State of Israel
Ministry of Environmental Protection

המשרד להגנת הסביבה
الوزارة لحماية البيئة
Israel Ministry of Environmental Protection

Israel's Fifth National Report to the United Nations Convention on Biological Diversity

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Executive Summary

The fifth National Report on the implementation of the Convention on Biological Diversity in and by Israel was prepared by the Ministry of Environmental Protection. The report covers the years 2010-2014, and has been organized according to the guidelines provided by the Convention.

It starts with a short introduction, describing biodiversity and legislation in Israel, and continues in three parts:

Part I - An update on biodiversity status, trends, threats and implications for human wellbeing

The main findings on biodiversity status are that the state of the coral reefs in Gulf of Eilat has improved in terms of cover, but recruitment is still low. For terrestrial ecosystems, a new National Biodiversity Monitoring Program has been established, which for now shows mostly baseline data and no trends. An exception is remote sensing analysis of woody vegetation cover, showing that during 2000-2013, in 27% of the areas vegetation density had increased, and in 7% of them it had decreased, in part due to fires and in part due to a long drought in the Mediterranean part of the country. Specific monitoring of various endangered species shows mixed trends. As for threats, it was found that habitat loss and fragmentation continues at the same rate as in the former report, and is still the main threat for terrestrial biodiversity. Other environmental pressures, such as sea pollution, have remained steady or decreased over the years. Invasive alien species are still an issue, and the main challenge is in preventing the entrance of new invasive species. There is an ongoing National Ecosystem Assessment, and preliminary results show that many important ecosystem services, such as freshwater regulation, have deteriorated. This assessment is novel in evaluating the importance and uniqueness of the services provided by the desert ecosystems, among which are the regulation of soil erosion and air quality, delivery of medicinal plants, and spiritual services.

Part II: The NBSAP - its implementation, and mainstreaming of biodiversity

This part provides an overview of the implementation of the 2010 NBSAP. A revised NAP is in preparation with updated targets corresponding to the Aichi targets. The implementation of the 2010 NBSAP seems partial in most areas. The report focuses on progress made in declaration of new protected areas, declaration of Israel's second biosphere reserve, and mainstreaming of ecological corridors and other ecological considerations into regional planning.

The main progress in mainstreaming in recent years has been in establishing the Open Areas Conservation and Rehabilitation Fund, by the Israel Land Authority – dedicating 1% of land sales revenue to projects on open areas and biodiversity; integrating biodiversity into Israel's Climate Change Adaptation Strategy, and new guidelines and pilot projects has also been established in the agricultural, forestry and infrastructure sectors. Additionally, Israel has adopted a Green Growth Strategy.

Considerable progress has been made towards promoting the knowledge base on biodiversity. The main achievements are establishing the Israel Natural History Museum and HaMaarag – Israel's National Nature Assessment Program. The National Ecosystem Assessment is currently being carried out, the National Terrestrial Biodiversity Monitoring Program is now functional, and periodical State of Nature reports are being prepared.

Public awareness to environmental issues is on the rise, as shown by the increase in number of environmental NGOs and by the success of the Green School accreditation program.

Part III: Progress towards the 2020 Aichi Biodiversity Targets and contributions to the relevant 2015 targets of the Millennium Development Goals

This part reviews the progress made by Israel towards achieving the 2020 Aichi Biodiversity Targets and the future challenges for implementation. It provides an overview of programs and actions in relation to all targets.

The progress made on **SG1 – mainstreaming biodiversity across government and society** includes the Green School program, funds like the Open Areas Conservation and the Rehabilitation fund, and the Green Growth governmental strategy. Sectorial sustainable development plans have been prepared by several ministries and governmental companies. The Ministry of Agriculture established a new Agro-ecology department to deal with the interfaces of agriculture and environment. A Strategic Environmental Assessment of the marine environment, including an assessment of ecosystem services and their values, is performed by the Ministry of Infrastructure. NGOs take a leading role in educational programs on biodiversity for the public.

SG2 – Reducing direct pressures on biodiversity and promoting sustainable use. A new country-wide mapping of essential ecological corridors was carried out, and its mainstreaming into regional planning had commenced. Regulation on river and marine pollution is being continuously implemented. Plans for sustainable fisheries are currently being formulated by the Ministry of Agriculture. New guidelines for forest management and some pilot projects on environmentally-sensitive agriculture had commenced. There are guidelines and projects to eliminate and monitor invasive alien species of plants. Anthropogenic pressures on the coral reefs are reduced so that their state is improving.

SG3 – Improving the status of biodiversity by safeguarding ecosystems, species and genetic diversity. New terrestrial protected areas are declared annually, and for terrestrial ecosystems they already exceed the Aichi target. A new biosphere reserve was declared. A new master plan for marine protected areas, which currently are still limited in area, was formulated.

Reintroduction and conservation programs for endangered species, including a new strategic plan for the Red List plant species, are produced and implemented, and an endemic amphibian species thought to be extinct has recently been rediscovered. A seed collection of most wild plants of Israel is maintained in the Israel Gene Bank. Restoration and rehabilitation plans are now implemented in degraded ecosystems, such as polluted rivers or quarries.

SG4 – Enhancing the benefits to all from biodiversity and ecosystem services; and SG5 – Enhancing implementation through participatory planning, knowledge management and capacity-building. New facilities for knowledge base were founded and are currently operational – the collection-based Natural History Museum in TAU, the new national biodiversity monitoring and ecosystem services assessment institution (HaMaarag). The NBSAP is in process of adaptation to the Aichi targets.

However, there are still gaps in implementation, e.g., testing the effectiveness of public awareness indicators, incorporating ecosystem services values into national accounting, phasing out existing harmful incentives and subsidies in agriculture and housing. Habitat loss and fragmentation continues to be the highest threat for ecosystems. The fishery reform has not been implemented yet. Afforestation management has improved, but there are still conflicts with biodiversity conservation, mainly in semi-desert and desert areas. Comprehensive legislation should be enacted on the prevention and treatment of invasive species, and more emphasis should be made on containment of existing animal invasive species. Better protection of the Mediterranean Sea habitats, and better representativeness of ecosystems in terrestrial protected areas are desired. The status of many endangered species is still deteriorating, and gaps in the law and regulations should be narrowed – especially for freshwater fish and for plants. Israel should consider joining the Nagoya Protocol, and there should be mobilization of financial resources for the implementation of the new national action plan.

Regarding contribution to the **Millennium Development Goals**, Israel is presently in a process of implementing the Green Economy Strategy to ensure its environmental sustainability; this may further contribute to the closure of gaps in the implementation of the Biodiversity Convention by Israel.

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0.1. Introduction

Israel ratified the Convention on Biological Diversity in August 1995. Since Israel is a developed country, in terms of both its scientific and technological development and its nature conservation and environmental experience (including law enforcement, management and research), it expects to take an active part in the implementation of the Convention.

For a small country, Israel has a high degree of biodiversity, notably for migratory birds and marine species. A variety of factors pose serious challenges for its conservation, including habitat reduction/substitution fragmentation, invasive species, pollution and overexploitation of natural resources. Relatively large shares of fauna and flora species are threatened, especially mammals, and the size of coastal and other ecosystems has decreased due to development. However, progress has been made in reducing pressures on aquatic ecosystems from river pollution, improving coral condition in coral reefs habitats and enhancing habitat protection. Israel has extended protection to a relatively large share of the total area, but some of the nature reserves and parks individually are too small to adequately fulfill their protection function, and collectively they do not represent the country's range of ecosystems. Substantial progress has been made in establishing national institutions and programs for taxonomic research and for biodiversity monitoring. Mainstreaming into sectorial policy had commenced, but much remains to be achieved. Policy and institutional coordination also remain a challenge. The 2010 National Biodiversity Strategy recognizes that economic development and biodiversity conservation objectives can be compatible, and provides a good basis for mainstreaming biodiversity considerations into all policy domains, including through greater recourse to economic instruments (e.g., agro-environmental schemes and tradable fishing quotas).

0.1.1. Biodiversity

Israel is rich in ecosystems, species and genetic biodiversity, as has already been demonstrated in the first report to the Convention. For example, there are approximately 2,780 plant, 7 amphibian, 96 reptile, 511 bird and 116 mammal species. Plant species richness per area is much greater than in California or other Mediterranean or European countries. This great diversity derives from Israel's location at the crossroads of bio-geographical regions, with typical climatic conditions, varied topography, geomorphologic structure, rock and soil types providing a variety of habitats, each with its own typical fauna and flora. Thus, the scarcity of wetlands is reflected in the dearth of amphibians, as opposed to the wealth of reptiles.

Historical and geological events in the area have enhanced the diversity. The Pleistocene era, with its strong climatic changes caused by glacial and interglacial periods, left many relics of African invasions through the Rift Valley to the Dead Sea region, the lowest in the world, as well as invasions from the cold north to the high mountains in the northern part of Israel. A long history of human activity of cultivation, domestication and active landscape changes enabled the introduction of other species, and the economic utilization of local species.

0.1.2. Responsibility

The Israel Ministry of Environmental Protection (hereafter MoEP) is responsible for the protection of the environment; this ministry is also responsible for the Israel Nature and Parks Authority (INPA). Recognition of the need to protect natural and landscape resources led to the enactment of the National Parks and Nature Reserves Law already in 1963. The Nature Reserves Authority, established in 1964, was given a mandate to preserve and develop nature reserves and natural assets, protect wild animals and plants, safeguard the quality of the landscape and maintain its beauty.

0.1.3. Legislation

The 1963 law was revised in 1992 and in 1997, and provides the main present legal structure for the protection of natural habitats, natural assets, wildlife and sites of scientific, historic, architectural and educational interests in Israel. It provides for the establishment of nature reserves and for the designation of protected natural assets. The law prohibits the taking, destroying, possessing or trading of protected natural assets except with the permission of the Authority.

The Israeli law defines a nature reserve as an area containing unique and characteristic animal, plant and mineral forms which must be protected from any undesirable changes in their appearance, biological composition or evolution. National Parks, which also play a role in preserving open spaces in Israel, are defined in the Israeli law as areas of natural, scenic, historic, archeological or architectural value that are protected and developed for recreational purposes. Both kinds of protected areas serve to safeguard the natural landscape from rapidly-encroaching urbanization. Outside the confines of the nature reserves, hundreds of plant and animal species, as well as inanimate natural assets such as fossils and beach rock, have been declared "protected natural assets".

The Wildlife Protection Law of 1955 proved to be an effective instrument in the protection of wildlife in Israel. This law, designed to protect birds, mammals, reptiles and amphibians, has been responsible for the recovery of many dwindling species. The population of the mountain gazelle, as well as of other species, has increased from few hundred to several thousand as a result of legal protection and enforcement. It defines protected wildlife as any animal that has not been designated as a "pest" or "game". The law requires a hunting license for game hunting or for the extermination of pests, and prohibits the hunting of protected species except by special permit and for the specific purposes listed in the law. In addition, the law prohibits certain methods of hunting, including the use of traps, explosives, poisoning, and shooting from a moving vehicle. Hunting of game and pests is restricted to the hunting season and to limited areas, and requires a license and strict compliance with established guidelines

The Planning and Building Law (1965) sets the legal framework for all development and land use in Israel, and serves as the basis for environmental policy. All development is subject to the approval of statutory planning boards.

Part I:

An update on biodiversity status, trends and threats, and implications for human wellbeing

Q1 Why is biodiversity important for the country?

1.1. The importance of biodiversity to Israel

Israel, a small country, is mostly arid and poor in natural resources. The increasing population pressures, industrial development and economic growth to which it is subjected have negative environmental implications. Thus, environmental awareness and efforts to conserve nature have recently become more prominent on the national agenda, although nature conservation has been well-established in Israel for many years, including law enforcement, management, leisure, research, and education.

The importance of biodiversity to the people in Israel has increased in recent years, as part of the realization of the scarcity of various ecosystems and their services in providing areas for leisure activities, recycling of nutrients and water, food provision to meat and milk production, and other key components for cultural services.

The Mediterranean part of Israel has been a source of agricultural cultivation of plants and animals. No fewer than twenty five species of wild progenitors of edible plants with very restricted global distributions exist in natural habitats in the Mediterranean part of Israel. In the wild, these plants are continually exposed to the environmental change, and their genetic constitution is incessantly molded by the forces of natural selection. Therefore, environmental management and conservation is, in effect, preserving assets of global economic value.

The southern, desert part of Israel has its own significance. It consists of a transition from the extreme desert to the steppe, with all of the related fauna and flora. It is the closest and most accessible desert to Europe and its tourist-producing populations, and has touristic and recreational value. This asset can only be preserved if it continues to function as a natural desert, i.e. if the natural ecosystems of this region maintain their typical structure and proper dynamic processes.

1.1.1. Awareness and scientific research, some reports on studies

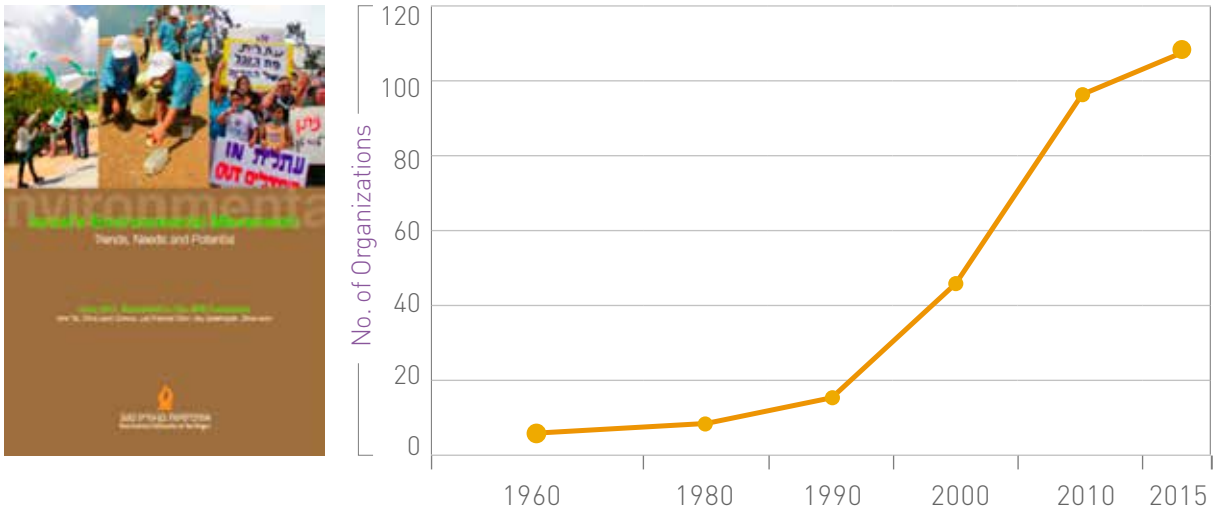
So far, awareness to biodiversity issues has not been measured, but the interest in environmental issues has clearly grown in Israel in recent years among policy makers, legislators, researchers in academia, decision makers in local systems, educators, and members of social and environmental organizations who work vigorously in the Israeli environmental arena.

The interest of the general public was studied by Bendas-Jacob et al. (2012), who found that in general, most of the sectors in Israel are concerned with environmental issues. This is also reflected in some other, more specified reports, as follows.

1.1.1.1. A report on the environmental movements and their trends

Awareness to environmental issues is demonstrated by the considerable increase in the number of environmental organizations in recent years, as shown in Fig. 1.

Figure 1 The number of environmental organizations in Israel over the last decades



1.1.1.2. A report on the biodiversity research

Figure 2 Biodiversity researchers divided by broad scientific disciplines (from (3))

The importance of biodiversity initiated a report on the biodiversity research in the universities and high educational institutes. The report, sponsored by the Israel Academy of Sciences, emphasized the importance of biodiversity, and its recommendations were:

1. Significant increase in the number of academic positions in biodiversity, in particular within specific, highly vulnerable sub-fields (see below).
2. New fellowships and study programs in the field of Biodiversity.
3. Participation of biodiversity scientists in all relevant decision-making forums and committees.

1.1.1.3. The most important questions on biodiversity.

In 2011 a multidisciplinary workshop was organized by S. Kark, the Biodiversity Research Group of the HUJI, to formulate the 50 most important research questions on biodiversity and policy for Israel. The results of this workshop were published in 2012 in Hebrew. A worldwide comparative analysis was recently published (Kark et al. 2016).

