (not allocated to permanent residents), employers who want to employ temporary workers could simply lease permits from the government. When people lease a permit, they will pay about the same amount per year as the tax.

One disadvantage of a tradable residency permit system is that it requires an explicit limit on resident population. This can be politically difficult. People cannot believe different things about what a policy implies for population growth because of ambiguities and uncertainties in the policy. They must face the implications directly.

A second possible problem arises if the market for permits does not operate well. A first problem would be if the process of trading is made complex and so it is difficult for potential buyers to find and negotiate with potential sellers. This can be avoided by minimising government controls over the process—i.e. minimising paperwork—and by providing an electronic or other place where people can post statements of interest in buying or selling. People could advertise through local papers, deal through their existing networks or use the official “bulletin board”.

If some group gains control over the process of selling and leasing permits they can still exercise discretionary control over who lives in Galapagos. They could arrange that their friends and employees can access permits more easily or at lower cost and exclude others. For example, large enterprises could try to stop their smaller competitors from accessing permits. If large enterprises simply value temporary workers more highly than small companies this is not a problem. It is only a problem if they use it in an anti-competitive way to deliberately harm the small companies.

One particular concern would arise if it appeared that any group was being pressured to sell their permits when they didn't want to. If the market is run in a very simple way and all transactions are observable it will be much harder for anyone to manipulate the market in this way. INGALA could take the role of ensuring that the transactions are done openly and that both parties truly consent.

It is extremely important that those who sell permits do so voluntarily and with informed consent. They would need to understand that if they sell the permit they renounce their right to live in Galapagos forever. If they wanted to move back they would need to buy a new permit. They need to have thought through the implications of this possibly major decision so they do not regret it later and resent the system. Currently people in Galapagos do not clearly understand the privileges associated with being a permanent resident and how valuable that right may be in the future. They could give it up without considering the loss sufficiently.

A critical legal issue associated with a tradable residency permit system is that it would require that people could legally renounce residency in a binding way. If they sell their permit they must not later be able to claim residency again without buying a new permit. They should also be renouncing residency on behalf of their children because whoever buys the permit will be gaining residency on behalf of their children. The ability to renounce residency is not in the current law. Before considering implementing this system the government would need to seek good legal advice on whether renunciation of residency is or could be made legally binding.

As with the tax, some people may be concerned that poorer people and small companies may not be able to afford to buy permits. We must always remember that those poor people who are already permanent residents are not affected by this (they gain a valuable asset). Poor people may be less able to immigrate than richer ones. The same arguments about whether allowing a few poor people to migrate to Galapagos is the best way to help poor people on the continent in Ecuador apply here. Galapagos is special in many ways, so the government may be able to get away with what will look like a policy that benefits richer people. In fact the Special Law already creates quite significant privileges for those fortunate enough to be permanent residents. The value of these privileges will become clearer with time.

7.1.3.b Transitional or partial permit systems

We have described a permit system that applies to both permanent and temporary residents. It is also described as a stand-alone mechanism for controlling migration. It may not be possible to implement such a system in the short term. Several options could be used to phase in a system.

One possibility would be to apply the system only to temporary residents. Permanent residents could not renounce their residency and have a permit to sell. However, instead of having a discretionary system for temporary permits, INGALA would simply limit the number of permits each year and sell those permits to the highest bidder. This could be expanded to allow permanent residents who are temporarily leaving Galapagos to lease their permits to temporary residents. This extension would not require that residents can renounce permanent residency. The permit's validity could be assessed each year; it would only be used for entry of a temporary resident as long as the permanent resident is out of the islands.

Another way to phase in the system would be begin by allowing permanent residents to sell their permits only to the government or NGOs. This would mean the total allowable population would fall every time a permit was sold. This could lead to a perception that the system simply aims to reduce population. If, however, there were concern about letting people “buy their way” into Galapagos it would address that concern.

Rather than introducing the whole system at once it would be quite feasible to allow a few discrete trades of permanent residency (where one person renounces it and another gains it) to demonstrate how it could work and how both parties could be better off.

7.2 Reduce migration pressure created by subsidies

The major benefit from subsidies, and the difficulty with reducing them, is that they provide significant benefits to permanent residents who can provide or withhold support for the policies needed to protect the Galapagos. Subsidies may also facilitate recruitment of skilled people by improving the quality of life. By making basic services much cheaper they raise the quality of life of all Galapagan residents. To the extent that these people would be poor otherwise, this is equitable. However, most indications suggest that Galapagans have high living standards relative to those on the continent.

Subsidies also cause significant damage. We need to be clear how exactly they cause damage so that we can understand which subsidies, and what aspects of those subsidies, are most damaging. If we can reduce a few subsidies or change their form and thereby reduce damage a lot, we may be able to maintain many of the benefits for permanent residents while still achieving our environmental goals.

Subsidies cause damage in two ways. First, they encourage excessive migration. Second, they directly encourage damaging behaviour. The key subsidies in Galapagos (see Section 5.1) are for transport, energy (fossil fuel and electricity), and public services that are much better than they would be if paid for locally, or if they received the same funding as on the continent.

The effect of subsidies on migration pressure depends on the value of the subsidies to a potential new resident. The effect of subsidies on migration operates through their effects on the few people who are close to undecided about whether to immigrate to Galapagos or emigrate from Galapagos. They are the ones whose migration decisions will be changed. Since the law was passed, the new residents who might choose to move to Galapagos in response to the subsidies will mostly be temporary residents. Permanent residents are unlikely to have more children or alter their choice of marriage partner because of subsidies. Subsidies will, however, also affect permanent residents' incentives to leave Galapagos.

Since the Special Law, legal temporary residents are mostly people with specialised skills. They will tend to have higher incomes and will tend to travel, use significant amounts of energy and value education and health services highly. Thus the current subsidies are likely to be very valuable to them. The sort of permanent residents who are most likely to emigrate are also likely to be young educated people who benefit significantly from the current subsidies. Thus the current level and form of subsidies might have significant effects on legal migration.

Some people would argue that mobile, educated people with specialised skills are exactly the people Galapagos needs so it is good if the subsidies attract and retain them. If Galapagos truly needs them, however, employers will be able to offer them more generous salary packages, which would compensate them for any losses they would suffer from reductions in subsidies. These salaries would target only those who employers want to attract rather than affecting everyone in Galapagos.

Illegal residents will not be able to benefit from the travel subsidies and are likely to be poorer so may consume less energy and may value education less highly. The subsidies will, however, affect their job opportunities. They will be affected by subsidies but perhaps less so.

Subsidies can also have direct and often perverse effects on the consumption behaviour of all residents. The travel subsidies will encourage higher levels of travel, which in turn increase the risk of species introduction. Fossil fuel and electricity subsidies encourage greater use of fossil fuel, which increases the risk of spills. They also encourage more fishing (an energy-intensive activity) and more transport among the islands both for tourism and other purposes. The current overexploitation of fisheries in Galapagos means that any increase in fishing is a direct problem. More transport among the islands is particularly damaging because of species transfer. In contrast, subsidies for education or health might be inequitable or inefficient but they do not lead to directly environmentally damaging activities.

As explained in Section 5.2, different subsidies are controlled by different organisations. Most are controlled by central government agencies. Some are specified in the Special Law so may be difficult to change. Thus reduction or even redirection of subsidies would probably require central government involvement. Local government has some control over the use of its resources for public services, so may have limited ability to redirect them.

Resources provided by non-governmental organisations to activities in Galapagos also can have negative effects on migration. If they are used directly for environmental improvement their net effect is almost certainly positive. If, however, they are aimed at social improvements, care must be taken to ensure that the direct benefits to society from the programs are not offset by indirect damage from increased migration pressure.

7.2.1 Reduction of subsidies

Reducing subsidies would make immigration less attractive, so would make migration control easier to enforce. If a tax or permit system were introduced for migration, the tax could, and permit price would, reflect the value of the subsidies. If subsidies were reduced these prices could fall. That would probably make the systems work more easily and would reduce the incentives to corrupt the system or control the permit market.

Even if it were possible to reduce only the subsidies available to temporary residents, this might have significant effects on legal and illegal immigration because temporary residents are likely to be most responsive to changes in the quality of life in Galapagos. This would have the advantage of not losing the support of permanent residents. Reducing the subsidies for temporary residents could probably be done only with travel subsidies. It would be difficult to have different prices for fossil fuels or electricity. It would be almost impossible to offer different levels of most public services. An exception is special training programs or scholarships for higher education where temporary residents are already ineligible. Even if it were technically possible it might cause social friction.