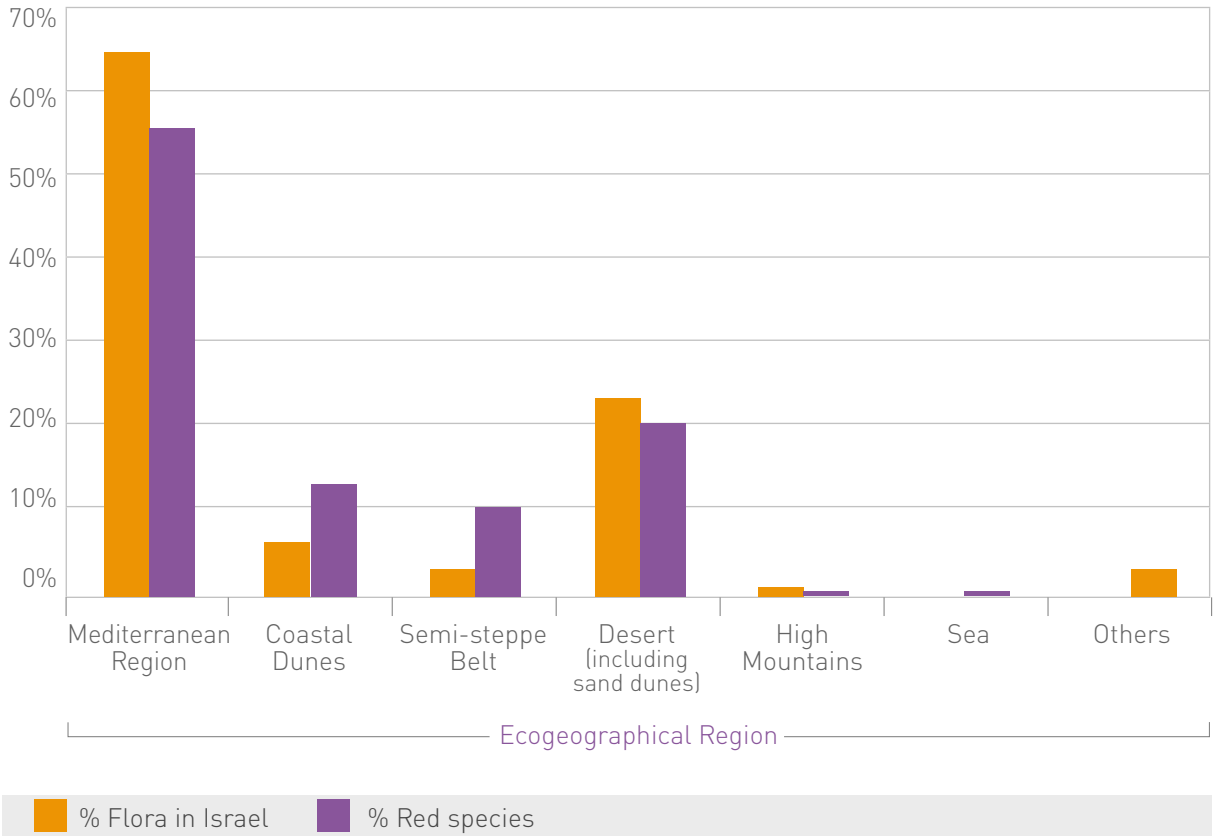
1.1.2. The diverse ecosystems of Israel

Israel is a meeting point between three continents – Europe, Asia and Africa; two seas – the Mediterranean and the Red Sea; and two climatic regions – the Mediterranean

region in the north and the desert in the south. The central part of Israel is a transitional area where peripheral populations from the north, south and east meet. Five different ecological bridges cross this meeting point from north to south. In the sea, the man-made Suez Canal bridges between the Red Sea and the Mediterranean. In the air, birds, bats and insects migrate between the continents. Along the sea shore, populations of sand animals and plants connected with the Saharan populations in the south encounter those from the northern Mediterranean. The mountain ridge connects southern, eastern and northern populations of animals and plants, and the Arava and Jordan Valleys connect tropical or Ethiopian populations with European ones. Along these bridges, movements of organisms take place, e.g., marine biota or bird migrations with gene flow between populations; as well as changes in geographical ranges of species, provided continuity of the passages is maintained, with no interruptions in the habitats of the species. Israel and other countries of the Levant are a main migration route for Palearctic birds and the terrestrial meeting point for biota from Europe, Asia and Africa.

Shmida et al. (2011, (5)) showed that flora (number of species) in Israel is distributed unevenly between the ecoregions, of which the Mediterranean contains more than 60% and the endangered species are distributed similarly (Figure 3).

Figure 3 Distribution of all plant species and red species among Israel's ecoregions (from (5)).



1.1.3. The main ecosystems in the country

There are many classifications of ecosystems in Israel, most of which are based on the representation of the 5 main bioregions existing in Israel – the Endemic, the Palearctic or Mediterranean, the Saharan, the Steppe and the Ethiopian. Here the ecosystems are broadly classified into 7 types to include unnatural ecosystems.

1.1.3.1. Woodland and shrub land ecosystems

Woodland and shrubland ecosystems once extended over most of Israel's regions in which a Mediterranean climate prevails, constituting a mosaic of patches of Mediterranean-type vegetation affected by spatial and temporal dynamics, and driven by management practices such as livestock grazing, firewood exploitation, prescribed fires, and crop cultivation. It is common for shrubland ecosystems to be transformed to woodland ecosystems and vice versa, depending on the human-driven use of these two mutually replaceable ecosystems, each with its own specific biodiversity and service provision. Large areas that previously constituted these ecosystems have been transformed into agricultural and urban ecosystems. In areas where the ecosystems have not been transformed, active management is required to maintain most of the biodiversity and services. Such management generates and maintains an optimal spatial mosaic of woodland, shrubland, agricultural and urban ecosystem patches. Each of the ecosystems in this succession is characterized by biodiversity and service provision specific to it. Management of these ecosystems aims to restore the historic spatial mosaic through controlled grazing, clearing and prescribed fires, and promotes the services of water provision, soil conservation and flood regulation. A sizeable portion of the natural Mediterranean type ecosystems in Israel have been transformed to planted forests, mostly pine, which intensify cultural services – especially recreation, but also soil conservation and flood regulation services – at the expense of services provided by the natural forests and shrubland ecosystems they replaced, such as forage provision, pollination and maintenance of rich biodiversity.

1.1.3.2. Coastal ecosystems

Most of the coastal region of Israel is currently comprised of agricultural and urban (or built-up) ecosystems. Nevertheless, in the remaining areas, a few unique ecosystems with a relatively rich biodiversity survive. The coastal ecosystems and their biodiversity are dominated by herbaceous, shrubby or woody vegetation, depending on the diversity of the coast's physical infrastructure (eolianite ["kurkar"] ridges, kaolinite clay ["hamra"] soils, or sand dunes of various degrees of stability), as well as on local variations in the coastal wind regime with its wind-transported saline sea spray. Stable dune ecosystems and shifting sand ones can transform between one and the other, and absolute protection of shifting sand ecosystems transforms them into fixed ones. Each of the two ecosystem types is endowed by its own unique biodiversity.

1.1.3.3. Desert ecosystems

The Israeli desert, comprising more than half of the State's area, encompasses several ecosystem types that differ in the degree of their aridity, their elevation above sea level and their land infrastructure, i.e. physical and climatic differences that reflect on differences among them with respect to their biodiversity. Despite those differences, all desert ecosystems are characterized by low biological productivity, and are severely constrained by water availability, which is the main reason for the low vegetation cover relative to all other ecosystems. Biodiversity in the more arid ecosystems contain a significant component of the Sahara and Arabian deserts; and in those of lower aridity, a large part of that component is replaced by that of the Asian deserts. Biodiversity of the desert oases also includes components typical to tropical Africa. Apart from the suite of supporting services, the desert ecosystems provide a wide range of cultural services, partly due to specific biodiversity components such as herds of Nubian ibex concentrated around permanent water sources, as well as hundreds of thousands (if not millions) of birds of prey and other birds that cross the Israeli desert during their seasonal migration.

1.1.3.4. Freshwater ecosystems

Freshwater ecosystems include a relatively large number of small natural and artificial water bodies, a few swamps around springs, ephemeral winter ponds, many ephemeral and a few perennial rivers, most of which are still polluted. For a country mostly dominated by a dryland climate, the value of the services of this ecosystem is high – especially water provision, purification and regulation services, but also cultural services and the service of supporting a rich and unique biodiversity highly exposed to the most ominous threats. Nearly all the swamp ecosystems have been transformed to agricultural and urban ecosystems, and the water provision services of most other freshwater ecosystems have been intensified at the expense of cultural services and biodiversity maintenance services. Many components of the biodiversity of freshwater ecosystems are currently exposed to the threat of extinction. Alternative water bodies are constructed mainly for the purpose of supporting biodiversity components that provide cultural services.

1.1.3.5. Marine ecosystems

The marine ecosystems in Israel provide a diversity of cultural services due to their unique biodiversity component. The marine biodiversity of the Mediterranean and Red Sea coasts of Israel are poorer and richer than that of many other parts of these seas, respectively. Apart from the service of food provision (commercial fisheries), the marine biodiversity provides cultural services (angling in the Mediterranean, coral reef tourism in Eilat), and possibly also coastal protection against storm impacts and erosion (the calcareous component of the coastal marine biodiversity – encrusting calcareous snails in the Mediterranean, coral reefs in Eilat). At the same time, Israel's marine biodiversity is vulnerable to a wide range of threats. The Mediterranean biodiversity is exposed to an increasing invasion of Red Sea species, projected to intensify due to global warming and the new Suez channel.

1.1.3.6. Agricultural ecosystems

Even though the agricultural sector's share in the Israeli economy is quite modest, the transformation of about 20% of the total area of all of Israel's ecosystems to agricultural ecosystems (which consume approximately 40% of the water provided through all other Israeli terrestrial ecosystems combined) has been instrumental in molding the landscape of the Israeli countryside, as well as the country's national ethos. Soil biodiversity constitutes a biodiversity component of natural ecosystems that persists in agricultural ecosystems. Its involvement in the provision of the nutrient cycling service and in the maintenance of soil moisture is critical for the main service of agricultural systems – the provision of agricultural products. Other natural ecosystems serve the agricultural ones by providing them with the services of pollination, pest control and flood regulation, but leakage of fertilizers and pesticides from agricultural ecosystems harms the biodiversity of other ecosystems, including those that support the agricultural ones. Agricultural ecosystems somewhat compensate for the biodiversity losses inflicted by the ecosystem transformation that has brought them into being. They often attract certain biodiversity components from other ecosystems that do not affect the provision of agricultural products, but enrich the agricultural ecosystems with the added provision of cultural services, as well as services that support the local and regional biodiversity.

1.1.3.7. Urban ecosystems

Urban ecosystems comprise built-up areas, mainly in cities but also in localities not categorized as cities, as well as built-up centers in rural areas. Part of the biodiversity of urban ecosystems is imported, but most of it comprises an integral component of Israel's biodiversity whose "natural" habitat is in these ecosystems. Another component of this biodiversity comprises domesticated or wild species originating in other ecosystems, either adjacent to or even distant from the urban ones. Only five percent of the State's area has been transformed to urban ecosystems, yet at a cost of losing a sizeable proportion of the country's water supplies, provided by the natural ecosystems prior to their transformation. More than 98% of the population currently resides in urban ecosystems, whose biodiversity mostly provides cultural services, while all other services used by the urban population are provided by most of the other non-urban ecosystems of Israel. City buildings and gardens combined comprise biodiversity habitats that somewhat compensate for the loss of habitats of in other ecosystems prior to their transformation. Furthermore, some components of the State's endangered biodiversity find refuge in urban ecosystems, where they benefit from public sympathy and the support of local authorities, leading to local biodiversity protection initiatives, which increase awareness and public support for biodiversity conservation at large. The transformation to urban ecosystems (built-up areas, including off-city ones) has appropriated only a small proportion of the overall area of Israel's natural ecosystems. However, the increasing urban sprawl of low-rise residential areas has a negative influence on biodiversity and ecosystem services through appropriation of land, which reduces the biodiversity of the habitat area and curtails the water provision service.

Q2 What major changes have taken place in the status and trends of biodiversity in the country?

1.2. Overview

The strongest effect on the Israeli biodiversity, mainly in the Mediterranean region, is the substitution of natural ecosystems by agricultural ecosystems, planted forest ecosystems and urban areas, industry and infrastructure (as explained in section 1.3).

It is obvious that the accelerated population growth and the increasing standard of living in Israel are bound to increase the conflict with biodiversity. If biodiversity loses, development that is generated by the socio-economic demands will become non-sustainable. The major long-term threats to biodiversity in Israel are: (a) increased loss of natural ecosystems due to substitutions and transformations; (b) increasing fragmentation of the remaining natural ecosystems; and (c) reducing water allocation to natural ecosystems. The consequences of these threats are: (a) loss of species and of species populations; (b) reduction of intra-species diversity; (c) loss of particular combinations of populations and species. The detrimental effects on the sustainability of development in Israel due to these consequences to biodiversity are: (a) impairment of ecosystem services; and (b) loss of biodiversity assets of potential economic significance.

To cope with these threats, Israel founded national monitoring systems for biodiversity in the terrestrial, aquatic and marine ecosystems, providing data on the trends and state of biodiversity presented in the report.

1.2.1. National level trends

Since 2011 reports are produced on the state of nature in Israel, both general and for specific ecosystem types. The last report described the trends and changes in the open landscapes of Israel (2015). The national monitoring of terrestrial biodiversity started in 2013, on the ecosystems described in section 1.1.3. All monitoring program data collected during 2012-2014 are displayed and accessible in www.hamaarag.org.il/monitoring. The main components of monitoring are woody vegetation, mammals, birds and butterflies, in various habitats. A first run determined the baseline (time 0) for comparison, and the main findings were as follows.

1.2.1.1. Changes in the state and condition of woody vegetation

As part of monitoring the state of terrestrial ecosystems in Israel, the condition of woody vegetation in natural and planted forests was studied in relation to various conditions as climate change, grazing, human habitation or agriculture. Monitoring was performed on-ground and by using remote sensing during the years 2001-2013.

It was found that in natural habitats there is a clear decline in the coverage of woody vegetation in the Judean Hills lowlands, which have less precipitation compared to the Carmel area and Upper Galilee. In the Galilee area there is a general trend of improvement expressed by increased density of woody plants in the forests and other wooden areas.

In planted forests there was no clear difference between the various monitoring areas.

1.2.1.2. Mammals

Small mammals were monitored using box traps. 7 species were found in planted forests with different abundance according to ecosystems. In the natural wood ecosystems, 8 species were found. The rate of capture in natural ecosystems and in planted forests was similar.

Medium and large sized mammals were monitored using camera traps. 6 species of carnivores and 5 more species of omnivores and herbivores were found in the monitored Mediterranean ecosystems. 2 species were found only in the planted forests, whereas one species was absent from this habitat.

1.2.1.3. Songbirds

Birds were monitored in the various ecosystems and showed a clear trend of reduction in total numbers and diversity from North to South. Species richness was higher in all regions of natural woodlands and the steppe than in the arid south. Human influences were examined. A distance of half a kilometer from settlements or agriculture to natural areas is enough to see significant differences in various species of birds and understand the impact of the threats on monitored birds. Near settlements and agriculture, the total number and species richness were higher than in natural areas. Desert and Mediterranean diversity trends were varied. In the Mediterranean region, the forest and shrublands songbird diversity is higher than in the nearby disturbed areas while in the desert, Northern Negev, Negev Highlands and Arava, the range in Species richness is not significantly different between sampling points, and the disturbed areas are relatively far away.

Despite the relatively small spatial scale of the sampled sites, the survey could give an accurate picture of local avian community. However, the survey cannot provide a picture of the state of rare species, of very large ones, or of some key endangered species. If

there is interest in understanding long-term changes in species – for example, various nocturnal birds, large birds of prey and waterfowl – it is necessary to formulate further sampling protocols for the species.

1.2.1.4. Butterflies

Monitoring of butterflies took place in the Mediterranean area, where three geographical regions meet – the Northern Galilee, Carmel and Judean lowland. The number of species varied between the regions – 8, 7, and 3 correspondingly – and no statistical difference was found in species and individual numbers of butterflies near and far from human habitations. Three species were found suitable to be biological indicators for the state of their habitats, and may be used further on.

1.2.1.5. Eastern Mediterranean Sea

Monitoring includes communities of plankton, soft and hard seabeds, and the IOLR (Israel Oceanographic and Limnological Research) has developed tools to facilitate and analyze monitoring results with molecular taxonomy and a thorough database, including historical data.

The distribution of phytoplankton, heterotrophic bacteria and primary bacterial productivity was monitored in Shikmona station on the coast every two weeks in the years 2013-2014, and in 32 stations along the coast in 2014. Ultra-phytoplankton algae were the dominant group along the coast, similar to those at open sea surface, but in higher concentrations. Respectively, the initial productivity values were higher than those usually measured in the open sea. The spatial distribution of all kinds of algae gradually decreased from south to north, but there was no similar spatial pattern for heterotrophic bacteria. Several kinds of diatom algae and dinoflagellates were found to have potential for toxicity, but only in small numbers. In the sampling station of Shikmona Coast (Haifa), where frequent samplings were conducted, a distinct seasonal change was found with maximum algae biomass in the winter, whereas heterotrophic bacteria dominated during the summer, when low nutrient levels were measured.

1.2.2. State of Ecosystems

Two reports on the State on Nature in Israel (2010, 2015) were published, as well as particular reports concerning various ecosystems. The reports rely on the national monitoring system and refer to the various ecosystems described in section 1.1.3.

1.2.2.1. Woodland and shrubland ecosystems

The findings of the on-ground monitoring from 2012 show that the situation of oaks as of that time was pretty good with no clear trend of drying. On the other hand, the analysis of the processes and trends of the general state of the Mediterranean wood by remote sensing, found that between 2001-2013, 34% of Mediterranean woodlands and shrublands surfaces exhibited clear changes in the percentage of coverage, and their current trend could indicate closure or opening of the vegetation coverage.

About a quarter of the areas gets more than 700mm of rain per year on average, about half of it gets 500-700mm, and another quarter gets less than 500mm. Plant density increased (closure of the woods) in 27% of woodland areas, and in 7% of the area plant density was found to decrease (which means – opening up the woods).

Statistical analysis found a significant correlation between the trends of change in plant coverage and the amount of annual rainfall: Where the average annual rainfall exceeds 400mm per year, e.g., in Upper Galilee, an increase in plant density was found. In areas where precipitation is less than 400mm per year, e.g., in the Judean plain, there is a substantial decrease in density of woods.

It seems that the Carmel area is in a steady trend of drying off, influencing negatively the health of its woods and indicating long term effects of global climate change. There have been consecutive drought years in the area, the recent of which was the longest and most severe one and lasted from 2004-2011, whereas former droughts lasted only three years each, and the intervals between such droughts were also bigger (recorded droughts are: 1956-1962, 1989-1991, 1999-2001, 2004-2011).

On the other hand, there is a clear trend of increase in the coverage of vegetation and of the density and vitality of woody plants in the North-Eastern parts of the country (Golan Heights, Galilee and Samaria).

1.2.2.2. Freshwater and wetlands ecosystems

As part of ongoing efforts to assess the state of nature, a report summarizing the status of wetlands in Israel was prepared, as a basis for preparation of a monitoring program for these habitats.

From a list of approximately 3,000 sites of wetlands, including streams, temporary natural pools, open reservoirs and oases over the entire country, 543 key sites were chosen by aerial photographs according to several criteria – amount of hydrophilic vegetation, unique or of great importance, and all the springs of the desert region. Wetlands were sorted based on criteria such as large rivers and seasonal streams, on hills, valleys and plains regions, in the Mediterranean region or the desert region, pools, seasonal ponds, swamps, and so on. These habitats were examined with biological, environmental and functional measurements and indices of impacts. The only regular monitoring parameter is water quality, therefore knowledge gaps were found in most

areas and clusters of habitats. About a quarter of the selected sites had no biological information, including information on invasive species, and 50% of the examined sites lacked information on the state of their aquatic invertebrates. There was also no information concerning external influences, such as grazing, recreation, enrichment with nutrients, or toxins.

The report recommends reducing the knowledge gaps by setting up laboratories, to encourage skilled work force, create a database for information from existing monitoring programs and to set a comprehensive monitoring program of wetlands. This program should be based on existing monitoring, while considering the knowledge gaps and the necessity to bridge them.

1.2.2.3. Marine ecosystems

1.2.2.3.1. The Mediterranean Sea

The Eastern Mediterranean is a body of water where nature constantly changes at a rate unparalleled in the world. This is a result of the unique structure of the Mediterranean, combined with the effects of human activities in the past and present. Combined with other factors, such as the warming of the sea, the Eastern Mediterranean has almost tropical conditions.

Despite its importance for Israel in providing many services, such as food (fish), water (waste treatment), recreation, energy, etc., the Mediterranean Sea is not in the center of public awareness and research. Human activity causes many local and regional effects, occasionally with a clear and well-known meaning to nature, but usually not. The local trends are sandy and rocky habitat destruction, migrant species, overfishing, aquaculture, pollution, nutrient enrichment, plastic waste, Industrial pollutants, underwater noise, hormones, thermal pollution, oil and desalination, whereas regional changes are caused by the Nile and the Aswan Dam, coastal rivers, atmospheric pollutants, metals, fertilizers, climate change, increase in acidity, warming, and exploitation of oil and gas resources.

A review of the ecosystem state of the Mediterranean Sea in Israel was carried out, based on reports, surveys, scientific papers, research papers, and especially interviews with many experts who studied this system. It highlighted the existence of many knowledge gaps related to most groups of species. Information consists primarily of qualitative knowledge, as well as almost non-existent quantitative knowledge. Most research was carried out in soft ground habitats near the coast, where organisms live in the substrate. The rocky and shallow sandstone ridges were investigated to a lesser extent, whereas only little information exists on other habitats. As a result of monitoring data analysis, it seems that one of the most effective tools for protection of the Mediterranean ecosystem in general, and species like marine birds in particular, is the existence of sufficient marine reserves.

The outcome of the national monitoring reveals that sandy habitats are homogeneous (having relatively few ecological niches), with low stability and low complexity. The grains of sand/silt infrastructure are under the influence of currents and mechanical disorders, which dictates relatively lower species diversity. Farther offshore and deeper into the sea, there is a lesser effect of waves on the bottom, resulting in more stable conditions. Sand infrastructure supports the existence of communities of various animals (on the bottom and the grains of sand). The composition of the bottom population is determined by a set of conditions, such as chemical composition of water, currents, sediment composition, grain size, depth, organic matter content and biological interactions that shape the community (such as competition, predation), and of course, the anthropogenic influences imposed on the system. The abrasion tables are a special habitat that has been monitored during the last five years. Species richness was higher in the margins than the center of the tables, and they exhibited a seasonal dynamics in diversity. The rocky reefs are the most diverse and rich ecosystem in the Mediterranean Sea; they have already undergone considerable ecological changes over the last century.

Invasive species are very common in all biological groups examined (algae, invertebrates and fish). Many native species (especially invertebrates), which were apparently very common in the past, are rare or not found at all in recent surveys. This is based on a thorough literature review, mainly mollusks of the Levant and anecdotal data on sea urchins, but it is most probably also true for other groups on which there is no quantitative information from the past. Overfishing significantly reduced the incidence of most commercial species in the reef area. This is based on a comparative study of fish in the Achziv reserve compared with all of the other sites.

1.2.2.3.2. The Red Sea

The state of Eilat's coral reefs, as reflected in the various indicators measured by the National Monitoring Program for the Red Sea, has improved in 2013, supporting the data from previous years, where a gradual trend of improvement was indicated.

Live coral cover at the reefs of Eilat has gradually increased since 2004. Two years have made particular contribution to this trend, 2007 and 2013. This is the case for live coral cover and for the cover normalized according to the available hard substrate at the different sites.

Over the past nine years of monitoring, a decline in the fraction of "small" colonies has been observed at the monitored sites, and an increase in that of "medium" colonies out of the four size classes has been noted. It seems that the decrease in "small" colonies is driven by diminished recruitment of corals. However, the availability of small colonies does not seem a limiting factor for the live coral cover. It remains to be determined whether this will become a limiting factor, or perhaps reduced recruitment reflects the increase in coral cover, and thus is a side-effect of a positive situation.

The monitoring also shows that a rare habitat of seagrasses at the Northern tip of the Eilat Gulf is recovering following the implementation of the decision to cease marine aquaculture in Eilat area in 2008.

1.2.2.4. Agricultural Ecosystems

Source: Perevolotsky and Berg, 2013.

25% of the area of Israel is utilized for agriculture, including rangelands. Biodiversity provides vital ecological services to agriculture, such as regulating soil erosion, biological control, keeping soil microorganisms and their functions, and pollination, whereas agricultural systems and their management may have negative effects on the environment.

Agriculture in Israel means more than just a supply of agricultural products. Agriculture benefits social, cultural, tourism, ecology and environment interests by the supply of cheap and fresh healthy food; maintaining state land and dispersion of the population; conservation of areas by creation of open green belts around cities and preventing urbanization; support for species of flora and fauna and their habitats; prevention of desertification; maintenance of cultural and historical heritage; use of agricultural land for disposal and recycling of organic waste; the keeping of soil ability to recycle groundwater; encouragement of tourism in the countryside.

The existing knowledge on the impacts of agricultural production on biodiversity is often limited. Monitoring catalog, proper analysis and dissemination of findings may increase the knowledge about the state of agricultural ecosystems and their trends. It is very important that this information is collected in a reliable, available and comparable manner.

Most of the monitoring is carried out using indicators. Such indicators in monitored agricultural systems should be simple to understand and affordable, because in many cases the monitoring is done by the farmers themselves.

A pilot project of fruit plantations monitoring was conducted, and the main results are:

Birds – During the spring bloom there was no differences in species richness and diversity between the managed plantations and between the various habitats. During the fruit summer season, a significant interaction between the type of management and habitats was found in a number of individuals; in unselective management, the number of individuals in the woods was higher than in plantations, but in orchards and environmentally friendly management the number of individuals in the woods was lower than in the plantation. No significant differences were found between habitats in species richness or diversity.

Pollinators – It seems that the intensity of pesticide usage in plantations affects the composition of pollinators communities in the surrounding woodland areas, and not necessarily inside the plantations.

Bats – significant differences were found in species richness and intensity of activity in favor of non-selective management, compared with targeted management.

1.2.3. Trends in the status of focal groups and species

Several species groups or individual threatened animal species are monitored or censused regularly, indicating trends and changes in biodiversity. Some species are indicative of the extent of conflicts between nature and agriculture, as with griffon vultures, whose state reflects the use of poison to resolve predation problems, or the pelicans that indicate the success in reducing conflicts with freshwater pond fisheries. Both species are very much endangered in their entire distribution range. Other species, like the otter, are very rare and endangered, indicating the quality of water bodies that constitute their habitats.

1.2.3.1. Waterfowl winter census

Counts of wintering waterfowl are conducted annually since 1965, by the INPA and volunteers, and are part of the international effort to monitor waterfowl, carried out simultaneously in many parts of Europe, Asia, and Africa.

In the 2013 census 135,000 birds were counted. Over the decade of 2004-2013, consistent trends can be identified in populations of several species (see Table s1), as the reduction in numbers of the mallard, yellow front duck and great cormorant, and a gradual increase in the number of teal and white-headed duck. The variations in numbers of other species are not consistent and cannot be explained.

Some of the changes over the years are related to the number, size and value of wetlands in Israel. The findings for all birds from 2004 to 2013 are presented in Table s1.

1.2.3.2. Threatened species

Of the 452 vertebrates of Israel, 30 are extinct and 153 are in various threat categories. For several there are monitoring programs and action plans. Some of the monitoring projects are presented here.

1.2.3.2.1. Terrestrial mammals

Of the 104 mammalian species of Israel, 60% are endangered. Several, like gazelles or wolves, have been monitored for many years. Monitoring results on a group of mammals – bats and other endangered species, such as the otter, are brought here as examples.

1.2.3.2.1.1. Insectivorous bats

The order Chiroptera, which includes 33 species in Israel, is the order with most species of all of Israel's vertebrates. The wide diversity of bat species in Israel is represented by multiple families and zoogeographic origins – for several species of which Israel is their edge of distribution zone.

All 32 species of insectivorous bats are protected by Israeli law. The vast majority of these species (28 species) is threatened with extinction and is listed in the Israel Red List of Endangered Species. Therefore, a monitoring program is implemented yearly by the INPA.

In 2014 a monitoring program based on guidelines formulated by EUROBATS Agreement was published. In total, 82 sites throughout Israel were surveyed in 2014 (92% of the sites in the monitoring plan). These sites include natural and man-made roosts (caves, buildings and abandoned army bunkers), as well as foraging sites, mainly consisting of natural water resources, located in Nature Reserves and National Parks. In total 28 bat species were documented, representing about 87% of the known bat fauna in Israel. In northern Israel, where annual monitoring has been conducted since 1980, the survey results from 2014 show a stability in bat activity at the majority of sites examined. However, in two important roosting sites in the Upper Galilee there is a trend of decreasing population size and changes in species composition. One of the plausible contributors for such a trend is attributed to visitor activity in caves, causing disturbance to the local bat populations during a critical time period of cub rearing. A reevaluation of the current visitation policy in bat-inhabited caves is required, taking into consideration the reproductive biology of different bat species.

Many species of insectivorous bats are known to congregate in large numbers at single roosts, and so any damage to important bat roosts may have significant negative consequences to the survival of these populations. During 2013 occurred a number of incidents of impairment to insectivorous bats and their roosts.

For most parts of Israel, the survey is conducted for the first or second time, so that the gathered data provide a baseline for monitoring, and so that a detailed database was laid for future comparisons.

1.2.3.2.1.2. The Otter (*Lutra lutra*)

Otters were common in Israel until the early 20th century in all coastal rivers from the Lebanese border to Nahal Soreq, and along the Jordan Basin from its sources in the north to the Dead Sea, including the Hula Lake and the Sea of Galilee. Beit She'an Valley, Harod Valley and the Jezreel Valley constituted a vital ecological corridor of wetlands, linking the population of the Jordan Basin to the coastal population. It seems that over the last decades there has been a dramatic deterioration in the situation of otter populations and their distribution in the country, and they are currently critically endangered. Monitoring, finding the factors influencing the population fluctuations, and finding ways to population rehabilitation, may leverage rational treatment and management of wetlands habitats and biodiversity.

The results of the yearly monitoring since 2000 show that Israel's population of otters is divided into two main types: permanent population in the Jordan basin, from its source in the north to the south Sea of Galilee, which shows steady activity over the years; and a transient population in the Jezreel Valley, Zevulun Valley, and southern Golan Heights, which shows a pattern of local extinctions and reestablishment every few years.

The distribution of otters populations has been reduced, and they are currently in serious danger due to fragmentation and loss of habitats. Chances of re-populating sites have narrowed down over the last 12 years, and the chances of extinction of habitats have increased and continue to rise steadily. It is therefore recommended to take a number of actions in parallel:

- The establishment of an effective breeding nucleus.
- Rehabilitation of ecological corridors linking habitats.
- Restoration of water bodies, such as abandoned fish ponds, and wetland habitats to maintain a stable and multiplying population.

1.2.3.2.2. Birds

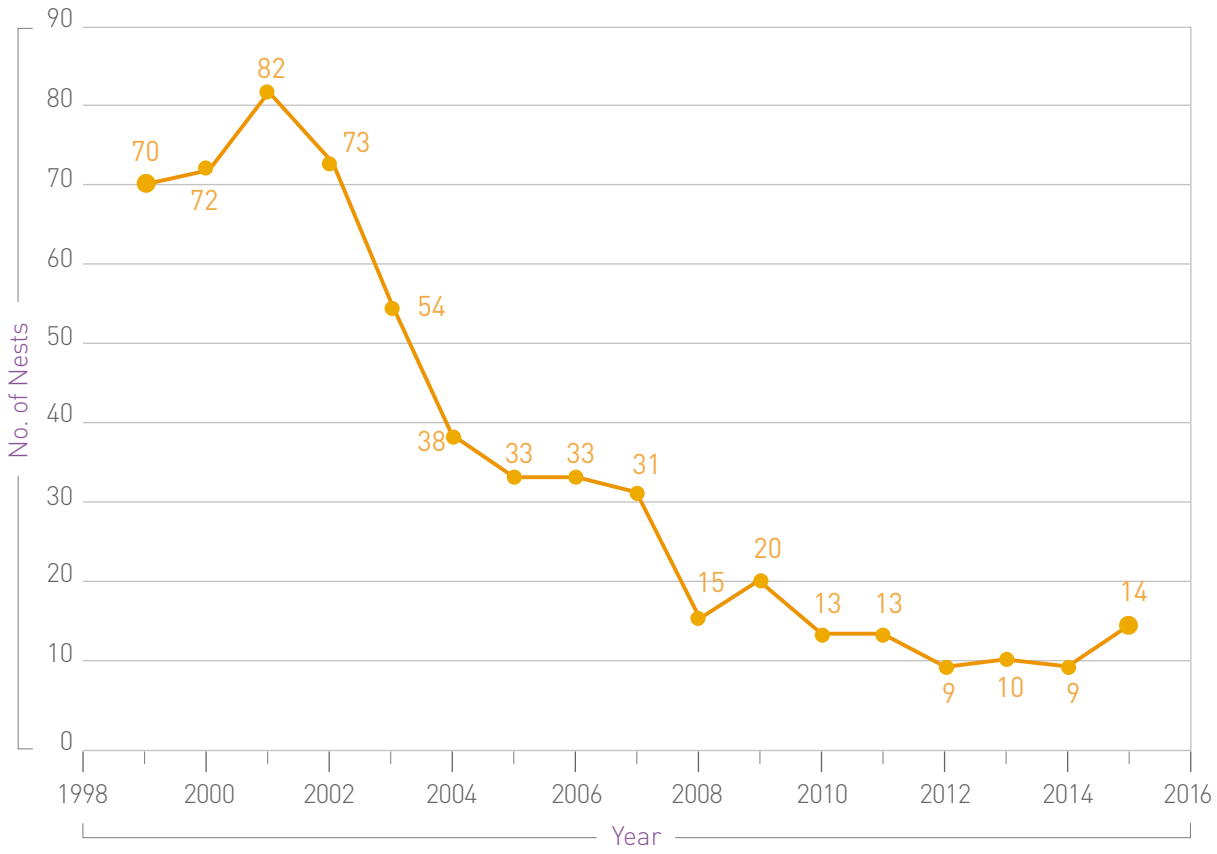
Of the 206 nesting bird species in Israel, 45 are in various degrees of endangerment. The monitoring results of one are presented here, as well as the results of a migratory species, most of the European population of which migrates or winters in Israel.

1.2.3.2.2.1. Griffon vultures

The situation of the population of Griffon vultures (*Gyps fulvus*), as indicated by annual censuses in Northern Israel, indicates a continuous decline over the years. However, the monitoring results seen in Fig. 4 indicate the beginning of a rise in the number of nesting starts, mainly resulting from the newly established population of the Carmel, and joining of individuals from the breeding nucleus in captivity and wild-born individuals. The improved situation of the vulture population in the Carmel is an important example of the ability to change the situation in a given population by taking appropriate management actions. This population became extinct in the 1950s, and was reestablished in the last decade. It has become a source from which individuals originated both in the wild and the aviary join the populations of vultures in several sites, including Gamla in the Golan.

Vulture population in the Golan is still in a bad shape, although the increase in the number of initiated nesting may suggest the beginning of a trend change. Many efforts are being made in recent years to promote management change in the Golan Heights, which includes extensive sanitation activities, expansion of activities at the feeding stations, public relations and enforcement against poisoning. All this is done in order to try and restore this population, whose situation is not encouraging, especially in light of the poisonings experienced each year. Unfortunately, for now, the conditions for the Golan Heights and the Galilee populations are not encouraging, and demand continuous actions in the current management.