Any of the subsidies could be either reduced or eliminated in theory. Reducing any subsidies would reduce all residents' perverse incentives to travel or use fuel excessively. Most consumers on the continent purchase fossil fuel through private gas companies (Texaco, Shell, etc.).

Replacing Petrocomercial with private companies in Galapagos would allow removal of the subsidy or would at least make it transparent. This may not initially be profitable for the gas company because the market is so small, especially if there is a transition period where Petrocomercial still operates, but they may be encouraged to do it as part of an environmentally beneficial project. It could be combined with a move toward more sustainable fuel and more secure fuel management and transportation as part of a wider energy strategy. Alternatively Petrocomercial could simply raise their price to reflect the transport costs and environmental risk involved in providing fuel to Galapagos.

Reducing the subsidy on diesel to electricity providers (either by directly charging more or by forcing them to purchase fuel from a private provider) would raise electricity prices and reduce electricity demand. Reducing the direct subsidy for electricity would have the same effect. These would both reduce diesel use, having a direct environmental impact, as well as reducing migration pressure.

Although reducing subsidies is theoretically the most efficient way to reduce environmentally damaging distortions, reducing subsidies directly lowers living standards for Galapagos residents. Therefore it would have to be done slowly and will be limited by political factors. Thus we will also consider the possibilities for redirecting subsidies so that most people's living standards are maintained but the damaging effects are reduced.

7.2.2 Redirection of subsidies

Moving the subsidies away from products that mostly benefit more mobile richer people to those that affect immobile poorer people would tend to reduce net immigration. Subsidising basic education rather than higher-level education would target poorer people. They tend not to utilise higher-level education. Raising the quality of basic health that is accessible to all residents rather than specialised healthcare that might be mostly utilised by higher income people might induce less migration than the current subsidies.

These shifts in the use of subsidies may, however, encourage illegal immigration, which may tend to involve poorer people. The value of this policy would depend on the strength of the overall migration controls.

Moving subsidies from directly environmentally damaging activities to activities that have local social benefits but increase migration pressure would reduce the damage from subsidies. For example, reducing subsidies for travel and fuel use and increasing spending on education, sustainable water supplies, sewage, roads or health would be an improvement both socially and environmentally. Moving subsidies to directly environmentally beneficial activities such as quarantine, conservation education, control of introduced species, or rehabilitation of habitat would also have long-term benefits for the economy as a whole and hence for residents, but the social effects would be much more indirect, so such a change may not be popular.

Given, however, that subsidies are mostly controlled by specific government agencies, it will generally be difficult or impossible to move the subsidy from one activity to a completely different one. Even within organisations, however, some subsidy shifts could be valuable.

For example, if the purpose of the subsidy for TAME (Ecuadorean airline that flies to Galapagos) flights is to provide some access for Galapagos residents for essential visits to the mainland, this might be achieved with less impact if the number of subsidised flights were limited. At the moment, if some people travel frequently they receive most of the benefit. This was probably not the intention of the policy. Instead subsidised flights could be limited to one per resident per year (not transferable) with free flights for medical emergencies (with a certificate from a doctor). If this were a redirection policy rather than a policy that simply reduces the travel subsidy, the overall funding could be maintained by subsidising each flight more heavily. This might achieve the original objective without encouraging such high levels of travel or making Galapagos excessively attractive to the mobile, educated people who are likely to want to migrate there.

Another possibility for redirection would come within the electricity sector. One of the subsidies for electricity comes through FERUM. Currently the consumer price of electricity is significantly lower than the production cost and FERUM covers the difference. FERUM has another program for construction of renewable or non-conventional energy systems. The current subsidy could therefore be transferred to one that shifts Galapagos away from reliance on diesel fuel. The consumer prices could either stay low or rise to the real cost, but in either case the environmental effects of the subsidy would be reduced. As long as diesel is so heavily subsidised it will be difficult for any renewable option to compete.

7.3 Reduce migration pressure and mitigate environmental impacts: Policies to address inadequate regulation of resource use

In this section we consider policies to address problems arising because of inadequate regulation of economic activity. Improvements in regulation of economic activity are complementary to policies that improve migration control or reduce or redirect subsidies. If economic activities can be regulated better so the activities impose less environmental externalities, the Galapagos will be able to support more economic activity and a greater population even while we protect the environment more. Better regulations encourage the right people to do the right activities in the right ways. Better regulation can also reduce pressure to migrate.

One important form of regulation that is only beginning to be imposed in Galapagos is land use regulation. Currently there is very little control of residential or commercial development. This is being addressed through a new regional planning process coordinated by INGALA. Decisions on new developments need to take into account direct and indirect environmental impacts that are not covered by other forms of regulation. They must also take into account pressure on local infrastructure.

Limits on land development are one effective way to restrict overall activity. If there are other forms of limits on activities (e.g. limits on number of tourists or on total population) the regional planning should focus on the location and exact form of tourism and residential developments rather than trying to use planning to duplicate the overall controls on the level of activity. Regulation generally works better with focused goals.

One key aspect of land use regulation in Galapagos is the need to protect the boundaries of national parks. As the population and economy grow these will be under increased pressure. Already there is little undeveloped land around the major towns. Processes for making objective decisions on further development that avoid environmental damage need to be strongly established before the political pressure forces decisions on the basis of commercial benefit. Development is costly and difficult to reverse.

We will now focus on two key economic activities that are fundamental to the Galapagos economy and have significant direct and indirect environmental impacts, tourism and fishing. We are looking for policies that will minimise the environmental impact of these activities while maximising their value.

7.3.1 Tourism

If we could assess the environmental cost of all tourism activities in dollar terms and force tourists and tourism operators to absorb this cost we would not need any additional policies. Tourists and tourism operators would make good decisions to maximise their economic benefit while minimising the environmental costs they impose. In reality these costs are hard to assess and it is difficult to match environmental charges directly to damaging or risky activities. Existing policies impose some of these costs through levies on proxy measures of damage and risk such as tourist days.

In many situations we cannot measure or impose the costs and a more direct preventative approach is needed to complement these levies on proxies. For example, we cannot exactly observe the care taken to prevent species transfer as tourist boats move between islands. In any case we do not really know how to relate care to reduced risk of transfer and then to the environmental cost of increased transfer. In other cases if potential damage is unlikely but very large if it occurs, deterrence will be ineffective because we will be unable to force operators to pay a fine equal to the damage caused. Direct prevention can involve limiting total activity or reducing the impact of activities.

To gain the maximum value from tourism while also protecting the environment we need to take all three approaches: encourage tourists and tourist operators to internalise the environmental costs they impose and hence change their behaviour to minimise them, directly control their behaviour to limit damage, and when environmental impacts per tourist have been lowered as far as is reasonable, limit the total amount of tourism.

To gain local support and increase the benefits from tourism to Ecuador as a whole, policies should also take into account the extent to which Ecuadorians capture the gains from tourism. Encouraging and facilitating use of permanent residents as workers in the tourist sector, a key way to capture benefit, also reduces the pressure to bring in more temporary residents to meet tourist sector needs.

7.3.1.a Internalise environmental costs of tourism

To a certain extent, tourists already pay at least part of the environmental cost they impose. Every tourist pays an entry fee for the National Park when they arrive at Baltra. In addition, tourist operators pay fees based on passenger days on their boats. Two issues remain. Are these fees at a level that really reflects the environmental impact? Are the fees responsive to different levels of impact depending on the length of stay and the activities undertaken?

If the fees were used to prevent and ameliorate the environmental impact would they completely protect the environment? Currently the fees are used for a variety of purposes, so this is hard to tell. Even if they were, it is likely that the tourists would cause some damage that would not be corrected while other areas of the environment would actually improve. Thus it would be difficult to assess if the damage and gain were equivalent. For example, tourists may lead to introduction of a new species but finance effective captive breeding programmes to build up the turtle population on Española.

Efficiency does not require that the charges collected be actually spent to repair the damage. They will encourage people to make decisions so that they will not cause damage they were not willing to pay for. The gain to the tourist exceeds the damage to the environment. The use of the funds is a separate decision that involves trading off welfare of Ecuadorians (e.g. spending on education and health) with the value of protecting the environment (e.g. spending on quarantine and captive breeding).

The current per capita charge on entry to the Park does not depend on the length of stay. It also does not vary between those who engage in local tourism, which is more environmentally damaging, and those who join a cruise-ship based tour.