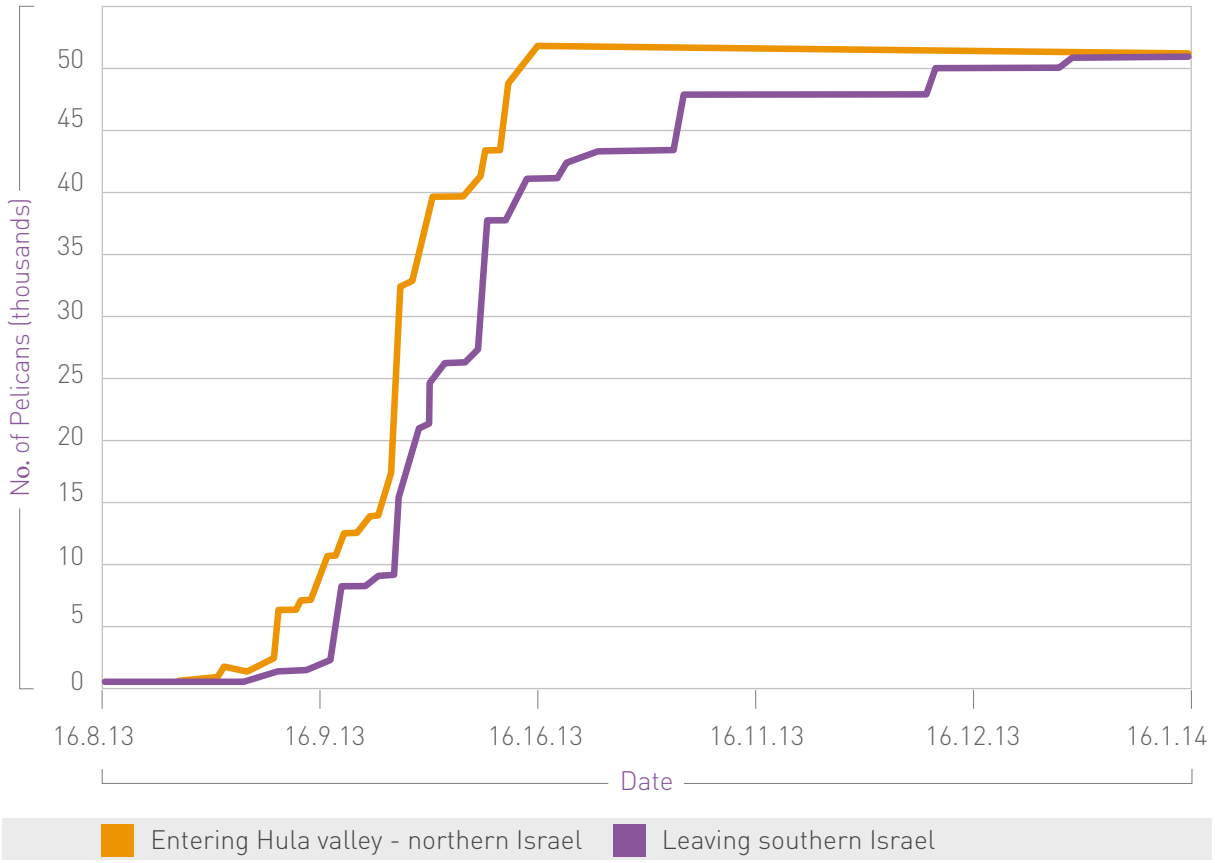
Figure 4 The number of initiated nests in griffon vultures over the years (from (15)).



1.2.3.2.2.2. White pelicans

The White pelican (*Pelecanus onocrotalus*) population in Europe is under pressure and considered vulnerable. All European pelicans (50,000) migrate to Africa, and Israel is, for most of them, a stopover site for stocking up energy, and some (few hundreds) stay to winter. During about 70 days the migrating pelicans pass over Israel, each of them staying around 3-6 days, mainly between end of September and mid-October, which creates conflicts with the fisheries. In a cooperative project of the fishery industry, MoEP and INPA, feeding locations were operated so as to deter pelicans from fish ponds and not on the expense of their energy needs to continue their migration.

Figure 5 Cumulative number of pelicans entering (Orange) and leaving (Purple) Israel during the migration period (from (16)).



1.2.3.2.3. Amphibians

One of the amphibians, the Hula painted Frog (*Latonia nigrivinter*), which is endemic to the Hula valley and was considered extinct, was found again after more than 75 years, probably increasing its population after the water quality in its habitat has improved.

Q3 What are the main threats to biodiversity?

1.3. Main threats

The strongest effect on Israeli biodiversity is the substitution of natural ecosystems by agricultural ecosystems, planted forest ecosystems or urban areas, industry and infrastructure. This has farther consequences as, for example, it is unknown how these substitutions and transformations have affected aquifer recharge. The spatial expansion of these substitutions and transformations not only dramatically reduced the size of natural ecosystems, but also increased their fragmentation. The Mediterranean natural ecosystem of Israel is now mostly embedded as small patches within the matrix of urban, agricultural and afforestation development. Both the reduction in size and the fragmentation of the natural ecosystems have dramatically increased risks of extinction of species. The scarcity of water in a dryland country such as Israel made urban and industrial development dependent on a large extent on water resource development, which further exacerbated the pressure on the aquatic ecosystems of Israel.

Most natural terrestrial ecological systems in Israel that are rich in biodiversity are within the open landscapes – areas that are neither built nor cultivated. These landscapes are not homogenous in character and their distribution varies, so that there are ecosystems and landscapes of various types in the different areas of Israel, each with a unique assemblage of organisms, dependencies and interactions.

Open landscapes are defined here as terrestrial areas that are not built or developed with intensive infrastructures (roads, railways, industrial, military or agricultural structures).

Since the existence of biodiversity depends on the open landscapes in Israel, any changes in their extent and quality may have a direct influence on its condition. These changes are mainly caused by the decrease in area of the lands as a result of their conversion to built areas and development of infrastructures, as well as decreasing connectivity between different landscapes.

Israel, with a population of over eight million people, is one of the most densely-populated western world countries; it has a western-world economy and resource exploitation, yet a population growth rate of a third world country. Thus Israel faces enormous challenges in protecting, managing, and exploiting its natural environment for the benefit of society.

Demography, economy and security are the main factors causing environmental pressures and land scarcity, coupled with invasive alien species, climate changes and fires, all directly affecting biodiversity conservation.

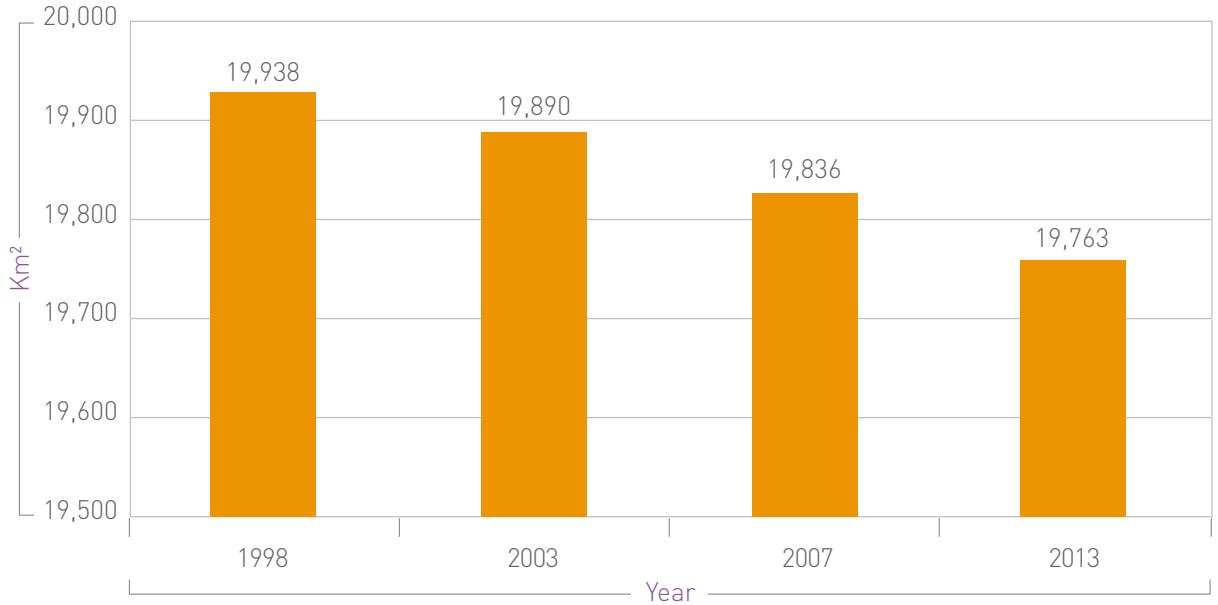
To cope with these threats, a national monitoring system was founded and put into operation as described in section 2.3.3.

1.3.1. Habitat loss and fragmentation

The amount of open areas in Israel is being reduced continuously, and as a result there is damage to the amount and scope of open landscapes. This is a consequence of designation of open landscapes for development-oriented land use (residential, business, industrial). The result is damage to the quality and continuity of the open lands areas and the destruction of extremely sensitive natural habitats and ecosystems within them, fragmentation of contiguous biological corridors and mismanagement of open landscapes.

Over the last five years (since the last report) the area of open landscapes has decreased from 19,836Km² to 19,763Km² (from 90% to 89.5% of the total area of Israel), and the built area has increased from 1,800Km² to 1,863Km² (from 8.1% to 8.5%). Water bodies comprise 2% (444Km²) of the total area. The transformation rate of the land over those five years was 12Km² per year, similar to former years.

Figure 6 Change in open landscape over the years (Km²) (from (6)).



It is predicted that for the need of increased population, there should be 310 Km² more allocated for building in 2030. It should be emphasized that the trend described of accelerated development occurs from Beer Sheva north and not in the desert area. The types of transformed areas are 3/4 natural habitats and 1/4 agricultural.

Most open areas in Israel are desert areas (55%), with low percentage of vegetation cover. About a quarter of the open areas are used for agriculture, so that only about 15% (the remaining area of Israel) may contain various plant configurations: about half of it Mediterranean or planted forest, and half containing lower vegetation formations like shrubs, bushes or grasslands.

1.3.2. Environmental pressures and degradation

Water, soil and air quality still needs to improve. Some of the major driving forces of environmental pressures in Israel are the population density and growth rate. Israel has a very high population density, especially along the coast. Israel's population has reached 8,296.9 million people in 2014, with a steady yearly population growth rate of close to 2% (according to the Central Bureau of Statistics). This driving force poses high pressures on natural resources, such as land, water and energy.

The population in Israel is expected to reach 12 million by 2035 (CBS) as a result of natural growth, immigration, and a rise in life expectancy. Economic growth, accompanied by a rise in the standard of living, is also foreseen. These trends are expected to accelerate pressures on natural resources, such as land, water and energy.

1.3.2.1. Water and sanitation

It is possible to identify three unique broad considerations that make water a priority issue for Israel: its high dependency on water treatment technologies for drinking water and irrigation, its relatively high number of sources of pressure per area, and its geographical and climatic character. Population growth, density and polluting sources relating to industrial, agricultural and urban activities exert pressure on water sources.

An increase in the demand for water and periods of inefficient water management throughout the nation's history have depleted and worsened the condition of Israel's water resources. Fluctuating water precipitation and forecast changes in climate have had a further negative impact on the availability of natural water. Unconventional water sources, such as desalinated water, have their own implicit costs, in terms of the impact of seawater intake and brine discharge from desalination plants and into the marine environment, increased air pollution and greenhouse gas emissions due to increased electricity consumption, and exploitation of Israel's densely populated coastal strip, or the effect of limited amounts of minerals such as magnesium on human health.

Israel is one of the most densely populated countries in the world. Most of its population resides in urban areas, and a significant portion resides on the coastal plain, placing

major pressure on the environment in the coastal area. As the driving forces behind water demand and pressures on water sources in Israel are expected to continue or increase even further, Israel is planning to increase its water supply by expanding its desalination capacity and improving the level of wastewater treatment in order to make much greater use of reclaimed water. Israel has heavily invested in, and relied on, innovative water treatment technologies for drinking water and for treated municipal waste water for irrigation. Efficient water practices have achieved 95% water efficiency in agriculture, which is the highest ratio in the world of crop yield per water unit.

1.3.2.2. Solid waste

Israel produces approximately 4.8 tons of municipal solid waste each year, a quantity that grows at an annual rate of 3–5%. The same amount of solid waste comes from agriculture. The major treatment method of solid waste in Israel is landfill followed by recycling. Hazards and nuisances that are associated with improper waste treatment include soil and groundwater contamination, air pollution and greenhouse gas emissions, proliferation of pests and spread of diseases, safety problems, visual nuisances and odors. In addition, landfill can reduce land values and availability of land.

One of the major problems is dumping of waste in unauthorized and natural areas. The main effects on biodiversity are the reduction of available land, and the increase in food availability for carnivores, resulting in increased carnivore populations, conflicts with agriculture factors and the spreading of rabies. The MoEP has produced a program to cope with the problem.

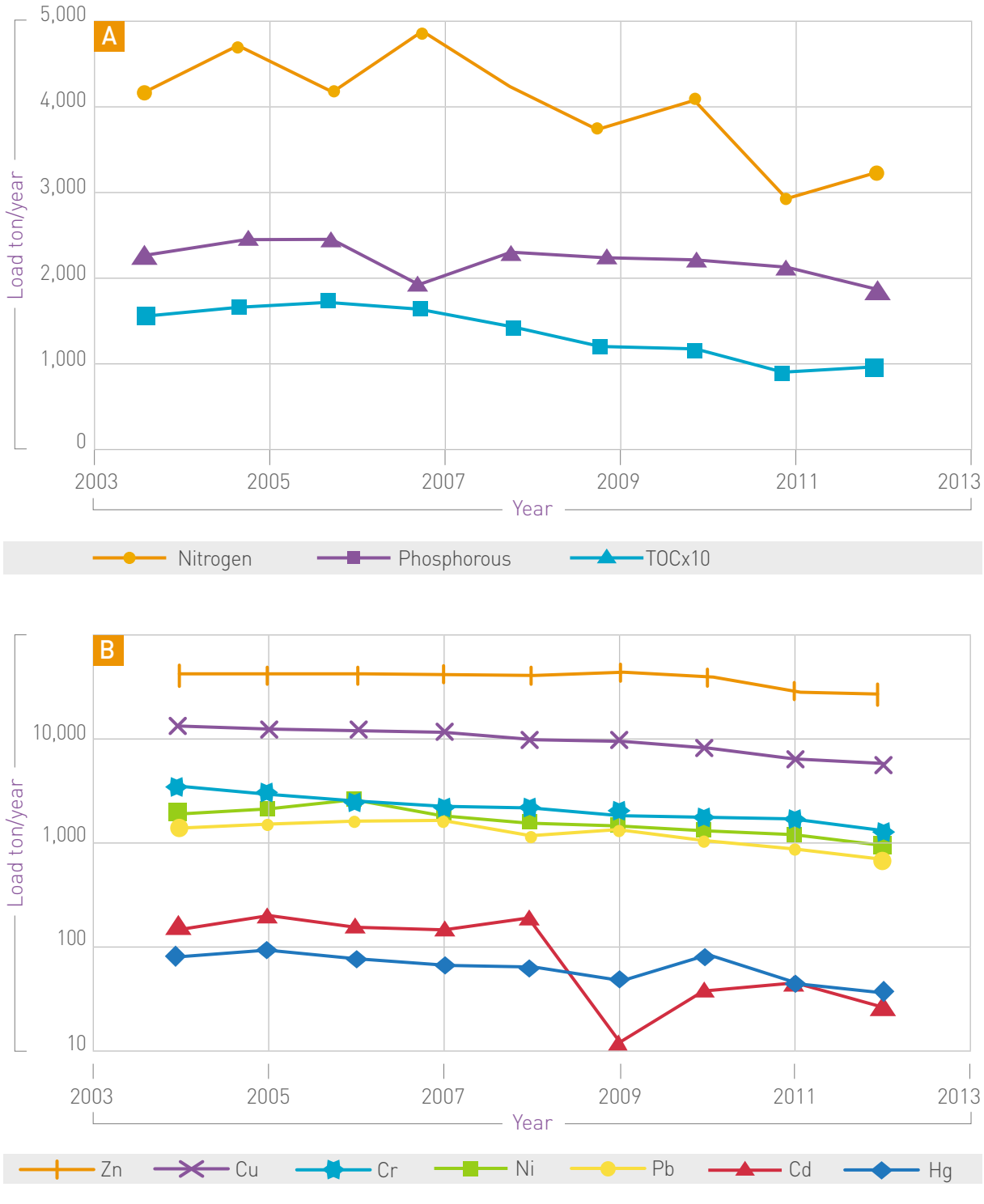
1.3.2.3. Industrial emissions

Industrial activities are accompanied by the emission of pollutants, causing serious environmental and public health problems. Industrial emissions in Israel are a major source of pollution, and are focused on a number of hotspots where major industrial activity is concentrated: Ramat Hovav industrial park in Israel's south, Haifa Bay in the north and the Ashdod industrial zone in the center of the country. In all these areas, ecosystems and the local population are exposed to an increased environmental and health risk.

1.3.2.4. Mediterranean Sea – pollution

The trend of decreased pollution levels observed until the middle of the last decade has continued for many pollutants, but stopped in recent years for some of the pollutants, as can be seen in Fig. 7.

Figure 7 The load of minerals (a) and heavy metals (b) on sea water over the years (from (7)).



The pollution values of various heavy metals, fertilizers and organic pollutants have stabilized or somewhat decreased, all in all indicating an adequate state of their levels, even though for some pollutants the level should be decreased even further. The current level of fertilizers, heavy metals and organic materials in estuaries, marinas and harbors is not satisfactory since it is yet at the moderate-to-severe level of ecological infection standards. It is worth noting that the level of TBT pollution in port water has decreased significantly, to the threshold of detection levels. In contrast, the bottom of the sea is still significantly contaminated, and at this stage there is no trend of reduction in the pollution levels. In the port of Ashdod, a reduction in the concentrations of heavy metals was observed, and in Haifa port there are still elevated levels of mercury alongside reduction in cadmium levels. In recent years there is an increasing trend of mercury concentrations that has yet to be explained in fish of north of Haifa Bay. Parameters indicating the environmental situation – such as the level of fertilizers, increased primary productivity and organic matter enrichment at the bottom – show that the situation in Haifa Bay and the coast of Israel can be defined as reasonable, and better than in other Mediterranean coasts that face the problem of eutrophication from nutrients enrichment. It seems that in some of streams that flow to the sea the situation remains unsatisfactory, despite the reduction in nutrient loads compared to the 1990s. Over the last decade most coastal rivers have shown some improvement, but there is no clear trend of the condition of others.