Charges should be regularly reviewed to assess whether they reflect the damage. The charge could be set higher than the damage to collect extra revenue for Ecuador. This might lead to over-protection of the environment but when foreign tourists are extremely keen to visit Galapagos the number of foreign visitors may not fall much even with a higher charge. The government might simply collect a lot more revenue from tourists. In contrast, the charge should not be set lower than the damage caused or Ecuador could lose from allowing tourists to enter because they degrade a valuable economic asset. This would be a particular concern where most tourist companies and most employees of tourist companies are not Ecuadorian citizens so the direct economic value is largely captured outside of Ecuador.

One problem with charges as an instrument for environmental protection is that they do not effectively address situations where activity can cause very large damages if care is not taken. If a tourist operator is extremely careless and allows considerable damage they should be able to be fined to punish them and deter others from behaving in a similar way. Unfortunately if the damage is large enough the fine will be impossible to enforce. The courts will limit the fine for political reasons or the company will go bankrupt and not pay. If that happens other tourist operators will not be deterred from taking similar risks with the environment. A way to minimise this risk is to require tour operators to post a bond before they begin activity where the bond is large enough to cover most damage they could cause. Then there are no problems with not paying the bond back in the event that the operator is careless and large damages do arise. The government already holds the money so does not have to extract it. The tour operator does not necessarily need to have the money themselves to pay the bond. This might exclude many small operators. They could get an insurance company to provide a guarantee on their behalf and simply pay an annual premium. Then the insurance company will keep an eye on the operator to minimise their own risk.

Thus charges on tourists and tour operators should be assessed to see if the level is sufficient. There might be gain in differentiating the charges more based on likely impact on the environment. Requiring that tourist permit holders post environmental bonds would encourage operators to prevent accidents that cause large environmental damage.

7.3.1.b Directly control tourist and tourist operator behaviour

Charges are limited because they can only be imposed based on very simple measures such as the number of tourists and the number of days they stay and possibly the broad nature of the activity they engage in. They cannot easily be differentiated depending on exactly what the tourists are doing or how careful the tour operator is to avoid damage. Even if it were not unwieldy to have a range of different charges, it is difficult to observe the level of care taken. Finally, tour operators might not know the best way to avoid environmental damage. Direct regulations can be informative.

Thus direct controls have a clear role in complementing charges. First, they can avoid large damage from discrete decisions (such as a new development). Regional planning is an important tool for this. Wherever large decisions are being made, local government (possibly the municipality and the National Park) should carry out an assessment of the local costs—both to the environment and in terms of infrastructure that government would need to provide—relative to the benefits. Developers should be encouraged to develop alternative proposals that impose less cost rather than making the decision one between some development and no development. This will allow compromise solutions to be found and lessen conflict.

Some people have suggested that per tourist, locally run tourism is actually more damaging than the larger tourism operations. This could be directly addressed through stronger requirements for the use of educated guides in local tourism, and by strengthening control of tourism activities in towns. Continuing education of all locals involved in tourism would help them minimise the impact of their activities as well as improving the quality of the tourist experience offered. For example, local diving operations and tours of the bay may be relatively uncontrolled at present and the guides may not be as knowledgeable as they could be. Activities involving animals that can spread seeds, such as horse trekking, may be particularly damaging so that their scope and level should be restricted. Maybe they should even be gradually phased out.

For all tours, an ongoing effort to organise tourist itineraries to minimise risk of species transport, keeping pressure on operators to take care that tourists do not spread species between islands, and avoiding extractive activities would reduce the impact per tourist. Monitoring the forms of transport used to reduce the risk of species transmission, for example using airplanes rather than large ferries for interisland transport, would have direct value. The cost of the transport should still reflect the environmental risk it imposes. One way to encourage this is to avoid developing a larger airport on any of the other islands so that flights are intrinsically limited.

7.3.1.c Limit total tourism

A combination of charges and direct controls could minimise tourism's impact on the environment and at the same time raise the cost of tourism, so automatically reduce the total number of tourists. Thus it would not be necessary to limit tourist numbers directly. A limit is useful when other forms of control are constrained in some way. It can be particularly useful when the environment has a reasonably clearly defined carrying capacity and is particularly sensitive to increases in numbers above a certain level (i.e. a threshold effect). A limit can keep numbers below the carrying capacity.

If a limit is to be applied it must be done in the most flexible way possible to avoid the use of the limit to protect existing ventures. Some limits already exist. The government limits the number of flights to Baltra. No flights come from the continent except to Baltra and Puerto Baquerizo Moreno. Total tourist numbers are indirectly limited through controls on the number of tourist vessels. One option would be to freeze the number of tourist vessels (or increase it more slowly) until we are sure that the environmental impact of tourism is controlled. This could create protectionism because new tourist operators could not easily get vessels. In addition, simply freezing tourist activity would not allow the types of tourist experience to adjust to provide the most valuable packages. Given that total tourism will be limited (either directly or through the higher costs implied by charges and strict controls) it is critical to focus the tourism that does occur on the unique opportunities offered in Galapagos as those will be the most lucrative for operators and valuable for Ecuador as a whole.

For example, it is unlikely that it would be efficient for Galapagos to compete in the sun/sand/surf tourism market. It is too remote and the environmental costs, if taken into account, would make this unprofitable. A lot of places can offer this type of tourism, so the market tends to become saturated and the price tourists are willing to pay is lower. Galapagos could, however, link with sun/sand/surf tourism options offered on the mainland to provide a combined ecotourism and sun/sand/surf experience if that is what tourists desire. Galapagos attracts an unusual tourist demographic for its ecotourist experience and it is almost certainly most profitable to focus on its clear advantages.

Tradable tourism rights

One way to limit total tourists but allow flexibility in which operators are active in Galapagos, so that they are under pressure to provide excellent services and flexibility in the types of tourism experience offered, is to use a tradable tourism rights approach. The basis for this already exists in the tourist quotas used by the National Park. Here we will briefly discuss how the existing system could be extended and the advantages of that.

Any tradable rights system must define the quotas to be traded, must assign clear ownership, and must set up a system for trading. The quotas here are currently defined in terms of passenger days. This could be expanded a little so each quota implies the right to a certain number of passenger days but also the responsibility to meet certain environmental standards. If these standards are not met, the operator's quotas could be revoked. The environmental responsibilities could be applied directly as controls, or, when new quotas are allocated or sold, those who seek a quota could propose their own standards and ideas for environmental protection and remediation. These proposals could be taken into account in the tender process. This latter process was used effectively to control pollution from buses in downtown Santiago, Chile. Routes in the central city were limited and tenders to operate those routes were submitted with both a price and an environmental plan.

Ownership of the passenger day quota is currently assigned through a process where new operators or those who want to expand need to seek additional quotas for themselves, which are added to the quotas of operators already doing business in Galapagos. In a tradable system, existing quota holders could have their quota "grandfathered" for a fixed period of time so they would not have to pay. They could gradually be made to face more stringent environmental standards. As new quotas are made available or existing quotas roll over, they could be tendered and sold at the highest price (weighed with the environmental considerations).

When quotas are limited they become valuable. Operators will be willing to pay to buy them because their businesses will become more profitable with limited tourists and hence limited competition. If the Park sells quotas, the revenue can be used to fund conservation activities or more generally to provide benefits to Ecuadorian citizens. The benefits of better regulation will be captured by Ecuador, not the foreign companies.

Alternatively quotas could be allocated to operators in a discretionary way. One disadvantage of giving the quotas away when they are scarce is that they are valuable and operators have an incentive to use political influence to obtain quotas. Large operators may be able to use the system to exclude small operators. A discretionary system is easy to operate without manipulation when quotas are not valuable, but comes under pressure when quotas are severely limited.

Quotas can be sold in perpetuity (allocating rights forever) or for a limited period of time. The key benefit of allocating them in perpetuity is that tourist operators can make investments secure in the knowledge that they can continue to operate. The disadvantage is that very few quotas would be traded and it might be difficult for new tourist operators to buy quotas. Also, if quotas initially sell for very low prices, the Ecuadorian people may receive little benefit. Allocating quotas for 20 or 30 years where this is done in a rolling way with some quotas expiring every few years might be a good compromise. Tourist operators would need to replace some of their quota periodically. This would force them to reassess their operations and would create an active market.

A quota system could effectively control tourist numbers, could be combined with incentives to improve environmental performance, and would still allow flexibility in the tourist sector. When operators have to pay for the right to serve tourists they would need to find ways to improve the quality of the service they provide. They would also need to match their packages more closely to what the highest-paying tourists want. This might lead tourism to focus more on wealthy eco-tourists and hence provide longer tours with more biology expertise involved. It might, however, lead to shorter tours where each tourist pays more per day for an intensive ecotourism experience.

The sector could evolve to find which tourist services are most highly valued and hence most valuable to the tourist operators and Ecuador. Tourist operators would take the environmental impact into account in all their decisions because of the direct controls, payments for quotas, and the environmental conditions operators offer when they tender for their quota.

The existing system of passenger day quotas could relatively easily be adapted to provide a more flexible system that also provides more value to Ecuadorian citizens. It could be done gradually to minimise disruption and political opposition from both foreign and local operators.

7.3.1.d Focus tourism to produce more local benefit (or at least to Ecuador)

It is not sufficient that tourism is well regulated to control environmental impacts and maximise its total value. Ecuador is a relatively poor country and is concerned that its own citizens benefit from the use of its valuable resources. In addition, effective tourism and migration regulation requires local Galapagan residents' support. They will be more supportive of restrictive regulation if they can see that it provides benefit to them. Currently most tourism operations are run from the mainland or from other countries, so much of the benefit also goes outside.

A key issue here is training locals and providing employment opportunities for them in tourism. When training is most effectively given on the job rather than through courses, it might be most effective to require that all tourism operators employ and train a certain percentage of Ecuadorian citizens (if the migration regulation is inflexible, permanent residents of Galapagos). If the more flexible migration controls discussed in Section 7.1 are implemented, the funds contributed through taxes or payments for residency permits could partly be directed toward local training. The basic training required is in biology/ecology, languages and the harder to define skills of working with tourists from developed countries who have high expectations about the level of service. The interpersonal skills involved in the latter can only be achieved through extensive contact with tourists or other foreigners as it is fundamentally a cultural issue.

Forcing tourist operators to employ large numbers of locals will probably lower the quality of tourism in the short run because the necessary skills are not readily found among locals. Thus training is a long-term strategy and any policy designed to encourage it should be aware of the trade-off against the quality and hence the economic contribution of tourism. This is an issue that is beginning to be faced with the requirement that new guides are permanent residents of Galapagos. Despite recent training programmes there are few top-quality experienced local guides. This problem will not be solved overnight.

A second issue is making sure that the market for tourism operators and new ventures is open to Ecuadorian citizens. Administrative barriers that bias against Ecuadorian operations should be closely scrutinised. If there are genuine failures in the capital markets that make it difficult for good local operations to gain credit so they can expand, these could be addressed. Extreme care must be taken, however, not to subsidise poorly organised and planned ventures simply because they are locally owned. Frequently when operations cannot find credit from banks it is for a good reason. Helping ventures with management skills, business plans and training in tourism operations would probably be far more effective in creating local businesses that provide genuine local benefit than simply giving low-interest loans.

7.3.2 Fisheries

Here we seek effective ways to regulate fishing (recreational and commercial) that bring benefits to existing fishers while protecting the stock in the long term. The fisheries regulation must be developed together with fishers because their active and willing participation is essential.[99] In the past fisheries regulation has been associated with violent conflict. This is now being addressed, but it will be a continuing concern.

[99] See Ostrom (1990) and Seabright (1993) for excellent discussions of the basic issues involved in cooperation in management of local commons.

A first need is simply to improve the control and definition of the group of people interested in fisheries. The first steps toward this have been taken with the Special Law, which requires that all fishers are members of a cooperative, and the moratorium on entry to cooperatives. Complete lists of members are not yet fully established and a lot of illegal fishing still occurs, especially for lucrative catches such as sea cucumbers, lobster, and shark fins. In addition the cooperative is a very large unwieldy group, many of whom are not full-time fishers. When the group of fishers is clearly defined, some flexibility can be introduced to allow entry and exit from fishers. It is impossible to allow this when membership of the fishery is not observable.

Once the group of fishers is clearly defined, cooperatives will have an increasing ability to self-organise to represent their interests and regulate themselves. They could be assisted in this slow, difficult task through advice and resources to help develop institutions and processes. CDRS, GNPS and others are already undertaking some of this work. No regulation can be truly effective without the effort and at least some support from fishers, so this is an essential ongoing human capacity-building exercise.

Fisheries regulation requires effective reductions in total catch from fishing stocks (a particular species in a particular area) that are under pressure from overfishing. Limits can be imposed in a variety of ways. Some have the advantage of being easy to impose and monitor, but they may be extremely costly to fishers. For example, restrictions on gear are relatively easy to impose and tend to make fishing effort less productive, which reduces fishers' incentive to fish, thus protecting the stock. However, any environmental gains are achieved at the expense of the fishers' incomes and the development of the fishery. This may achieve environmental ends but at a high social and economic cost. It is likely to be resisted in the longer term. The restriction to artisanal fishers within the marine reserve is an example of this type of limit.

The ideal system is one that limits annual catches of each fish stock to a harvest level that is sustainable given the initial stock when the system was introduced. The limits would be set taking into account ecological factors as well as the economic value of having a larger, and hence easier to harvest, fish stock. The total limit can be defined as number of tonnes of each fish stock. Each fisher then receives a certain number of tonnes of quotas for each stock. The allocation of quotas among fishers could be done by the cooperatives. Often allocation is based on historical catch, so truly active fishers receive most of the quota. This allows a smooth transition into a quota system because most people can continue to do what they were doing and little money needs to change hands. Alternatively, the cooperative could choose to sell the quota to their members and then distribute the revenue among the group. If the historical level of fishing is higher than the sustainable level, some fishers could be paid to give up their rights to quotas in the initial allocation. This buy-back could be funded either by government or environmental groups or could be funded out of future resource rentals paid by those who stay in the fishery. The fishers who remain will benefit from the newly sustainable stocks, so they will be better off even if they have to pay for the buy-back.

Ideally these quotas are transferable so fishers can enter or leave a particular fishery and can collect a set of quotas (different tonnages from different stocks) that matches the type of fish they would like to catch with the boat they have, their crew and their location. If quotas last for several years, or even in perpetuity (forever), fishers can make good long-term investment decisions about the types of boat and gear they want and potential fishers can make decisions about training to enter the industry. Stable long-term regulation provides security of investment and employment. The Individual Transferable Quota (ITQ) system proposed here avoids overfishing but puts the minimal possible limitations on who fishes, when they fish and how they fish. Thus the value of the fishery can be maximised. Individual transferable quota systems are used in fisheries around the world.

A system of individual transferable quota should be complemented with some direct controls. For example, if fish have a breeding season during which the stock is vulnerable it can be a good idea to have a fishing season. This is not used as a mechanism to limit total catch but to control when fish are caught so the impact on the stock is minimised. If fishers understand the purpose of the fishing season and own quotas, they will recognise that it is in their interests to help enforce it. Gear restrictions similarly may be useful to avoid capture of undersized fish and by-catch. Again the purpose of the restriction is not to reduce total catch but to change its composition.

For this system to work, entry to the fishery must be strictly limited and enforced. New fishers can enter only by buying quotas from existing fishers or by inheriting quotas. Total fishing must be controlled.

7.3.2.a Simpler systems and transition

Any regulation has to be relatively simple because there are a large number of small operators in fisheries. This makes monitoring complex, and in addition many of the fishers are not well educated, so complex rules would be unduly burdensome. The current level of institutional capacity in cooperatives and the level of scientific knowledge about stocks probably would not allow a full ITQ system to be created in the short term. We would not know how to set appropriate limits, and monitoring of catches would be very difficult for many species.

Simpler systems could be used instead or as a transition toward a long-term ITQ system. These would have some of the flexibility of the ITQ system but would be simpler to administer. They would also be more familiar because they are closer to the current forms of regulation. They may be more acceptable to everyone involved.

One possibility would be to have a tradable quota system on boats. The type of boats that can be used in the Marine Reserve is already limited under the Special Law. If it were not, a limit on the number of boats would probably simply lead to the use of larger boats. The National Park holds a registry of boats. It would be relatively simple to maintain the current moratorium in the Special Law on new vessel permits but allow existing permit holders to replace their boats or sell their boat permits to others (if they were going to sell their boat or use it for non-fishing purposes). If the same type of boats were used for tourist diving operations and fishing their use would need to be monitored, but this would be relatively easy.

The current number of boats still allows overfishing, so this would need to be combined with a programme to buy back vessel permits and retire them, thus reducing the fishing fleet. This is a common feature of the introduction of any tradable quota system in an overexploited fishery. A buy-back achieves the environmental goal of reduced pressure while avoiding the conflict with fishers caused by forced cutbacks.

Gradually the remaining vessel permits would become highly valuable. The group of vessel permit owners would be relatively small and clearly defined. They would have common interests in protecting the stock and excluding outsiders from the fishery. The owners of the vessel permits would have a stronger incentive to monitor other vessels to make sure they were not illegally fishing.