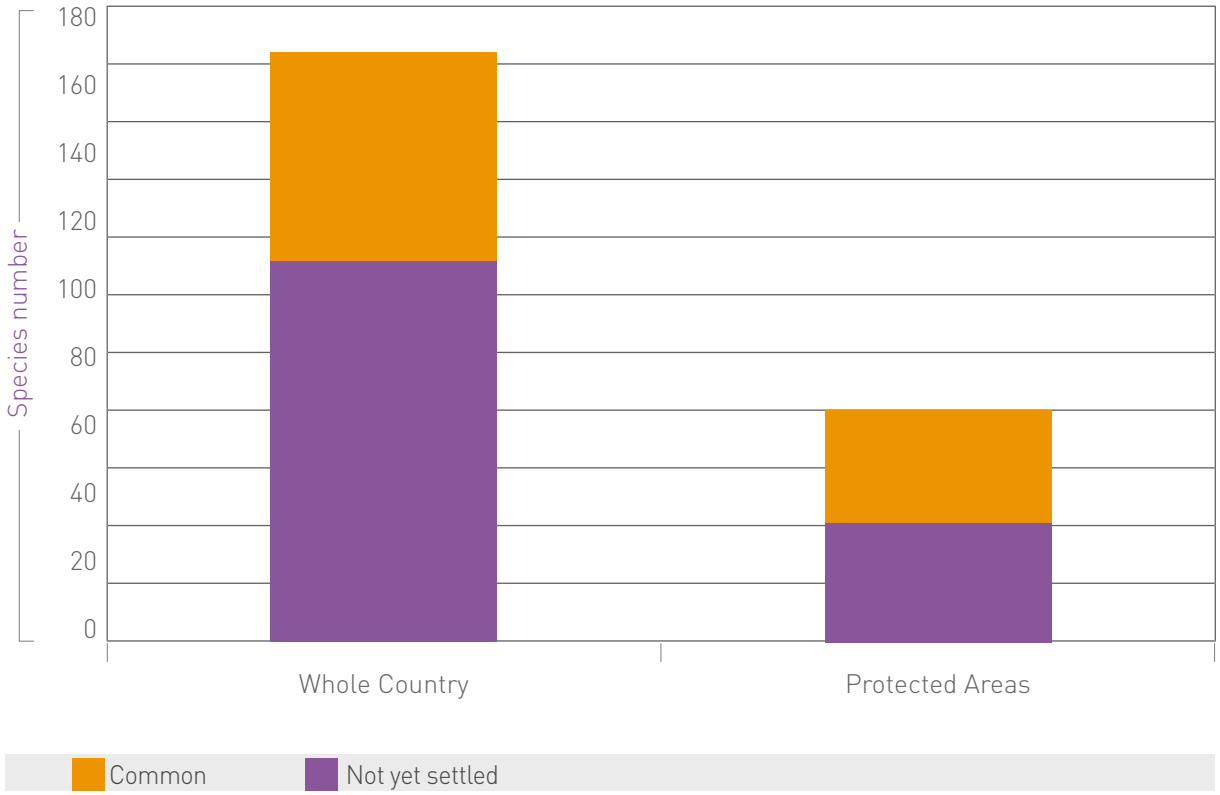
1.3.3. Invasive species

Invasive species of various taxa constitute a continuous threat for most ecosystems, mainly for coastal sands and freshwater habitats.

1.3.3.1. Invasive plant alien species

In a study on the state of alien invasive plants in Israel (19) vulnerability of the various ecosystems has been evaluated, and it was found that there are already 166 species of IAP, of them 59 became common or very common. 59 of all IAP (Invasive Alien Plant) species were found in protected areas and of them 28 were common.

Figure 8 The number of invasive alien plant species (both common ones and ones that have not yet settled) found all over Israel and in protected areas, based on data in (19).



The phenomenon of invasive plants in natural areas of Israel requires special attention for two reasons:

(1) Natural areas are reduced significantly due to land development, and nowadays natural areas are small and fragmented. This feature greatly increases the sensitivity to invasions of alien plants.

(2) Population density in Israel continues to rise in all regions of the country. This creates stress on the remaining natural areas by the development of settlements and accompanying infrastructure, especially denser road network and fragmentation of natural areas. Disturbed habitats generated by infrastructure provide "corridors" for the spread of invasive plant species.

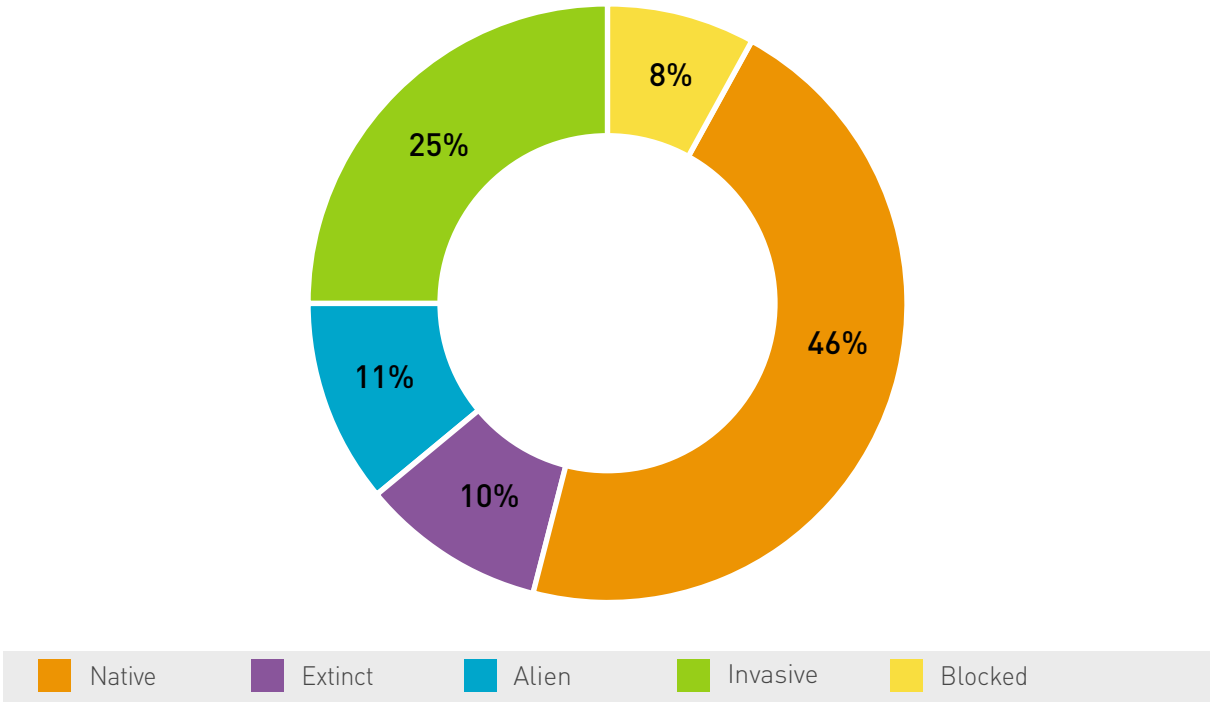
1.3.3.2. Nonnative mollusks in freshwater bodies

The aquatic ornamental plants and aquarium industries are the main pathways of introduction of freshwater mollusks and their dispersal throughout Israel. In a recent study, 29 taxa of alien freshwater mollusks were found in pet shops and water plants nurseries, six of which were documented in human-dominated habitats in Israel. In

addition, alien freshwater mollusks that are not yet established in nature have been introduced in pathways of authorized import (for purposes of commerce, aquaculture and research for biocontrol) and of illegal smuggling (for purposes of commerce or consumption by migrant workers).

Invasive freshwater mollusk species differ from other categories by being mainly gastropods of Nearctic origin, monoecious, capable of self-fertilization, breathing using lungs, tolerant of low oxygen concentrations, and capable of inhabiting a large variety of habitats, including polluted and disturbed habitats.

Figure 9 The distribution of native vs. alien freshwater mollusk species in Israel (from (20)). Blocked category - intercepted by custom control at the Israeli border and confiscated.



The distribution of native vs. alien freshwater mollusk species in Israel is as follows: native – 56, extinct – 12, blocked – (intercepted by Custom Control at the Israeli border and confiscated) – 13, alien – 30, and invasive – 10.

1.3.3.3. Red Sea – Mediterranean Sea invasions

Bio-invasion along the Israeli coast of the Mediterranean is globally unique in its intensity. It has been occurring in relatively shallow waters since the opening of the Suez Canal in 1869, and may increase with the opening of the new, additional pathway of the canal. At present it reaches several hundreds of alien and of some invasive species,

and demonstrates diverse harmful effects. It should be noted that some bio-invasions from other origins have been occurring as well – those are much more restricted than the Indo-pacific ones in terms of number of species, but they also affect considerably on the marine environment here and in other Mediterranean regions. The map below shows the intensity of fish invasion in the Mediterranean, with the highest intensity in the eastern Mediterranean.

Figure 10 The intensity of fish invasion in the eastern Mediterranean (from (21)).

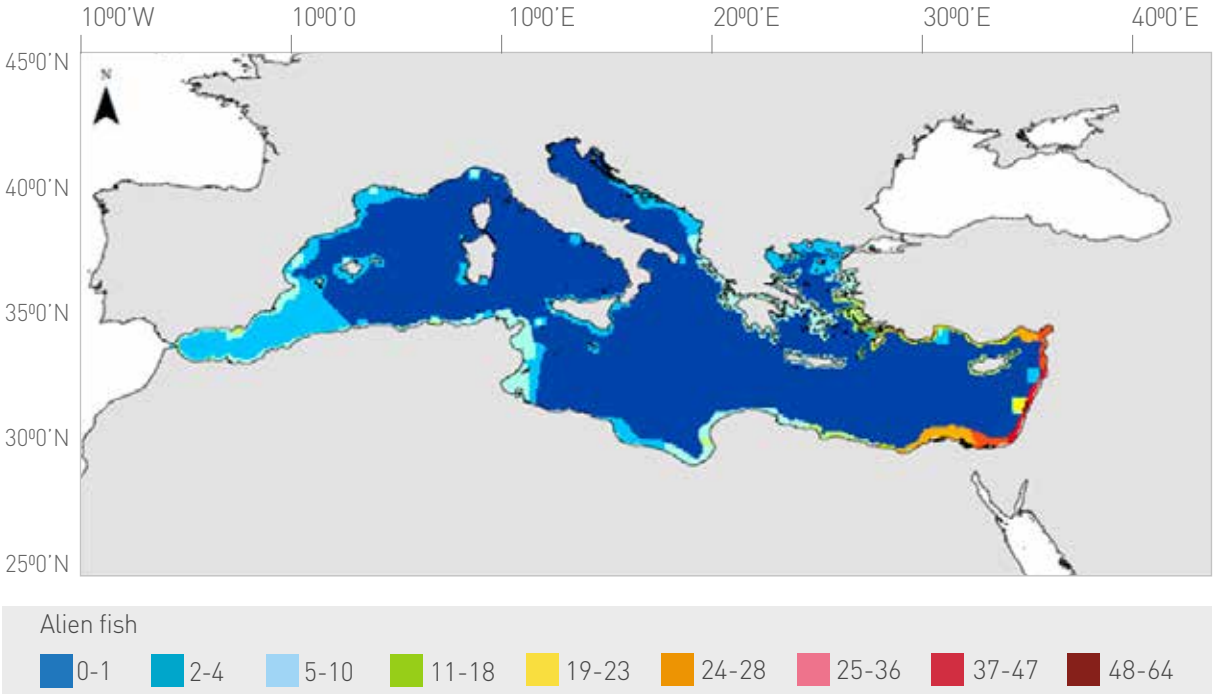
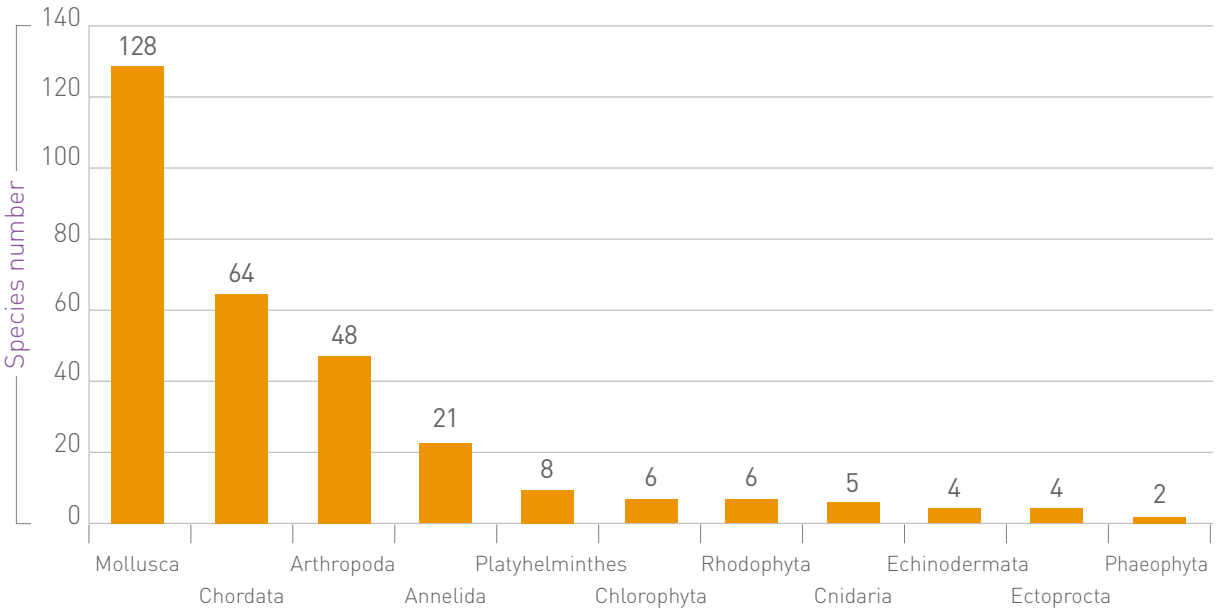


Figure 11 Taxonomic classification of alien species along the Israeli coast (from (42))



1.3.3.4. Invasive alien species – economic implications

A study on the economic implications of IAS (Invasive Alien Species) was commissioned by MoEP and published in 2013, dealing with a whole range of species already found in Israel, such as fire ants, ambrosia, or the Indian crow. The cost of handling each species was compared to its damage, and was found to have an economic justification.

1.3.4. Climate change

The northern part of Israel is characterized by a Mediterranean climate and its south by an arid climate, with a narrow, semi-arid strip in between. Frequent weather changes are common in this climate zone due to the effects of climate systems with different synoptic characteristics. This is reflected in significant inter-annual variation in both temperature and rainfall. The most crucial component of Israel's climate is the rainfall regime. Changes in the rainfall regime – including annual quantity, number of rain spells, seasonal distribution, intensity and timing – have major impacts on the country's water resources. Global climate forecasts predict an increase in average annual temperatures of 0.3°C-0.5°C per decade, a reduction in rainfall of 1.1%-3.7% per decade, an increase in the frequency and intensity of heat waves and extreme events, such as floods and droughts, and an increase in the probability of forest fires in the Mediterranean region over the next fifty years. In practice, the past four decades have demonstrated an average increase of 0.5°C in temperature per decade in the Mediterranean Sea area. A trend of rising seawater levels, totaling in over 10cm, was recorded in the Mediterranean Sea over the past two decades, consistent with scenarios ranging from 1cm to 10cm per decade. Such a rise is associated with increased flooding along the coastal plain and increased intrusion of seawater to the coastal aquifer, which leads to salinization. Wave storms with wave heights exceeding 3.5m have also increased, along with exceptional storms with a wave height of more than 6m, which are expected to pose major risks to coastal installations and to the collapse of the coastal cliffs.

Biodiversity is likely to be extensively affected by climate change, which will be accompanied by changes in the ecological services the natural ecosystems provide for human welfare (1.5.1.).

1.3.4.1. Effect on human wellbeing

As reported by the Ministry of Health (MoH) (2014), in June 2009 the government decided to establish a CEOs commission with power to make recommendations for a National Action Plan for the preparation and adaptation to climate change (see 2.4.1.2). One of the components of the program was drafting guidelines for government offices concerning assimilation tools and means necessary for minimizing the damage anticipated from climate change. In March 2011 the MoEP established a knowledge center for climate change preparedness in Israel, located at Haifa University. The center has published two reports on climate change in 2012 and in 2013.

A study that was conducted in Israel a few years ago found that an increase in temperature is a positive predictor for the size of mosquito population. The study found that a rise in the number of mosquitoes, which transmit West Nile disease and other diseases, is a risk factor for the transfer of Diseases. Another study found a link between the increase in fish pond water temperature following a heat wave and the rise in sickness caused by *Vibrio vulnificus* bacteria. Another research published in 2013 describes the relationship between the number of reported cases of malaria and West Nile disease, which are transmitted by mosquitoes, and ambient temperature.

The MoH collects data on the incidence of various diseases, including malaria, West Nile and skin Leishmaniosis. The data indicates trends in the incidence of diseases due to changes in extreme climate conditions or gradients. In 2014 the MoH researchers reported that after a decade of limited and short bursts of West Nile fever, nearly 1,400 cases of the disease were reported in 2000–2012. The sharp increase in the incidence of morbidity occurred in parallel to the identification of new viral genotypes in the mosquito population.

1.3.5. Natural Resources Utilization

Hunting, fishing, cutting of trees and picking wild plants for use is regulated by law, but poaching and illegal exploitation can still be found.

1.3.6. Fires

Israel's forests, woodlands and shrublands are fire-prone. The Mediterranean climate, with a long dry season, increases the chance of fires; yet, almost all of the fires are human-ignited. It was found (6) that most repeated fires over the years are located in military fire zones, and it is clear that the army is responsible for many of the fires in natural areas. Following the great fire in the Carmel area in 2010, the Government decided to reinforce the firefighting system in Israel and some management practices were decided upon, such as buffering, thinning vegetation around human habitations, and other means that are currently implemented.

Q4 What are the impacts of the changes in biodiversity for ecosystem services and the socio-economic and cultural implications of these impacts?

1.4. Impacts on services

The natural capital of Israel depends not only on land availability, but also on ecosystems that provide services required for the existence of human life. Population growth dictates a growing need for these services – for example, systems of woodlands, shrublands and fresh water serving fresh water supply, water quality control, climate control (absorption of carbon dioxide), pollination services, erosion control, soil protection, and cultural services (such as recreation in nature). Converting natural areas to built and agricultural areas means causing damage to these services. Compensation for some of the lost services can be achieved by modern technology, e.g., import of food products, but this is not true for most of the control services and the majority of cultural services.