One disadvantage of limits on vessels rather than total catch by species is that the system is not responsive to particular species that might be overfished. If, for example, sea cucumbers are highly profitable but also in danger of overfishing, the limit on the number of boats will not protect the stock. Fishers will still focus on sea cucumbers rather than other, less stressed, fish stocks. Similarly this system does not encourage fishers to focus their effort in locations where the stocks are strongest.

Economically, systems with limits on the number of vessels will tend to lead to overuse of the vessels and introduction of more powerful vessels that can harvest more fish. Fishers will also be encouraged to fish throughout the year rather than focusing on the most profitable and safest seasons. An effective level of environmental control on overfishing will probably require very tight limits on the number of vessels. An ITQ system might have more vessels that are used in a more restricted but more effective way.

A third possibility would be to limit the number of fishers rather than boats or catch. The current system, where fishers must belong to a cooperative, is an example of such a system. The difficulty is that the existing number of registered fishers is enormous. If they all fished full-time the fishery would be rapidly destroyed. Many, however, are not really active in the fishery. They may fish part time or simply maintain the option for themselves or their children to fish. Suppose a tradable permit system were set up where every current member of the cooperative received a tradable permit to fish. If the cooperative or others wished to reduce fishing activity by reducing the number of fishers they would need to reduce the number quite considerably before they would have any impact on total fishing effort. The first "fishers" to sell their permits would be those who were not really fishing anyway. This is a difficult problem even when there are genuine proposals for full-time fishers to be paid to leave the fishery. For example, the Diving Association has proposed that a group of 50–60 divers be paid to stop fishing and move into creating a tourist diving operation. There is no guarantee that other fishers in the cooperative will not simply replace their fishing effort.

One way that cooperatives could gradually reduce their size would be to require that members are active fishers. Being "active" could be defined as having a certain number of days of fishing activity over every, say, three-year period. As long as fishing vessels or total catch were limited, this would not increase total fishing activity, but it would gradually separate out serious fishers from the part-time fishers and make the cooperatives smaller, more manageable groups.

A final option that arises quite frequently in discussions related to Galapagos is the idea that other economic opportunities should be offered to fishers to encourage them to leave fishing. Given the high level of danger in fishing and its poor economic outlook these could be popular. If the economic options of potential fishers could be improved it could also be environmentally effective. This would require clearly enforced restrictions on who can enter the fishery and a broad programme that benefits a wide range of fishers.

One particular proposal is to expand tourism on Isabela to take pressure off the local fishery. Would this be effective? Probably not, because the group who can fish from Isabela is not clearly defined. If some of them did find jobs in tourism and move out of fishing, other fishers would probably come from other islands to take their place. The total population in Isabela would increase and the level of fishing activity would not fall. In addition, it is not at all clear that local fishers would get the jobs in tourism. They are not necessarily trained for those jobs and may not find them attractive. It is more likely that the new tourism jobs would be filled by internal migration to Isabela from Santa Cruz and San Cristobal with no particular impact on fishing activity. Tourism could only displace fishing if fishers or their children were trained for tourism jobs and if the expansion in tourism were great enough to reduce the total supply of potential fishers in Galapagos as a whole. This could happen in the long run (assuming total population is effectively controlled) but is unlikely to be an effective strategy in the short run. It may take a generation or more to change education levels and focus so that local people are so much more heavily employed in tourism that they leave fishing voluntarily.

In summary, a combination of defining cooperative membership clearly, human and institutional capacity-building in cooperatives, improved scientific knowledge, and gradual reductions in the number of vessels and fishers is likely to be the most effective long-term strategy.

Regulation needs to be developed together with fishers, needs to be complemented by strengthened knowledge and institutions, and needs to be simple. In the short run environmental imperatives may require that these efforts are complemented with cruder forms of regulation, such as fishing seasons or gear restrictions, that protect the fishing stocks. As other forms of regulation become more effective these restrictions could be altered so they do not act as limitations on total effort.

7.4 Reduce impact of migration and migration controls

7.4.1 Reduce environmental impact of migration through protection and remediation

As economists, this is not an area of expertise for us. We will simply summarise some of the key points made by others more knowledgeable about this. In particular we draw heavily on suggestions put forward in Charles Darwin Research Station (2001).

7.4.1.a Environmental Protection

Given that the single largest environmental issue in Galapagos is introduced species, the most important protective measure would be better quarantine systems. Quarantine could be improved by increased use of controls in Guayaquil and Quito before people and goods enter Galapagos. Use of scanners and dogs would improve inspectors' ability to identify risky goods. Increased cooperation with the military and marine transport companies would close some current loopholes in the quarantine system. Improving education of inspectors and permanent residents, cargo transporters and tourist operators so that they understand why quarantine is valuable and what activities create the highest risks would probably reduce efforts to circumvent controls, reduce the transport of potentially risky items and increase support for the quarantine system. Creating a system to quickly identify and address new introductions could allow them to be controlled before they spread too far. Improving quarantine and the reaction to new introductions seems like an immediately valuable use of resources. Clearly it cannot avoid all risk but it can reduce it.

The second key problem appears to be the spread of species among the islands. Controlling transport between islands so that there is less movement, and so that people and goods that move are inspected to reduce the risk that they will spread species, could reduce this. Some islands, such as Isabela, are particularly vulnerable to introduced species. Avoiding large increases in population or activity on these islands, not introducing direct flights from the continent, restricting the ports that can be used for cargo vessels from the mainland, and minimising or controlling the impacts of transport from other islands might be particularly valuable in these cases. The economic impacts of any restrictions might be minimised by understanding why people need to travel between the islands and where possible providing alternative ways to achieve those goals. One suggestion was to improve telecommunications so that fewer people need to travel simply for meetings.

If severe restrictions on transport and development causes economic loss to the current population of the smaller populated islands (Isabela and Floreana), the populations are small enough that their aspirations could be relatively easily and cheaply met without development on the islands themselves. If the environmental cost of economic development on these islands is very high, any efforts to help these communities should be focused on the individuals in the existing communities, even if this involves helping them to move elsewhere, rather than on providing improved community services on the islands. Improving services will encourage people to stay and will encourage new people to move to the islands, thus exacerbating the environmental problems. Providing scholarships for education or grants to enable current residents to establish businesses or careers elsewhere could be more valuable to them and more effective in the long run.

Within each island, the spread of species could be reduced by avoiding the use of animals for transport and by encouraging landowners to control the pests on their land. Some people have suggested that landowners should be encouraged to expand agriculture onto land that is currently abandoned because it both reduces the pests (the land is in productive use) and reduces the need to import food. This idea, and particularly the part that promotes self-sufficiency in food, sounds like an expensive and possibly ineffective option and should be carefully compared to other, possibly more direct, ways to control the spread of pests from agricultural land.

Any new road, airport or port, and any new developments within the boundaries of the National Park increase the risk of species introduction and spread. Residential developments and abandonment of agricultural land also increase risk. Regional planning that takes into account the effects of new development on species transport would be valuable. Risks need to be clearly identified and weighed against the economic value of each proposed development. Where a development does go ahead, systems would need to be created or strengthened to minimise their impact. The costs of these systems should be borne by the developers.

7.4.1.b Environmental remediation

In some cases, avoiding environmental damage will be extremely expensive or impossible. Instead of pushing protection to the limit it might be better to use the resources for environmental remediation and accept a trade-off. For example, however careful we are about quarantine and rapid reaction, some new species will be introduced to Galapagos. Once a good quarantine and reaction system is established it might be better to spend additional resources on captive breeding, elimination of existing pests or restoration of habitat on abandoned agricultural land. This would be an ecological decision that should take into account the economic costs of different ways to improve environmental outcomes.

7.4.2 Reduce impact of migration controls on social well-being

In Section 2 we emphasised the pressure that the migration restrictions in the Special Law put on the economy and society in Galapagos. If these are not addressed effectively, either the Special Law will severely limit the potential of the Galapagos to contribute to Ecuador's development or the controls on migration will break down under intense economic and social pressure and environmental degradation will accelerate again.

In Section 7.1 we discussed ways to make the migration restrictions more flexible. These are a key way to reduce the economic and social pressure arising from limits on population. They could, however, be complemented using other policies. If none of the options in Section 7.1 can be implemented, these other approaches will be critical. Here we discuss three commonly raised possibilities.

7.4.2.a Education

Why is education important?

First, education is probably the fundamental driver of development. It is almost certainly the only truly effective way to raise local living standards and ensure that Ecuadorian citizens and Galapagan residents receive a higher share of the benefits that flow from the unique resources in Galapagos.

Second, when there are migration controls that constrain the local labour market, improved education can help avoid shortages of key skills that either paralyse developments that require these skills (such as high quality ecotourism) or push wages in specific areas to extremely high levels, creating resentment and making it impossible for ordinary local people to obtain certain services.

Third, people with better general education tend to be more mobile. They are able to find good opportunities in a range of places. Thus if they don't have skills that are specific to Galapagos and would be happy to live elsewhere they will be able to emigrate, reducing population pressure and allowing others with essential skills to enter.

Fourth, people with better general education are more likely to understand the importance of conservation as well as the actions needed to sustain it. As we will discuss in Section 8, improved local human capital is essential to build effective institutional capacity to regulate migration, tourism and fisheries, and for environmental protection and remediation.

How could the education of Galapagos residents be improved?

The first key thing is that we need to define the goals of improvements in education. In our discussions with people interested in the issues, all agreed that education was important but sometimes they had contradictory goals. Is the goal to facilitate emigration or build local human capacity without immigration? Is the goal to train people for specific well-defined tasks such as being tourist guides or to provide general skills that they can use in a wide range of ways to respond to changing labour market needs?

Partly the goals depend on the context. If migration control is extremely inflexible it will be critical to be able to train people for specific niches. One way to address the problem of goals when the overall context is uncertain (as it will continue to be) is to consider the roles of different types of education. Education happens both within and outside schools, formally and informally, and both in Galapagos and in continental Ecuador (or even overseas). Different sources of education have different roles.

It is extremely difficult to predict the needs of the job market in the short term, let alone the long term. This will be even more acute in a tiny economy such as Galapagos where the number of people in each job is very small and in many cases vacancies arise sporadically, as individuals retire or move away, rather than continuously. In modern economies most workers will need to have a number of different “careers” through their lifetime. This makes it risky to make the education too specific, particularly at an early level. School-level education should aim for excellence in general skills that can be applied in a wide range of jobs.

That said, in the specific environment of Galapagos where many jobs involve interaction with tourists or foreign researchers, additional emphasis on foreign languages and understanding of foreign cultures would probably be valuable for all students.

Teacher salaries in Galapagos are relatively high because of the Special Law. They are not linked, however, to teacher performance, and because of the migration laws there is little competition for teaching jobs. The quality of teachers could be addressed through teacher training or through performance assessment to identify and reward good teachers and remove poor ones. Bringing in temporary residents as teachers, particularly when they have specific language and cultural skills, could be valuable. They could teach students and also help with training of local teachers. One particular shortage is teachers who can teach English. Foreign temporary teachers could teach both students and teachers. Another problem is the poor quality of facilities and equipment. Teaching budgets used to be controlled by the Ministry for Education, but the state has significantly reduced its spending on education in Galapagos in recent years. INGALA is now investing in education reform.

Efforts are already underway to improve formal education in Galapagos. Integrated education reform has been going for nearly two years. It aims to redirect education to needs. Servicio Ecuatoriano de Capacitación Profesional is helping with capacity-building by providing instructors. An education study was done by the National Polytechnic, which would provide more ideas on useful approaches to improving both school and post-school education.

Once young people have a good basic education, post-school education can focus more on specific skills targeted at specific labour market niches. These skills could be provided through local training. For example, permanent residents are trained locally to be tourist guides. The wealth of local scientific knowledge available through the National Park and the Research Station and the need for local experiences and knowledge unique to Galapagos facilitate this. They would, however, still benefit significantly from much more detailed university level training in natural sciences as well as international experiences to improve their language skills and knowledge of and comfort with different cultures.

Tax breaks are available for training permanent residents (Title VI Special Law). The cost of the training can be deducted from income declared for value added taxes. Several programmes offer fellowships for permanent residents to study outside Galapagos. They are offered by the research station and jointly with INGALA and Instituto Equatoriano de Credito Educativo (five per year). One issue with these is that many students do not return to Galapagos. When training has the goal of filling local labour market niches, those who are trained at local expense should be encouraged to stay in Galapagos as long as they are needed. Fellowships for university study are too expensive a mechanism to encourage general emigration and would encourage only emigration of the most skilled locals. This problem could be addressed by making return for a given period a condition of the fellowship. Students would not necessarily have to return immediately after graduation, it might be valuable for them to get a couple of years of job experience first. They could be given the option of repaying the fellowship if they choose not to return. One way to do this is to make the fellowship a loan that is forgiven if the student returns to work for a long enough period of time.

A key decision is what skills fellowships are provided for. Analysis of persistent shortages in the local labour market could identify skills that are highly likely to be needed for a long period of time. These may not be glamorous university-level skills but could be skills needed by mechanics, secretaries, chefs, travel agents, and carpenters. Training that is more oriented towards trades might be provided through a combination of courses and apprenticeships that could be on the continent.

Relatively uneducated people cannot necessarily recognise the value of quality education or even its existence. It is critical that people can see the value of education and see that young people with better education get better jobs. Ideally parents and students will be critical consumers of education and will put pressure on institutions to help and encourage them to provide better service. Supplying better education will be much less effective if there is no demand and desire for improved education.

We are not education experts, but one key word of caution when putting extra resources into education is always to remember that the quality of education is at least as important as the quantity. Simply increasing teacher numbers, reducing class sizes, or providing local opportunities to gain tertiary qualifications will have little value unless they lead to real learning. Paper qualifications that are not backed by real skill are of no value to employers and in the long term have no value for their recipients either. Having more local opportunities to do university degrees through distance learning could be counterproductive if those who graduate find that employers still do not want to hire them. This is particularly important when considering whether to increase educational opportunities in Galapagos relative to facilitating study on the continent for Galapagan residents.

Who should pay for improvements in education and training?

Any policy to improve education and training requires resources. The design of the policy often defines who will provide those resources. Four considerations could suggest roles for different funders. First, key beneficiaries of improvements in the supply of specific skills are those who face staff shortages. Those who face the most critical shortages are currently applying for temporary residency permits to bring in workers from outside. If as part of this process they were required to contribute to the training of permanent residents (see the discussion of a “tax” in Section 7.1 also) they would have a reduced need for temporary resident workers in future. Tourism operators who currently employ many temporary residents but will be forced in future to employ more local workers might also be major beneficiaries from specific training programmes, so could be expected to contribute possibly by providing on-the-job training through apprenticeships.

Foreign companies capture much of the economic benefit from tourism in Galapagos. As one strategy to gain local benefit, these foreign companies could be encouraged/required to contribute to training. Their contribution would have short-term benefits to Ecuador through funding a useful activity; in the longer run, the skilled Ecuadorian workers that result would be able to work in the tourist sector and hence gradually capture more of the benefits of the unique resource. Foreign companies' most effective contribution may be through on-the-job training. Simply requiring that they employ locals would probably not be sufficient. They need to be encouraged to actively provide training.

Education will have some environmental benefits if it reduces pressure on the Special Law and hence facilitates population control. It might also have benefits through increased conservation awareness. These environmental benefits are shared globally but particularly accrue to Ecuador as owner of the resource. Thus there is some justification for additional government subsidies for education in Galapagos. There are tax subsidies for training in Galapagos.

Galapagos already receives nearly five times as much funding per student as the average on the continent, however.[100] The justification for central government funding arising from the environmental benefits that flow to Ecuador may be offset by equity arguments that would suggest that extra government spending should be focused on the most deprived Ecuadorian citizens. In addition, as we have discussed in Section 7.1, we need to be careful that policies aimed to reduce pressure on the Law do not make the Galapagos more attractive and hence increase migration pressure. Some of the increased education spending could come from within the Galapagos through redirection of existing resources and particularly subsidies.

[100] 1999 data from Sistema Integrado de Indicadores Sociales del Ecuador, SIISE, 2001.