It is possible to point to trends of reduction in quantity and quality of the services provided by ecosystems in Israel (such as flood control, soil erosion prevention, regulation of water and air quality, climate regulation, regulation of agricultural pests, parasitic diseases regulation, and maintenance of biodiversity).

1.4.1. Evaluation of ecosystem services and importance

The Israel National Ecosystem Assessment (see section 2.7.4.1.) Initial reports on ecosystem evaluation have been produced.

1.4.1.1. Service regulation of inland water quality in rivers and lakes

One of the most important ecosystem services of inland wetlands is regulating the water quality, which means purification – at least in some of those streams and ponds with excess organic matter and fertilizers arriving from outside. The regulatory process is complex and multi-stage in relation to the various components of biodiversity – water insects, small crustaceans, snails, tiny fungi, bacteria and fish, which convert particulate organic matter to dissolved organic matter. Dissolved matter is absorbed by the algae and other plants in the water, and compounds of nitrogen and phosphorus are

disassembled by them so that their concentration falls below the threshold of damage to organisms involved in providing regulation services. In fact, many man-made water purification systems imitate these water regulating services of the ecosystems, by using a large portion of the same components of biological diversity.

Effectiveness of the service of water regulation depends largely on the composition of the pollutants (domestic and industrial wastewater, excess fertilizers and pesticides, and other agricultural materials) and their quantities, reservoirs drainage and streams flow slowing. The greater the intervention and the flow of pollutants discharged to the water, the larger the number of species (involved in regulating pollution but also sensitive to its effects) that will be affected. The situation in most coastal rivers is that most of the species involved in providing the service, particularly water plants, have completely disappeared from contaminated sections of these rivers. The good news is that human involvement and pollutants discharge have been reduced by now, so that the remaining biodiversity is in damaged systems in a process of recovery, intensifying the migration of species from other water systems providing renewable supply service, so that the system regains its effectiveness in regulating moderate dimensions pollution.

Indeed, reducing the discharge of pollutants to wetlands by wastewater collection and treatment and improving wastewater treatment plants, as well as reduction and optimization of the use of fertilizers and pesticides in recent years, has led to an improvement of service supply in some systems. For example, in the upper section of the Yarkon River, which is relatively free of pollution, it takes approximately 500 meters downstream to convert a contaminant particle (such as ammonia molecule) into its non-toxic form by the ecosystem of the river, while in the middle section of the river, which previously contained a flow of untreated effluent for over 20Km (nowadays the wastewater are being treated), it takes about 3Km to convert such toxic components to their non-toxic form.

The service of regulating water quality in rivers and fresh water bodies of Israel has cultural, health and economic benefits. High-quality water enables irrigation. Streams and wetlands of high-quality further provide a focus for cultural activities of leisure and relaxation: bathing, sailing and picnics on the banks. The risk of development of pathogens and their carriers in fresh water ponds is significantly smaller compared to polluted bodies of water that supply low regulatory services, and provide a focus for the development of various pathogens. Even the economic value of the real-estate around clean water wetlands is higher.

1.4.1.2. Marine ecosystems and services

Ecosystem services to man from the biodiversity of the Mediterranean and the Gulf of Eilat marine ecosystems were described, and their state and the spatial and temporal trends were quantified. Factors causing changes, as well as policies to handle these changes, were presented.

The value for man of certain elements of nature in the marine environment is infinite (e.g., photosynthetic oxygen production) or very difficult to quantify (e.g., beauty, pleasure, and mental health), and therefore such an assessment would essentially give only a partial picture of the full value. In the Israeli systems a number of processes occur that support these services and the existence of all life, including primary production and processing of fertilizers. Such prominent services are delivery services of water in quality suitable for desalination and provision of food from the sea (fishing and aquaculture), regulation services of various disorders (climatic, biological and oceanographic), and a variety of cultural services, including leisure and recreation, heritage, education and research. Most of the biodiversity in these systems is close to the shore, on the continental shelf, and supplies services, culture and some regulation services, showing a similar trend of decrease as the distance from the shore grows. Compared to the continental shelf, the deep water mainly provide services and regulation of far lower importance per unit area than the shelf, and many of these services are still uncertain. However, the importance of deep sea stems not only from specific habitats, but from their large surface area (and its large volume) where processes occur. This trend is noticed in the assessments of system services that rely on the space of subsystems, which were made according to Global parameters "imported" from other systems. Global estimates were revealed as inaccurate and limited for implementation in Israel, due to the large data gaps and differences in supplying services that the Israeli system provides. Many ecosystem services are concentrated on the hard rocky bottom, from coral reefs in Eilat, as well as in the Mediterranean tables, its surrounding islets and rocky coast, through the ridges and limestone beneath the sea to the rockery in deep sea – biodiversity on these stable physical infrastructures is high and provides many ecosystem services, although they are only located in a small area of the sea relatively to the soft ground. Hence the mapping process performed here may reveal the great importance to these systems.

Supply services of sea food in Israel are modest, but are influenced by many factors causing change, while the supply of desalinated water is higher and less affected by the changes brought about by man, and in addition the role of the ecosystem service here is not clear.

Knowledge gaps for regulatory services are the greatest, although recently studies have begun to take place in order to fill those gaps. Among the regulatory services, the absence of invasive species prevention in the Mediterranean is prominent, since almost all system services are greatly affected by the huge changes in biodiversity as a result of invasions. Cultural services are also affected by changes in biodiversity. Israelis love the sea, and the extent of the cultural services described here is very large, particularly in the shallow water near the shore, and in particular in the ecosystem of the Gulf of Eilat.

For almost all services (all except the supply of food) it is difficult or even impossible to determine the contribution of the marine ecosystem to service delivery, and dedicated research is required in the future.

Indeed, one can evaluate the ecosystem services according to their areas, but here we demonstrate how such evaluation may result in major errors, originating from uncertainty and gaps in knowledge about the value of the various subsystems in our region and in the world at large.

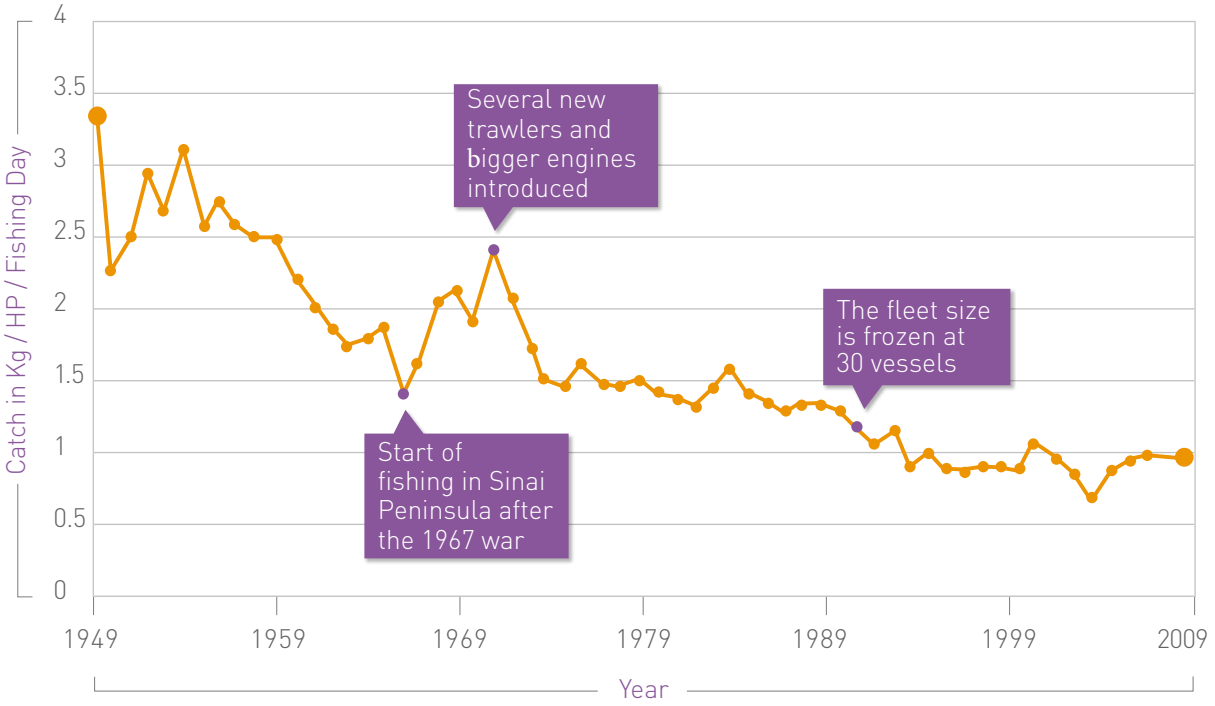
1.4.1.3. Fish supply service from the Mediterranean Sea

Like other marine systems, the ecosystem of the Mediterranean provides fish provisioning services. The commercial fishing in the Israeli territorial waters of the Mediterranean Sea includes over 100 species of fish, crustaceans and mollusks, with a total weight of 2,500 tons per year, mostly used for consumption by the citizens of Israel. The existence of those fish – some carnivores, few herbivores – depends on the various creatures of the marine ecosystem, and therefore they are affected by the state of biodiversity in the ecosystem, both qualitatively (which species are there) and quantitatively (how many of them are there).

Fish supply service has economic, health and cultural benefits. Marine fisheries and mariculture supply each about 3% of the total demand for fish, while around 71% are supplied by import and approximately 23% from fishponds. However, concerning only fresh fish, marine fish and mariculture becomes 10% each. In Israel, the average consumption per person remains almost constant, at about 10Kg of fish per year, a low value compared to Europe and the Mediterranean. 1,000 commercial fishermen, and at least several hundred craftsmen, depend on marine fishing. In addition, tens of thousands of anglers benefit from non-commercial fisheries and are responsible for fishing hundreds of tons of fish from the sea every year, mostly for personal consumption.

Since the 1990s marine Fisheries catch volume has declined and is currently measured at 2,500 tons per year. The dynamics of reduction in yield are demonstrated in (27), see Fig. 12.

Figure 12 Declines in CPUE (Catch Per Unit Effort) of Israeli trawlers, based on data collected by the Department of Fisheries in the Ministry of Agriculture and Rural Development since 1949 (from (27)).



The composition of fish species caught in the net has gone through a dramatic change over the years. Many species have experienced a decline and existing species, mostly local ones, such as flounder and cod, have disappeared altogether, and new species invading through the Suez canal have appeared in the Mediterranean. The decline in the volume of catch and the change in composition of fish species are probably the result of four factors combined: direct invasion of species, climate change, fishing effort (including overfishing), and pollution. In turn, these factors are affected by economic and geopolitical factors outside the fishing world. Hundreds of species of fish and invertebrates of tropical origin entered the Mediterranean through the Suez Canal, and currently make up about a third of the catch. In addition, water warming due to global climate change encourages fishes of warm habitats to take over local species establish in the Mediterranean. Some species of invaders have high economic value, but many others interfere with fishing activities, such as poisonous and toxic fish and jellyfish that clog nets and compete with local fish. There is no estimate of the fish stock in the marine system, but evidence show that there is heavy bottom over-fishing, as can be seen in the graph, although the number of fishing vessels has remained constant over the last years. Infrastructure development in and the sea and in its vicinity – especially in harbors, marinas, and energy facilities and desalination plants – and the flow of sewage into the sea causes an increase in the concentration of waste materials, such as heavy metals, pesticides, plastic particles and other chemicals, causing damage to

biodiversity and decline in primary productivity, while some chemicals (for example, mercury) accumulate and harm fish, and may also affect humans who consume them.

1.4.1.4. Evaluation of ecosystem services in the arid desert

The arid desert ecosystem stretches over 4,997Km² of the Negev, between Be'er Sheva and Mitzpe Ramon, which constitutes 22.6% of the total area of Israel. Precipitation is limited – less than 100mm of rain per year, there is a variety of soils, the more fertile of which are the loess soils. The system provides a variety of services, some of which are unique biological diversity components, such as microorganisms that build soil crust. The main drivers of change in this system over the past decades have been changes in land use – expansion and empowerment of military activity and Bedouin settlements on the one hand, and the establishment of extensive nature reserves on the other.

Regulating service of soil erosion and air quality

The most important ecosystem service of the arid desert is the regulation of soil erosion, which reduces the extent of erosion caused by natural processes and man, and contributes to the creation of land. Regulation service that maintains the ground, which is an important component of the natural capital of Israel, is provided by two ecological processes that involve unique components of biodiversity. The first is the process of building a protective biological membrane on the ground surface using a variety of microorganisms, the most important of which are cyanobacteria. The second process is caused by the desert vegetation, reducing the wind speed and flood waters flow velocity near the surface, thus reducing soil erosion. At the same time, plants capture windblown dust and washed away soil in significant rates (up to 277 grams of dust per square meter annually), thus contributing to the slow process of building land.

The same biodiversity that is involved in soil erosion prevention services also provides air quality regulation service, when the dust in the air causes a severe air pollution in the Negev, which affects the health of local residents, as well as the visibility, and thus increases the risk of traffic accidents. Dust storms occur mainly between November and May, and could lead to deviation of 13 times or more from existing standards in harmful particles (up to 5,170 micrograms per cubic meter). Biological membrane and shrubs in loess and sandy regions are involved in this service by capturing particles from the air. Besides the health benefits, this service contributes to reducing both the penetration of dust and sand to inhabited settlements, as well as coverage of transport infrastructure and agricultural systems that are embedded in the arid desert.

In the past the two regulatory services of soil erosion and air quality were in a better condition than they are today. Trimming or removal of plant cover and breaking down of biological membranes are the factors that brought about this trend of deterioration in the extent of supply of both services. The main cause is overgrazing that increased over the years, and the growing use of military and civilian vehicles on the surface. The dust in the air, as health and quality of life service, can be tolerated with medicines, however soil loss is irreversible; damage caused to the ecosystem service regulation of soil

erosion affects other system services, as soil erosion damages the habitat maintenance of many components of biological diversity and life, most of which are involved in the supply of other ecosystem services.

Delivery service of medicinal herbs

Another important system service in the arid desert is delivery of medical herbs. This service provided by at least 80 kinds of wild plants, identified to have medical benefit. Most users are members of the Bedouin sector residing within the system. The different species are used to treat various medical problems. A few species of these plants are used for research of industrial production of cosmetics and medicines, some of which are used in conventional medicine and available to all residents of the country, while others are still in the process of development. The extent of supply of this service is now smaller than it was in the past.

The potential of the service supply has been determined according to its use during the 1980s, which included 80 species. Since then, the extent of use has diminished to only about 20 species at present, mainly due to increasing accessibility to conventional medical services. Hence it Is currently an unrealized potential service. A change may come with a growing trend of eco-friendly cosmetics and drugs from nature. This trend is reflected in the research of medicine plants by local industrial experimental production, R&D centers of the Ministry of Agriculture and Rural Development, and the gathering of plants for commercial agricultural systems to replace the increasing demand for natural herbs. It is likely that the increasing research in this area will use additional species as medical herbs and/or cosmetics.

Delivery service of food

Another system service delivery is providing food by livestock pasture. About 60 plant species are involved in the supplying this service. Biodiversity complies with grazing pressures, and thus ensures a stable supply of material benefits – milk, meat, and fiber products for tents and carpets, in addition to preserving the tradition of Bedouin herding that has existed for thousands of years. Specific sites serve as supply of fodder. Delivering livestock pasture is on the decline due to transformation of natural systems to agricultural systems, built areas and military firing zones, as well as political and cultural factors.

Spiritual service

The arid desert landscape system also provides cultural and educational services used by many travelers, both local and international, such as marked trails, camping grounds, field schools that are located throughout the desert. Components of natural landscape combined with biotic component – unique desert biodiversity – meet the needs of seeking inspiration and experience in the desert. In springtime, a variety of plant species providing spectacular flowering performances, as well as the gazelle, ibex, leopard and wild ass, houbara bustard and partridge are the charismatic species, and many find seeing them in their natural habitat (i.e. the desert) an exciting experience.

The users of these services have been growing in numbers since the late 1990s, along with the development of tourism infrastructures, including Individual farm enterprises within the system, which rely on agricultural-tourism model. It seems that sustainable tourism development with minimal facilities has preference over tourism based on maximum development with strong human intervention.

Biodiversity maintenance service

Without the service of biodiversity maintenance in the arid desert, there will be no provision of any of the above mentioned services. This is one of the support services that provides and maintains habitats like the loess and sandy areas, to all components of biological diversity along the system involved in supplying all services. As these territories have been shrinking – while being transformed to agricultural systems, populated areas, areas of intensive training, infrastructure and planted forests – the remaining areas are degraded, and ecosystem services are limited, which causes increased soil erosion and exposed bedrock, as well as decreased populations; and the different species are locally reduced or even become extinct. There is also lesser supply of services, such as agricultural pests and pollination, as well as services that directly benefit mankind, such as regulation of local climate, regulation of air quality, regulation of diseases, provision of pasturing, supply of medicinal plants, and the supply of cultural services.

There is a price for reducing the ability of this ecosystem to provide habitats to each of the hundreds of species comprising its biodiversity. That price is the loss of possibility to realize the potential supply of services and uses that are still unknown for the benefit of the future. This is because species have adjusted to exist in an ecosystem where the living conditions are challenging, and some benefits of such adjustments may have not yet been identified. One warning sign is the evaluation that the overall biological diversity of the desert in Israel in 2000 was only 70%-80% of the original variety, and this trend could continue and might lead to a loss of additional 10%-60% by 2050, on top of what was already lost.

1.4.1.5. Extremely arid ecosystems and their services

The structure and function of the extreme arid ecosystems depends first and foremost on the availability of water (28). The value of 5% defining the extreme arid ecosystem is not an arbitrary limit, it is determined by the ability of vascular plants to exist. Below this value, vascular plants cannot survive. This feature, which sets the landscape and the transition from arid to extremely arid, can be seen as the landscape changes from scattered shrubs on the slopes, to almost no vegetation on the slopes but some concentrated in the wadis. The existence of extreme arid vegetation therefore depends on the concentration of precipitation from different locations. This source-sink phenomenon depends on the topography. If Southern Israel would have been flat, the amount of vegetation there would be very minimal, if not nil. An exception may be numerous amounts of occasional rains, allowing for growth of annual plants whose seeds are dormant in the soils, as well as plants that manage to reach the aquifer in order to germinate – two relatively rare cases.