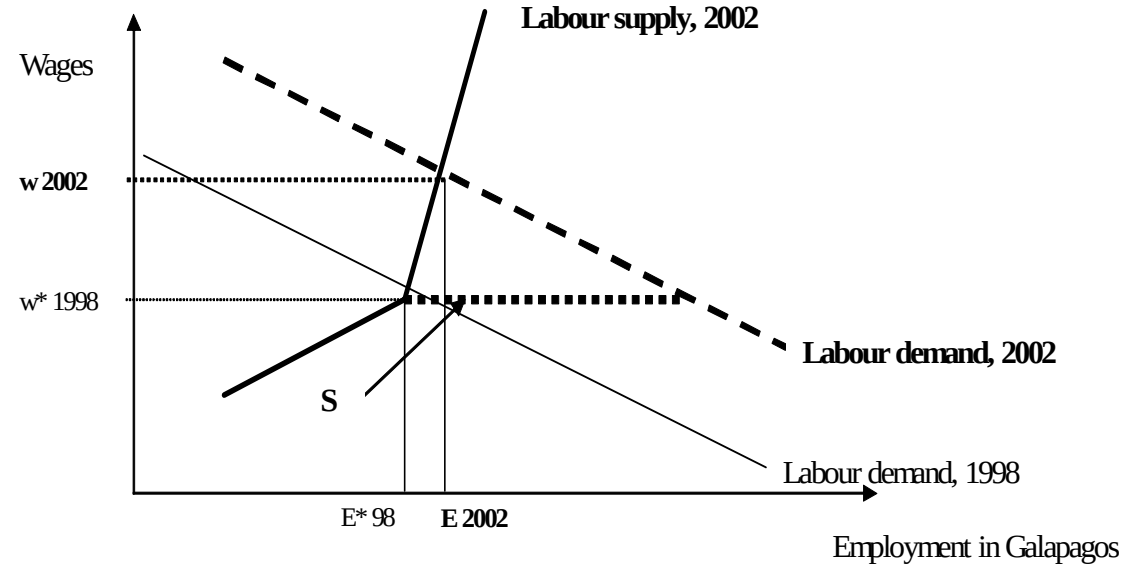
7.4.2.b Direct limits on wages or prices

In Section 2, Figure 11 showed the effect on local wages from restrictions on the labour supply caused by migration control. If migration control is inflexible, wages will need to rise a long way to match the local supply of skilled labour to the demand as economic opportunities and hence labour demand rises. If migration control were made more flexible wages would still rise but not so far.

People in Galapagos are beginning to notice increases in wages in some sectors, including construction and agriculture. These create problems for employers and consumers of those services. Two responses are proposed. The first is to allow more migration into these sectors. This would solve the short-term problem but in the long run undermines the purpose of the Special Law. The Special Law will gradually cause wages to rise in many sectors, not just these, and if the response is always to allow more migration, migration will not be controlled.

The second response is to legally limit wages in these sectors. As we see in Figure 18, a limit on wages at the 1998 level would lead to acute labour shortages if the demand for labour continues to rise. S is the 2002 shortfall between labour supplied and labour demanded at the 1998 wage level. It is likely that larger companies and those able to offer attractive non-wage conditions (e.g. training, health or pension subsidies or job security) would have first pick from the limited labour pool. The limited numbers of workers would not necessarily even be used where they are most valuable. What is worse, with wage limitations local people would have no incentive to train so they can do these jobs. The shortages would persist or get worse.

Figure 18: Effects of wage controls on labour market shortages



Wage limitations are a superficially appealing solution to an observable symptom of the migration controls but would be very damaging economically and possibly socially.

Direct limitations on the prices of goods produced by scarce labour would have similar damaging effects. If the goods cannot be produced outside of Galapagos and imported, shortages would arise. Any system for rationing the limited goods available would be economically inefficient and probably unfair.

7.4.2.c Increase participation of women in workforce?

One other policy that could ameliorate labour shortages would be to increase the labour force participation of those already in Galapagos. To a certain extent this would happen automatically if wages are allowed to rise, and as women get education that equips them for the labour market opportunities. It could be facilitated through increased emphasis on education of girls, on retraining programmes for women, and on removing barriers to labour force participation such as access to childcare. The main barriers are likely to be cultural. There are disadvantages to having more women working when they have children, which families will balance against the attraction of extra income.

Similarly as wages rise older people may tend to keep working longer. If they have skills that are scarce, this will reduce pressure on the labour market. Removing any barriers or disincentives for healthy older people to work if they choose could have value. Both of these are, however, fairly limited solutions to the problems of increasing labour demand with a relatively fixed population.

8 Capacity building needs

We have discussed capacity building at the individual level to address labour market shortages. To implement effective policies to reduce migration pressure and control population, specific individual skills are needed and some institutional development will be needed. Policies need to be designed to be effective given the capacity that exists but if it is possible to improve that capacity in clearly defined ways, the options for effective policy will broaden. Some essential policies are currently not implemented as a result of capacity problems.

Better capacity in institutions does not have to relate to more capacity. Increasing the number of people in policy roles, and the size of institutions, could in itself be a major contribution to migration. Bringing in outside consultants contributes extra visitors and more economic activity in the Galapagos and hence increases environmental risk.

Improving the quality of staff and institutions while minimising the quantity needs to be the clear aim. Several people have suggested that Galapagos has too many institutions for a group of islands with fewer than 20,000 people. A larger number of institutions will not necessarily provide better regulations and service. Duplication, lack of coordination and lack of concentration of resources are likely to arise when funding and related functions are spread among institutions. Resources may be diverted into unproductive competition among institutions. Reducing the number of institutions and the overlap of functions between institutions could improve their performance of those functions as well as directly reducing population pressure and pressure on labour markets.

8.1 Capacity needed for migration control

We discussed the capacity needs for more effective migration control in Section 2.3. The basic need is for a good registry of permanent and temporary residents, a system for tracking entry and exit of all people and enforcing compliance with the regulations, and a good process for deciding who should gain temporary residency. INGALA is currently addressing these needs. The quality of the infrastructure they create should continue to be monitored, as it is the linchpin of any migration control system.

8.2 Capacity needed for effective regulation of economic activities

We have discussed regulation in three main economic areas—land use, tourism and fishing. Capacity to regulate tourism through the National Park seems to be well developed, though the roles of other institutions may need to continue to be harmonised. The capacity to regulate and promote local tourism is more poorly developed and needs attention.

Fisheries face a serious problem of lack of capacity, particularly in the areas of research and the ability of fishing cooperatives to contribute to the design and implementation of regulations. Stronger definition of the role and membership of cooperatives and reductions in the total number of fishers would help them to build their own institutions. Providing some expert assistance and direct training on design and implementation of fisheries regulation and continuing the processes of active participation by involving fishers in decisions will continue to raise capacity.

To an outsider it appears clear that Galapagos has too many municipalities and government bodies involved in regional planning and provision of local infrastructure given the very small population. Many of the municipal functions could be combined. This would not only reduce the need to duplicate skills but would ensure harmony and coordination of services across islands within Galapagos.

For example, one institution could easily control water supply. If the number of institutions were reduced, the ratio of communication and consultation time to actual implementation would fall. Training of staff would be more productive because the training resources could be focused on a smaller number of staff who would each have greater influence and control in their area of responsibility.

While formally combining municipalities might be legally and politically difficult we understand that there are no legal barriers to agreements to share responsibilities so that one municipality takes responsibility for one function and another for another. INGALA could coordinate this if necessary. INGALA legally controls work done and money spent by municipalities. They have chosen to exert indirect influence, for example, by hiring a consultant who works with all parties. They might want to put some effort into simply reducing the number of relevant parties where possible and most valuable.

In general the multiplicity of organisations makes any progress on regulation difficult and costly. It makes it difficult also to identify the extent of subsidies to Galapagos because there are so many channels for indirect subsidy. It will tend to lead to overregulation, with many different, possibly conflicting, rules. When regulation becomes too complex it either stifles economic activity or the regulation is ignored in practice. Reducing the number of institutions may be difficult because the Galapagan regulatory structure simply mimics that in other provinces but it would be worth investigating whether functions could be combined either formally or informally.

Finally, quarantine is another area where increased capacity would be enormously valuable. Improvements in border control would have direct environmental benefits.

9 Summary and recommendations

In the body of this report we first identified the goals and problems (symptoms), then analysed the sources of problems and potential for achieving goals (diagnosis) and finally used our analysis to derive ideas for changes in policy that would effectively move toward the goals (prescription).

9.1 Identify symptoms of concern and define clear final goals

We began by exploring the current legal, administrative and statistical information on migration and population growth. Drawing on written and statistical sources as well as interviews, we identified the issues of current and potential concern and the basic goals that all share in their concern about migration and the environment in Galapagos.

We found that it was very important to separate final goals from intermediate mechanisms aimed at achieving those goals. Migration is not the only problem, nor is migration control the final goal. Population increase does increase environmental pressure but it only partly results from immigration; it is also strongly affected by natural increase and low levels of emigration.

We also found that some environmental problems result from poor regulation unrelated to population. Regulations aimed at controlling migration were themselves creating economic and social problems that would ultimately undermine them. Without addressing the problems faced by the people who are able to control the environment in Galapagos, the Galapagan residents and, more broadly, Ecuadorians, we consider that we cannot effectively address the environmental issues. While this paper focused on migration, we sought to put it in the context of the wider issues.

Thus we defined the social goals this study aims to help achieve as:

1. protect and enhance the unique environment in the Galapagos
2. promote the welfare of people throughout Ecuador by making the best possible use of the resources in Galapagos

3. promote the welfare of the residents of Galapagos to gain their active support to create a sustainable future and to reward them for their efforts.

9.2 Diagnose problem

Once we had a clear idea of the goals and problems, we worked to diagnose the sources of those problems. We began by summarising the theory about what drives migration. We then applied these ideas to the particular situation in Galapagos. Our analysis suggests that the Special Law can have strongly positive effects on the environment and create useful infrastructure. It also, however, creates problems of its own and needs to be complemented with additional efforts.

Without further efforts to improve regulation, local wages for some occupations will rise steeply, putting increased pressure on illegal migration and efforts to subvert the application of the law. Local prices will rise, creating local resentment and increased inequality as only some groups benefit from higher wages. Skill shortages will intensify, limiting the development of the local economy and particularly of key sectors such as tourism. This will lead to loss of economic benefits both for local people and for Ecuador as a whole. Our empirical analysis combined with statistics on the characteristics of immigrants and emigrants (Table 6) both suggest that up until 1998, immigrants tended to be skilled people coming from large cities, while emigrants were often leaving for higher education, training or employment opportunities on the continent. These flows were healthy for the Galapagan economy and society; hindering them through inflexible regulation would create economic and social stagnation.

We found very high levels of subsidy for a number of activities. These subsidies not only make the economy in Galapagos more active and life there more attractive, thus encouraging migration, but also encourage environmentally perverse behaviour such as excessive travel and fossil fuel use. We found relatively good regulation of tourism, the largest sector, though with some potential for improvement, but quite poor regulation of fisheries. The problems with regulation have made migration more attractive in the short term (before the resources are degraded) and also lead to direct environmental damage.

9.3 Identify possible solutions: Recommendations

The Special Law was an important step. It creates a basis on which other policies can be built. Here we simply list policies that we believe should be implemented or explored further. The details of the policies, their justification and their advantages and disadvantages are discussed in Section 7.

9.3.1 Policies that directly control population

Enforce existing law and regulations, especially:

- tracking and deporting of illegal residents
- enforcing guarantee system for temporary residents.

Directly reduce labour demand:

- Improve efficiency of public services to minimise staff.
- Minimise research staff who work on site and trips by NGO and government officials through careful consideration of which activities must be carried out in Galapagos and which could be done elsewhere.

Explore possibility for:

- creating a “point” system to assess potential temporary migrants in a less discretionary way.
- implementing a “tax” system through requirements for employers of temporary residents to provide local training or funds for local training. The tax would allow other regulations on entry to be relaxed so the process for controlling temporary migration involved less discretion.

Explore possibility of creating a tradable residency system, specifically:

- legal possibility of renouncing permanent residency
- use of permit system for temporary residency
- leasing but not sale of permanent residency permits
- sale of residency permits in a few discrete cases.

9.3.2 Policies that reduce the migration pressure that arises directly from government subsidies

Reduce subsidies where possible:

- Reduce fuel and electricity subsidies.
- Restrict TAME subsidies to one flight per resident per year and medical emergencies.
- Increase effectiveness of tax collection in Galapagos to make services more self-funding.

Redirect subsidies:

- Target subsidies more toward permanent residents and poor. Focus on the original purpose of the subsidies. For example:
- use more funds for school-level education and basic health services.
- Use electricity subsidies to promote use of renewable energy rather than to subsidise consumer prices.
- Redirect subsidies to quarantine and conservation where possible.

9.3.3 Policies that reduce the excess migration pressure and adverse environmental effects arising from poor regulation of economic activities including tourism and fisheries

- Strengthen land-use regulation through improved regional planning processes.

Tourism:

- Regularly reassess charges for tourists and tourism operators.
  - Are levels appropriate?
  - Should charges vary more by activity and length of stay?
- Improve control of local tourism.
  - Enforce the same environmental rules as for larger tourist operations.
- Apply ongoing attention to itineraries, form of transport, and pressure on guides to help avoid species transfer.
- Explore the possibility of total tourism limit with transferable permits.
  - Could be based on existing quota system.

- Tourism operators could be required to meet environmental standards as well as being required to own quotas

- Train locals to bring more benefit from tourism to residents of Galapagos.
  - Business management.
  - Tourism skills: languages, hotel management, catering, ecology/conservation.

Fisheries:

- Strengthen cooperatives by:
  - Reducing numbers or creating preferential membership for active fishers.
  - Continuing capacity building in cooperatives.
- Explore possibility of creating an Individual Transferable Quota System in the long term.
  - Assess scientific research programs to see if they are collecting necessary information.
- Explore short-term possibilities for creating tradable quota system for vessels.
  - Buy-back program for vessel quota as part of establishing tradable quota system.
- Strengthen short-term regulations to protect stocks. For example:
  - make fishing seasons appropriate to biology of species as well as to limit catches and be consistent from year to year
  - use gear regulations to protect species in a biologically appropriate way as well as reduce efficiency (to discourage fishing) in the short term
  - possibly relax regulations to serve only a complementary function as more efficient regulations are implemented.

9.3.4 Policies that directly mitigate the environmental effects of economic activity and population growth and the adverse effects of migration control

Environmental Protection:

- Strengthen quarantine system and system for rapid response to accidental species introduction.
- Explore ways to minimise travel among the islands, e.g. improved telecommunications.
- Direct any assistance for less populated islands toward the people who are already resident (whether they continue to live there or not) rather than to general development and services on those islands.

Reduce social impacts of migration control:

- Make migration control more flexible.

Education:

- Improve education in schools.
  - Emphasise general skills that could be used anywhere but with special emphasis on languages, conservation and foreign cultures.
  - Use temporary residents as language teachers and to train local language teachers.
  - Introduce performance-related rewards for particularly good teachers rather than raising all salaries and conditions.
- Improve education for adults—post-school.
  - Fund some improvements in post-school training through “taxes” on foreign companies and employers of temporary workers.
  - Focus post-school training on locally needed skills.
  - Use scholarships for training outside Galapagos for less glamorous “trade” skills as well as for university education.
  - Make each scholarship a loan which is non-repayable only if students return to work in Galapagos.
- Emphasise *quality* of education.
- Avoid direct limits on wages and price; these would exacerbate problems.

9.4 Implementation and capacity building

- Emphasise institutional quality, not quantity/size.
- Reduce the number of institutions involved in regulation if possible.
- Strengthen local participation and self-regulation, e.g. fisheries cooperatives, involvement of community in regional planning.
- Strengthen quarantine system.

9.5 Further studies that should be conducted to more accurately inform policy makers

Two critical areas arose repeatedly in discussion and during analysis and we were unable to address them sufficiently. The first is a better understanding of the demographics of the permanent resident population so that we can project the natural increase in the population. In future natural increase may be more important than migration.

The second is the commonly floated idea of agricultural self-sufficiency as a way to address the problem of introduced species spreading from agricultural land. We are somewhat sceptical that this would be an effective or economical approach to this problem. It may also create significant unanticipated problems. Before any moves are made in this direction this policy and alternative ways to address the same problem should be carefully explored.

Many of our recommendations take the form of “explore…”. Many others need more investigation before a decision could be made on whether and how they should be implemented. We will not repeat the list here. This report covers a wide range of issues so cannot cover any in real depth. In addition we are outsiders and good policy design requires local participation and local information. These are suggestions for directions that we feel would be valuable to explore with more applied research. All the information collected for this project is available in Appendices or on disk so that future researchers will not need to replicate our work but can move forward to develop a range of effective, equitable policies.

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Appendix A: Data Appendix

Table A1: Passengers moved to and from Galapagos (in thousands)

Tourists	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Foreigners	25	30	38	44	32	42	46	32	40	42	57
Domestic	32	29	26	33	34	41	37	27	24	35	45
Residents	15	13	10	13	15	17	19	17	25	50	44
Total	**73**	**73**	**75**	**89**	**80**	**100**	**102**	**75**	**89**	**128**	**146**

Note: These numbers do not include passengers transported with special tariffs, group tariffs, promotions, or courtesy tariffs.

For the majority of the data used in preparation of this project see the file Galapagos_data.xls included on CDROM with the paper, and available at http://www.motu.org.nz/dataset.htm.

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