Extremely arid ecosystems are characterized by major differences between completely

bare areas and those with quite a lot of vegetation, including shrubs, annual plants and many trees. The transition between the bare and fertile region is very extreme and not a gradual one. The reason is the existence of a positive feedback, enhancing lack of available water that causes extreme dryness through a number of routes, as well as the fact that water availability eventually increases water quantity.

The existence of vegetation in extreme aridity depends on the amount of water that comes from different sources and concentrates (almost always) in the lower areas. Because the presence of vegetation depends on the availability of water, the ecosystem depends on a number of parameters that determine its availability. Availability of water depends on the ecosystem's ability to absorb and store water, and on the contribution of water to the system. Absorption and retention of water depend on the nature of the soil, including soil type, alluvium depth, permeability, vegetation cover and its nature, as well as the breadth and degree of the Wadi. The contribution of water depends on the size of the drainage basin, the slope, soil type, rainfall amount and intensity on the donor area.

The lack of vegetation in extreme arid ecosystems except in wadis is caused due to a chain of interrelated factors, creating a positive feedback that leads to increasing dryness processes; this in contrast to the dry region, where the slopes are very dry but the moisture (precipitation of over 50mm per year) is sufficient for processes that enable the existence of plants. Negative feedback in arid ecosystems maintains adequate soil moisture for plants. In extreme arid ecosystems the decline below this threshold does not allow the existence of flora including woody and annual plants, as well as biological crust on the soil. In the absence of any presence of vegetation there is soil and minerals erosion from the slopes, leading to source-sink relations where the vegetation is present only in wadis. There is an extreme difference between wadis where the biomass is relatively high, mainly due to the existence of trees, and the rest of the area. The trees density in extreme arid ecosystems is higher than in the arid ones, where there are mainly bushes.

Despite low initial productivity, extreme aridity contains a very complex food web. Because the amount of rainfall is very unexpected, it is difficult for animals dependent on fresh plant material to maintain stability in large populations. The variable rainfall from year to year more sharply affects the abundance of single flowering annuals, and therefore the number of species like bees and butterflies, which are based primarily on annual bloom, is comparatively low. However, Israel's extreme arid situation is not low compared to other places in the world: studies that have been conducted in the Central Arava in recent years have found over 200 species of bees. There are many primary consumers that feed on dry organic matter (detritus). A dominant group of species in the deserts is the detritivores, since detritus is a reliable food source, available and abundant. The main groups of which are termites, isopods and beetles, and they constitute the basis for the complex food web found in the extreme arid ecosystem in Israel.

The main change-causing factors in the extreme arid ecosystems are the impact of farmland-adjacent open spaces, mining of sandy habitats, the effect of settlements and military camps, climate change and especially droughts, military operations (outside the military bases), the impact of elongated infrastructures and especially roads, pollution from factories, and mining.

OPTIONAL QUESTION:
What are possible future changes for biodiversity and their impacts?

1.5. Future scenarios

Two examples are used – Climate Change and Sustainability.

1.5.1. Climate change

In 2012 the MoEP founded the Israeli Climate Change Information Center (ICCIC), which conducted an expert survey to evaluate climate change impacts on biodiversity in the terrestrial, inland, freshwater and marine ecosystems of Israel. The main climate change impacts in Israel include ongoing deterioration of freshwater habitats, decline of shrubland and woodland areas, and increased frequency and severity of forest fires. As for the Mediterranean Sea, the surveys predict further introduction and establishment of invasive species from the Red Sea, accelerated erosion of coastal rocky habitat, and the collapse of coastal rocky platforms. In the Gulf of Eilat, the Red Sea, corals may be resilient to foreseen climate change due to their high tolerance for rising water temperatures.

In detail, an increase in drought frequency is expected to lead to extensive mortality of woody vegetation in various geographical locations in Israel. Decreasing precipitation and rising temperatures will exacerbate this trend. Mortality of woody vegetation may have far-reaching effects on the function of the ecosystem, including water regime, soil erosion and nutrient cycling, as well as the abundance of biota and microorganism populations. In addition, a shift in distribution of wildlife and flora species is expected, particularly at the ecotones between the arid and Mediterranean ecosystems. These changes will affect the structure and function of the ecosystems in several areas in Israel. Furthermore, a rise is expected in the number and duration of fire risk periods in the Mediterranean forests. The greater frequency of fires may overcome the natural regeneration capacity of the forests, and this may drastically change the structure/composition of the flora and the ecosystems.

Aquatic ecosystems have been deeply affected throughout the years by man-made pollution, freshwater overexploitation and development pressures. Considering that climate change will lead to higher temperatures and greater evaporation, a reduction in precipitation will enhance water pumping and will consequently aggravate the deterioration of these ecosystems.

Specific species which are sensitive to changes in salinity, temperatures and/or oxygen concentration may disappear from the ecosystem, to be replaced by more robust species, either local or invading ones.

Reduction in rainfall and the expansion of evaporation will shorten the duration of seasonal pools or may even halt their development completely. Swamps and perennial rivers may degrade permanently and irreversibly due to the transition from a permanent, year-round water presence to a seasonal, transient presence, in which the biota that needs permanent presence of water will completely disappear.

As for the marine ecosystem, it is expected that in the Mediterranean Sea, the current invasion of tropical species from the Red Sea through the Suez Canal will transform the Mediterranean ecosystem, which will lose its unique nature and become similar to tropical marine ecosystems. The acceleration of sea water acidification (as a result of increasing CO2 concentrations) may exacerbate the erosion of the sea cliffs and lead to the collapse of the unique abrasion platforms. In addition, the benthic and sub-benthic zones, along with their biodiversity, will be affected by the sea-level rise that is expected as an outcome of the rise in temperatures. In the Gulf of Eilat, coral bleaching may accelerate, a process connected to the sensitivity of symbiotic algae in the corals to high temperatures, leading to coral mortality. Though until now corals in the Gulf of Eilat have not been significantly affected by climate change, the rising temperatures may exacerbate this process.

It is expected that ecosystem services will deteriorate in terms of the following: provision of drinking water, genetic resources, prevention of soil erosion, regulation of invasive species, pest control and pathogens, recreation, and cultural services. The fisheries composition and stocks in the Mediterranean Sea will change and include more species and a larger amount of organisms from the Red Sea.

Despite these predictions, science-based knowledge regarding the contribution of management toward minimizing climate change impacts on biodiversity is still lacking.

A National Strategy and Action Plan for Climate Change Adaptation is currently being formulated and draft recommendations have been prepared (section 2.4.1.2.).

1.5.2. Israel Sustainability Outlook 2030

This was a joint initiative of MoEP and the Environmental Policy Center at the Jerusalem Institute for Israel Studies, which was conducted over the years 2010-2012. The project included experts from a wide range of fields – economy, society, public policy, planning, ecology, energy, and water.

The initiative to prepare Sustainability Outlook 2030 was based on the understanding that Israel's environmental future needs to be guided by coherent and long-term public policy and was based on scenario building.

Scenario building was chosen to anticipate possible future situations in a context of high uncertainty. The scenarios are different possibilities that may or may not materialize. An examination of the social, economic and environmental trends and processes over the last 20 years constituted the basis for creating the scenario that presumes the continuation of present trends. This is the "business as usual" option. The team of experts developed six other scenarios that differ from one another by variables with a high level of uncertainty, such as the market economy, the geopolitical context, the bureaucratic-institutional framework, the economic-political ideology, and resilience to crises.

The scenarios were classified into four main groups by the degree of dominance of various mechanisms. One group includes scenarios in which the market mechanism is particularly dominant; in another group the social mechanism is dominant; the third group includes scenarios where the mechanism of state intervention is dominant; and in the fourth group it is the geopolitical mechanism that is dominant.

1.5.2.1. Dominance of market mechanisms

"BUSINESS AS USUAL" SCENARIO: market dominance: An emphasis on markets and growth; continued population growth and current consumption patterns; reaction to short-term problems; development of a city-state; absence of an integrated vision; focus on local conflicts; the Israeli-Arab conflict continues to play a central role on the agenda; degradation and fragmentation of ecological systems (in fact, marginal attention is given to the environment).

UNREGULATED MARKET SCENARIO: A strong, powerful market along with deepening degradation of the environment and increasing social discontent – neoliberalism is the reigning ideology; absence of environmental and social regulation, and development of a city-state; growing social disparities adversely affecting young people and the middle-class; privatization of state land.

REGULATED MARKET SCENARIO: A strong, powerful market; growing attention to the environment, but with a splintered and polarized society; promotion of growth; creation of a bureaucratic-institutional mechanism; integration between economy and environment; absence of social inclusion; restraint on the concentration of wealth.

1.5.2.2. Dominance of social mechanisms

COMMUNITY MOSAIC: Strengthening of social resilience and reduction of environmental degradation, but a significant drop in economic growth – emphasis placed on inclusion (integration of all elements of society); promotion of grassroots processes; promotion of social businesses, new entrepreneurship networks and organizational and community structures; emphasis on local economy.

State as developer scenario, state mechanism dominant Intervening/developing state:

Adoption of a post-neoliberal approach with social and environmental emphases, government intervention in market processes – as a result of social unrest and outburst of waves of protest throughout the country, which led to the rehabilitation and intervention of the bureaucratic-institutional system; drop in economic growth.

1.5.2.3. Dominance of geo-political mechanisms

UNREGULATED FORTRESS STATE: Environmental, economic and social deterioration caused by political seclusion – worsening of geopolitical status along with boycott and sanctions; cessation of foreign investments; ongoing environmental neglect; increase of environmental risks; growing reliance on local natural resources.

REGULATED FORTRESS STATE: Strong regulation following political seclusion, drop in economic growth while protecting the environment and building social resilience – worsening of geopolitical status along with boycott and sanctions; cessation of foreign investments; government intervention; development of innovation in defense industries; establishment of inclusion and regulation mechanisms in the social and environmental areas; protection of reserves and effective use of resources; protection of open landscape areas for security reasons.

1.5.3. Conclusions

The different scenarios have different levels of sustainability (environment, wellbeing, and resilience). A scenario from the "market superiority" group can reach a relatively high level of sustainability only in a "regulated market". The social scenarios would reinforce wellbeing and the environment, but their economic price would be high. In the geopolitical situation of a fortress state, sustainability would be compromised from all aspects but regulation could mitigate the severity of the damage. An analysis indicates that the level of sustainability in each scenario is far from the desirable situation and that we should be able to reach a higher level of sustainability – whatever the scenario.

Part II

NBSAP - Its implementation and mainstreaming of biodiversity

Q5 What are the biodiversity targets set by the country?

2.1. Updated biodiversity targets

As a first step towards a new NBSAP, the biodiversity vision and NBSAP targets were updated lately, so as the targets were coordinated with the CBD strategic plan for the years 2011-2020 and the Aichi targets and adapted to the needs of Israel.

It is envisioned that by the year 2040 biodiversity in Israel will flourish and become respected by the public for its own value and importance to human wellbeing, thus it will be protected, restored and managed sustainably for the benefit of present society and future generations.

The mission is to stop the deterioration of biodiversity, ecosystem services and natural assets through sustainable development by 2025. This is planned to be achieved by mainstreaming the importance of biodiversity and its benefits into decision making processes and through the public, in order to cope with the causes of biodiversity loss by reducing direct and indirect pressures on biodiversity and dissemination of sustainable use of its products, as well as by improving its situation through direct protection of functioning ecosystems, species and genetic diversity.

2.1.1. The targets

A. MAINSTREAMING OF THE IMPORTANCE OF BIODIVERSITY AND ITS BENEFITS TO HUMANS:

- Public awareness – increasing by 2020, the public awareness to the existence and wellbeing value of biodiversity to humans and to the actions the public should take to protection of the environment and to sustainable use.
- Action plan – the national action plan will start implementation by 2017.
- Incorporation in governmental policy – by 2025 considerations of biodiversity conservation and of its benefits will be incorporated in the policies of relevant offices and authorities, the planning system and local governance.
- Economic incentives – by 2025 economic incentives that harm biodiversity will be significantly reduced, and positive incentives to protect biodiversity and its sustainable use will be activated.

- Green Growth and its implementation in the business sector – by 2020 the government decision on Green Growth will be implemented, and biodiversity considerations will be incorporated in the business sector, so that use of natural resources will be within safe ecological limits.

- Knowledge base – by 2020 the scientific knowledge base related to the various aspects of biodiversity, including ecosystem services, will be expanded and improved, and so will the national monitoring system, the accessibility to information and its assimilation in the management of biodiversity and in decision making.

B. REDUCTION OF STRESSES ON BIODIVERSITY:

- Reduced conversion of open landscapes – by 2025 the rate of conversion of natural habitats and all open landscapes will be reduced by half, reducing unsaturated new housing construction, reducing conversion of agricultural land to built area and restoring an abundance of agricultural lands.

- Fisheries – by 2020 fishing in the Sea of Galilee and the Mediterranean Sea will be sustainable, avoiding overfishing and damage to protected natural assets, endangered species and marine ecosystems.

- Forest management – by 2020 management of planted forests will be sustainable according to the updated forest management doctrine of the forestry organization.

- Agriculture – by 2020 considerations of biodiversity protection and of ecosystem services will be implemented into the agriculture policy, including marine aquaculture.

- Pollution – by 2025 pollution of the sea and wetlands by hazardous materials and surplus of nutrients will be reduced to levels that are not harmful to the function of ecosystems and biodiversity.

- Invasive species – by 2020 legal measures will be developed and implemented to prevent introduction of invasive alien species to Israel, and for existing species a prioritization list for confinement and eradication will be provided and implemented.

- Coral reef of Eilat – by 2020 stresses on the reef will be reduced.

C. IMPROVING THE STATE OF BIODIVERSITY BY DIRECT PROTECTION:

- Protected area representativeness – by 2025 representation of the diverse ecosystems will be improved so that all important ecosystems will have a viable area.
- Connectivity – by 2020 ecological connectivity between protected areas will be improved by ecological corridors and wildlife passages.
- Management – by 2020 protected areas will be managed according to principles of knowledge based on adaptive management and monitoring.
- Endangered species – by 2020 actions to improve the status of endangered species will be implemented with preference to the most endangered species, endemics, species at the periphery of their range and key species for ecosystems.
- Restoration of ecosystems and populations – by 2025 restoration of wetlands in critical state, including streams and winter ponds, will be accomplished, and restoration of underrepresented ecosystems and extinct species will take place as a management routine.
- Genetic diversity – by 2025 the genetic diversity of all local wild relatives of cultivated species, or that have economic or cultural value, will be conserved.

Q6 How has the NBSAP been updated to incorporate these targets and to serve as an effective instrument to mainstream biodiversity?

2.2. Mechanisms for mainstreaming biodiversity

MoEP, in collaboration with many organizations – including The INPA academia, government departments and public bodies – leads many enterprises for maintaining biodiversity in the Israeli ecosystems. These projects relate to all the important aspects for maintaining biodiversity, and include plans for evaluation and monitoring the natural state of Israel, as well as characterization of threats to biodiversity using legal, economic, educational, research and planning tools. Cooperation with the various bodies involved in nature conservation, national and actionable recommendations can be targeted for biodiversity conservation in Israel, through integration of international efforts on the issue.

2.2.1. Update

Update of the NBSAP is currently drafted, aiming to reach a coordinated and integrative interministerial plan, and will be described in the next report.

Q7 What actions has the country taken to implement the Convention since the last report, and what have been the outcomes of these actions?

2.3. Actions taken according to plans presented in the 2010 NBSAP

2.3.1. National Planning

Israel's National Master Plan for Building, Development and Conservation (#35) document for all upcoming development nationwide includes the need to preserve the remaining undeveloped areas in Israel wherever possible, and to maintain connectivity between these areas. It was adopted in 2005 and is currently in the process of revision, including specific designation of ecological corridors.

This Comprehensive National Master Plan for Building, Development and Conservation is an overarching outline plan affecting biodiversity conservation. It establishes guidelines for the development of conservation-worthy areas, including coastal areas. It also gives protection to landscape ensembles and to coastal, river and landscape strips.

Key sector-specific national plans that contribute to protecting Israel's biodiversity include: the National Master Plan for National Parks, Nature Reserves and Landscape Reserves; the National Master Plan for Forests and Afforestation; the National Master Plan for Coastal Areas; and the National Master Plan for Rivers and Drainage.

The Comprehensive National Master Plan for Building, Development and Conservation is built on three guiding principles:

I. "Deconcentrated concentration": population will be dispersed at the national level and concentrated at the regional level. It is reflected in the population which quantitatively expresses the national target of accelerated development in the southern district, controlled development in the northern district, reduced rate of development in the central district, strengthening of Jerusalem and significant regeneration of the metropolitan cores in the Tel Aviv and Haifa districts.

II. The metropolitan structure: Most of Israel's urban, industrial and commercial development will be organized within metropolitan frameworks. The planning

principles for each metropolitan region will be adapted to its particular stage of development. The internal accessibility within the metropolitan regions – between residential and employment areas and the main urban centers and sub-centers – is of crucial importance to their daily economic functioning. The planning policy of NOP 35 considers the fostering of urban quality of life to be a central cultural value of Israel in the 21st century. Therefore, a lion's share of the planning and implementation efforts will be directed toward wise planning and development of the future Israeli city.

III. The spatial structuring of open landscapes: Open and rural areas, which are rich in natural assets, landscape beauty and heritage, deserve protection, fostering and shaping, through the creation of a clear and a whole spatial structure on the national level. The national green spine is the main north-south landscape axis. This green spine is a mixed preserved texture, which embraces the majority of the most valuable and sensitive open and rural areas, nationally protected and commonly appreciated. The main landscape axis includes nature reserves, national parks, forestry and ensembles with high cultural value. The green spine also assures the continuity of open space countrywide and would serve as the main ecological corridor, vital for the preservation and rehabilitation of biological diversity in this ecologically sensitive part of the world.

2.3.2. Conservation and management of biodiversity

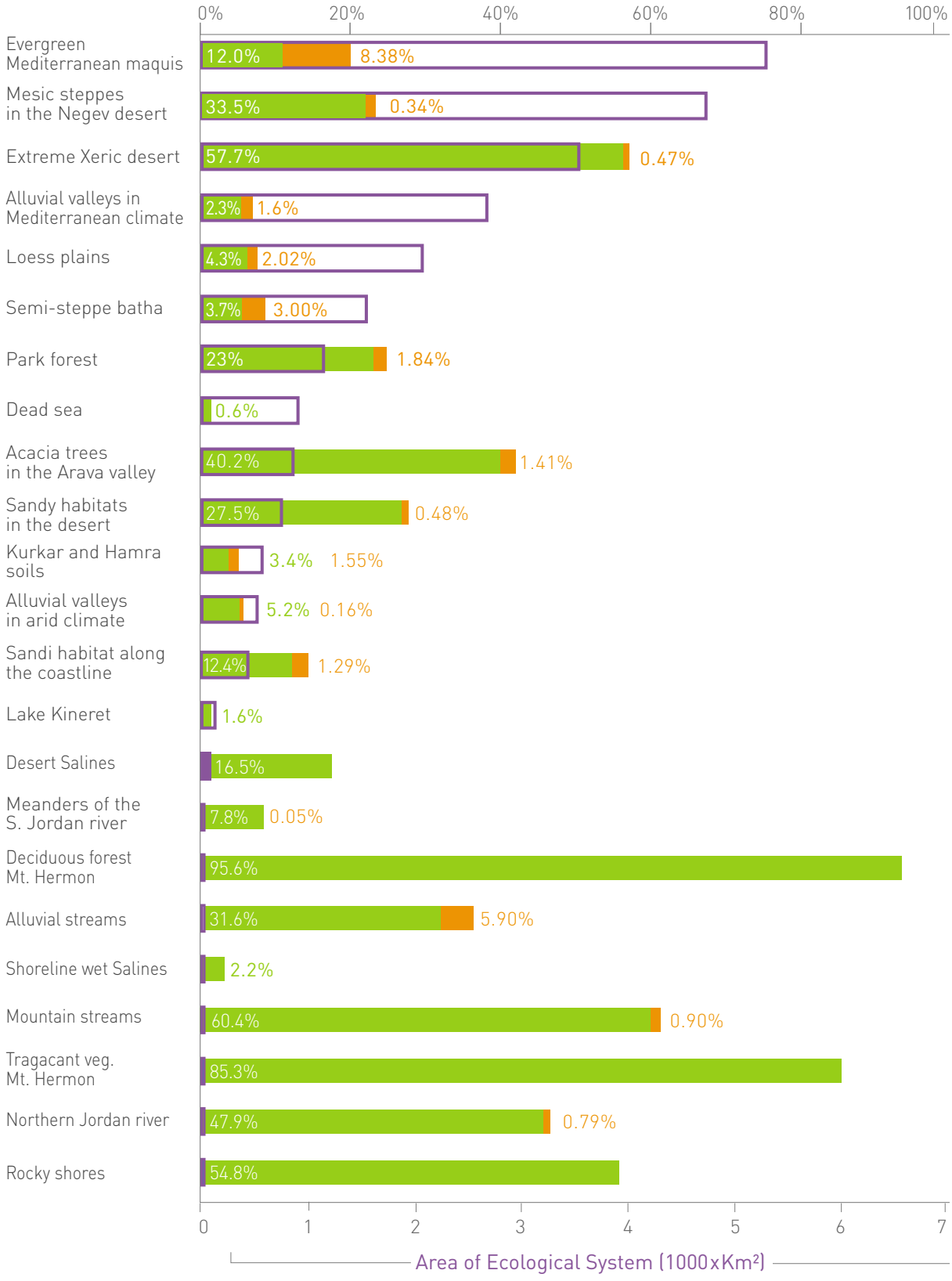
2.3.2.1. Protected areas

The law in Israel assigns protection of various types to areas in Israel according to the goal of their use. The main type designated for biodiversity conservation is the nature reserve, but also biosphere reserves, and to some degree other open areas uses such as forests (within the National Master Plan for Forests and Afforestation there is a category of "forests for conservation"), rangelands and even military zones.

In 2014, the INPA analyzed the representativeness of the protected areas system (including nature reserves, national parks, and forests, as defined in National Master Plan 22) in Israel.

The 5 main natural ecosystem types in Israel (see section 1.1.3) are sub-divided into 23 ecosystems.

Figure 13 The representation of each ecosystem of Israel in protected areas



Recently, the representation of these ecosystems in protected areas was analyzed by the INPA (see Fig. 13). It seems that many ecosystems that comprise a large part of the country, except the desert, are not sufficiently represented in protected areas, especially the Mediterranean forest, the bush steppe, alluvial valleys, and loess areas.

2.3.2.1.1. Nature reserves

These are protected areas declared by law for the purpose of nature protection. They comprise 21% of the area of Israel (4,645Km^2). Until 2014, 352Km^2 were approved by concerned Ministries, 172Km^2 are currently in process for approval and 1,739Km^2 have been suggested by professionals as deserving protection. Since the last report there was an increase of 7% (160Km^2) in the area of declared nature reserves, and of 2.5% (45Km^2) in suggested areas for declaration.

2.3.2.1.1.1. Marine reserves

In 2012 the INPA presented a new policy for marine protected areas (published in Hebrew). From the mid-1960s to the early 2000s Israel declared 7 small marine reserves in total area of 10.4Km^2, about 0.25% of Israel's surface area in the Mediterranean, which usually extend from the shoreline to a few hundred meters west into the sea. These reserves protect the majority of the coast islets and habitats of tides and shallow water environment at a depth of up to 20m, but are not representatives of the entire marine environment. To these nature reserves 2 Marine Protected Areas were added – one in Rosh Hanikra-Achziv and the other in the Carmel coast, where nature values are protected in accordance with the National Parks, Nature Reserves, National Sites and Memorial Sites Law.

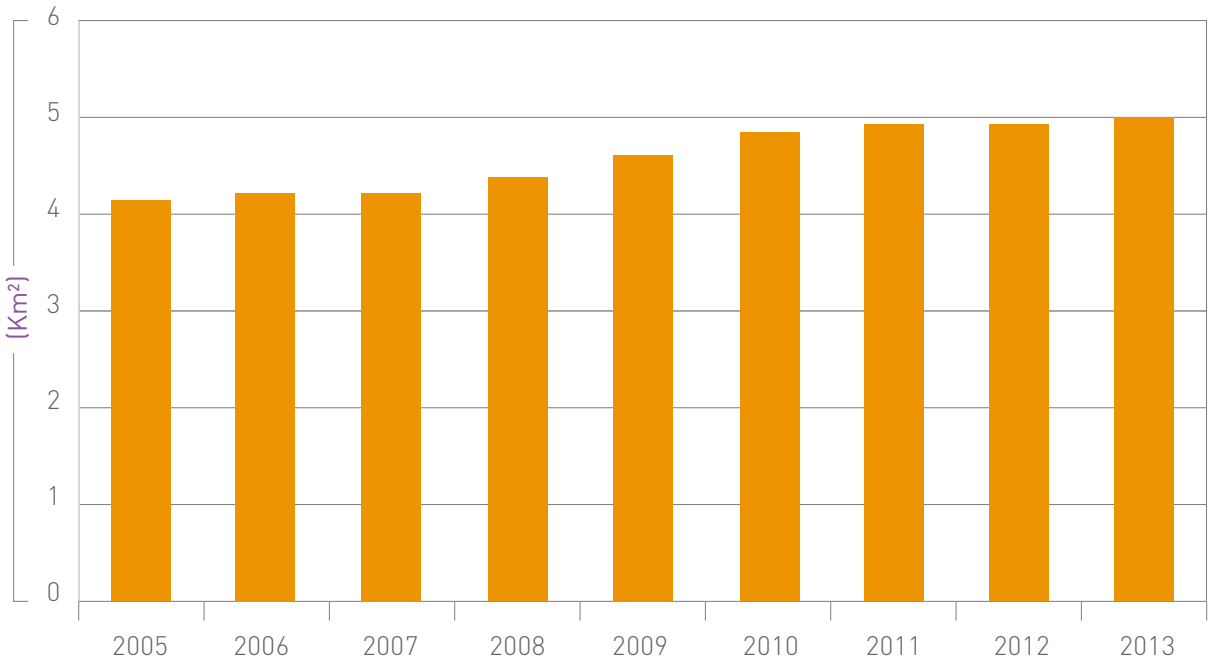
Establishment of marine reserves is planned in order to protect areas better representing the properties of marine habitats – areas with soft shifting sands and unique habitats, such as limestone ridges underwater, areas with hard-stabilized rock, and the tidal tables. Rare habitats, such as underground canyons and mountain ridges that extend to the sea, will be fully included. The planned marine reserves will be divided into several categories: (A) large reserves: four will extend from the east coast to the west boundary waters. These reserves will protect habitats that represent sea depths from 1,000m to 150m as limited by the territorial waters. Large reserves are planned off the coast between Ashkelon and Ashdod, the Sharon, Carmel, and Rosh Hanikra; (B) special reserves where the habitats have unique characteristics and worth preserving, such as the top of the Carmel ridge in Bustan Hagalil; (C) coastline reserves to be added to those already declared and extended for a distance of one hundred to hundreds of meters from the shoreline where there is a need to provide additional protection to the coastline Itself and adjacent habitats; (D) areas aimed at protecting the ancient coastal cities, their harbors and other heritage sites in the vicinity of the beach or sea.

According to the plan, the marine protected areas will comprise more than 600Km^2.

2.3.2.1.2. National Parks

These are areas used for recreation in nature or to protect areas of cultural heritage values. The extent of such areas is 190Km², 0.9% of Israel's area. Since the last reporting date 36Km² was approved, 11Km² are in process of approval, and 48Km² have been suggested. Since the last report, 1.67Km² have been declared, 11Km² approved, 5.57Km² in process and 18.35Km² have been suggested to be National Parks.

Figure 14 Protected areas declaration – total area over years in Km²



A steady, although very moderate, increase in protected areas is presented in Fig. 14.

2.3.2.1.3. Biosphere reserves

In June 2011 the UNESCO Committee declared Ramat Menashe as the second biosphere reserve (BR) in Israel. The first was Mount Carmel, declared in 1996. A process of public and stakeholders participation, which was guided by the head of the regional council, took place during the planning stage. The BR total area is 17.3 Km² overlapping the area of the Megiddo regional council, with zoning that includes core areas totaling 1.6Km², a buffer of 12.8Km², and transition areas of 2.9Km².

Ramat Menashe BR encompasses a mosaic of ecological systems that represent the Mediterranean Basin's version of the global "evergreen sclerophyllous forests, woodlands and scrub" ecosystem types with biodiversity components of Asian steppes and African semi-deserts, including their genetic variation typical to populations at the edges of their geographical distribution. The conservation of these communities and

ecosystems (locally called "batha"), whose spatial mosaic contributes to a pristine, rural-natural landscape, is effected through controlled and regulated livestock grazing, without which these ecosystems would be either naturally transformed into woodland ecosystems, or be appropriated by agricultural development and turn into cultivated ones.

Within the biosphere region there are 13 cooperative agricultural communities, of these 9 operate as "kibbutz", whereby all production means – land rights, homes, and community institutions – are collectively owned, and 4 operate as "moshav"– whereby each family has its own land rights, home and means of production, but some agricultural activities are collectively carried out. The total population is 10,000. About 95% of the land of the BR is state property leased to the agricultural communities' cooperatives and to their members for agricultural, housing, and light industry purposes. Afforestation areas are managed by the JNF; and nature reserves are managed by INPA.

At present, a management plan for the newly established BR is being developed.

2.3.2.2. Endangered species conservation plans

2.3.2.2.1. Plant species

In accordance with the Global strategy for plants protection, and following the survey and publication of the Red List of plants in Israel, in 2011 the INPA published an action plan for protection of plant species appearing in the Red List of endangered species. Three courses of action were decided upon:

1. To prioritize, within the species in the Red List, the ones requiring an individual conservation plan. 40 such species, endemic to Israel, have been chosen. This selection highlights the responsibility of the State of Israel, at the global level, to prevent the extinction of plants unique to its territory.

2. Concentrate in-situ conservation efforts on hotspot sites rich with Red List species. From 36 hotspots, 3 focus areas have been chosen, each representing a different habitat type containing the highest number of endangered species and those rare in their extent.

3. Ex-situ conservation in botanical gardens, special shelter gardens in nature reserves, and in the plant gene bank.

So far 10 shelter gardens have been established in nature reserves and national parks, and 3 reintroduction projects have been carried out as part of this program.

2.3.2.2.2. Endangered animal species

Conservation of endangered animal species is a routine activity performed by the INPA. Some special emphasis was given to the preparation of a new conservation plan for bat species, freshwater fish species, raptors and other bird species. Some monitoring efforts are presented earlier in this report (see section 1.2.3).

2.3.2.3. Conservation of genetic diversity

The Israeli Plant Gene Bank (IGB) is a unit of the Ministry of Agriculture and Rural Development, responsible for the collection, preservation and evaluation of plant species indigenous to Israel. The IGB is set up to preserve plant genetic resources and the endangered genetic variability of the Israeli flora. IGB is the main ex-situ conservation agent, with few additional small ex-situ targeted collections located in other research institutes.

Between the years 2007 and 2014, 1,300 native species were deposited in the gene bank, representing approximately 48% of the flora of Israel (see Table 1).

Table 1 The number of seeds and species collected over the years by Israeli Plant Gene Bank.

Year	No. of collections	Species collected	New species
2007	959	313	313
2008	1,225	408	213
2009	1,022	349	111
2010	775	362	130
2011	648	348	141
2012	675	368	127
2013	557	390	158
2014	516	351	107
Total	**6,377**		**1,300**

During these years, 280 endangered plant species were deposited in the gene bank; comprising 67% of the endangered plants, 39 of them are endangered endemics that are 97% of that category.

2.3.2.4. Invasive species

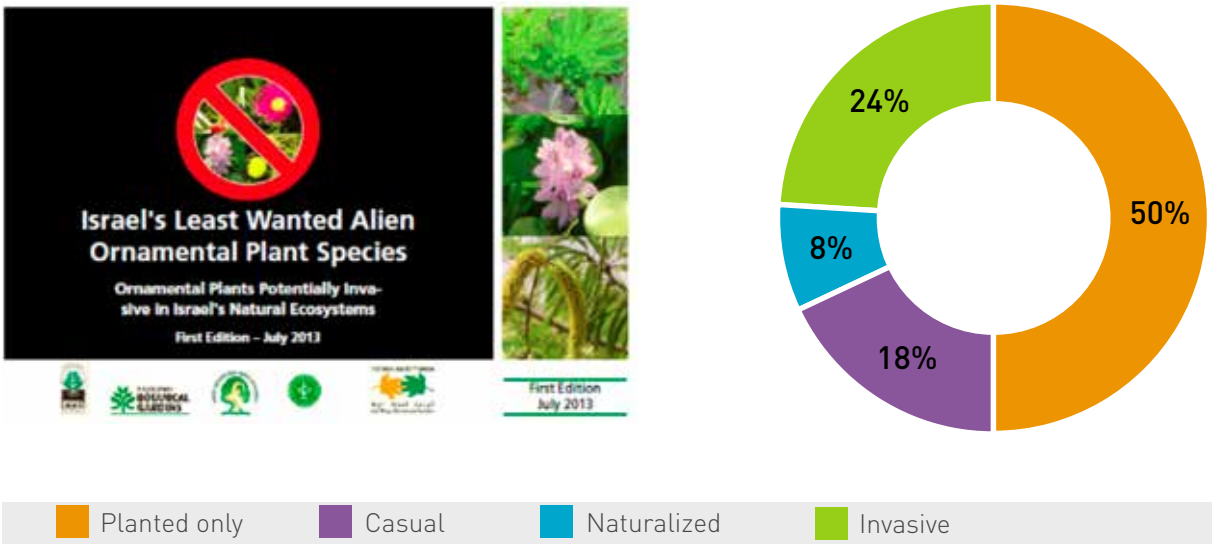
Several projects have been carried out to tackle the problem of invading plants and animals. Some are guidelines and manuals that have been published; others are eradication experiments. Projects taken since the last report are:

2.3.2.4.1. Invasive ornamental plant species

Since the last report the issue of IAS has been tackled from several angles. A list of alien ornamental plants and plants known to be invasive or potentially invasive in Israel, compiled by and agreed upon 2010, was published by the MoEP and INPA in 2012. This list is a voluntary tool being offered to landscape architects, gardeners, foresters and the general public. The list allows checking whether an alien plant species proposed for planting has a high invasive potential in Israel and may pose a threat to local ecosystems. The main objective of the list is to prevent the use of plants that might become invasive in natural ecosystems in Israel's various regions.

The current edition of the list includes 141 species of ornamental alien plant taxa potentially invasive in Israel, as shown in Fig. 15, as well as 10 alien species recommended for monitoring, as their invasiveness potential in Israel is still unclear. The selection of plant species to be included in the list was based on the bio-geographic approach, which stipulates that an alien plant species that has become invasive in a given geographic region, primarily characterized by a specific type of climate, is likely to be invasive in other regions with the same type of climate.

Figure 15 Proportion of alien plant species in each invasion stage (based on (31)).



2.3.2.4.2. Guidelines for infrastructure projects

A manual for reducing the influence of infrastructure development on increasing spread of IAS was published in 2012 by INPA, and is mainstreamed through EIAs for the major infrastructure construction projects. It focuses on guidelines for surveying, options for plant IAS population treatment, and guidelines for spread prevention.

2.3.2.4.3. The national plan for treatment of Ambrosia

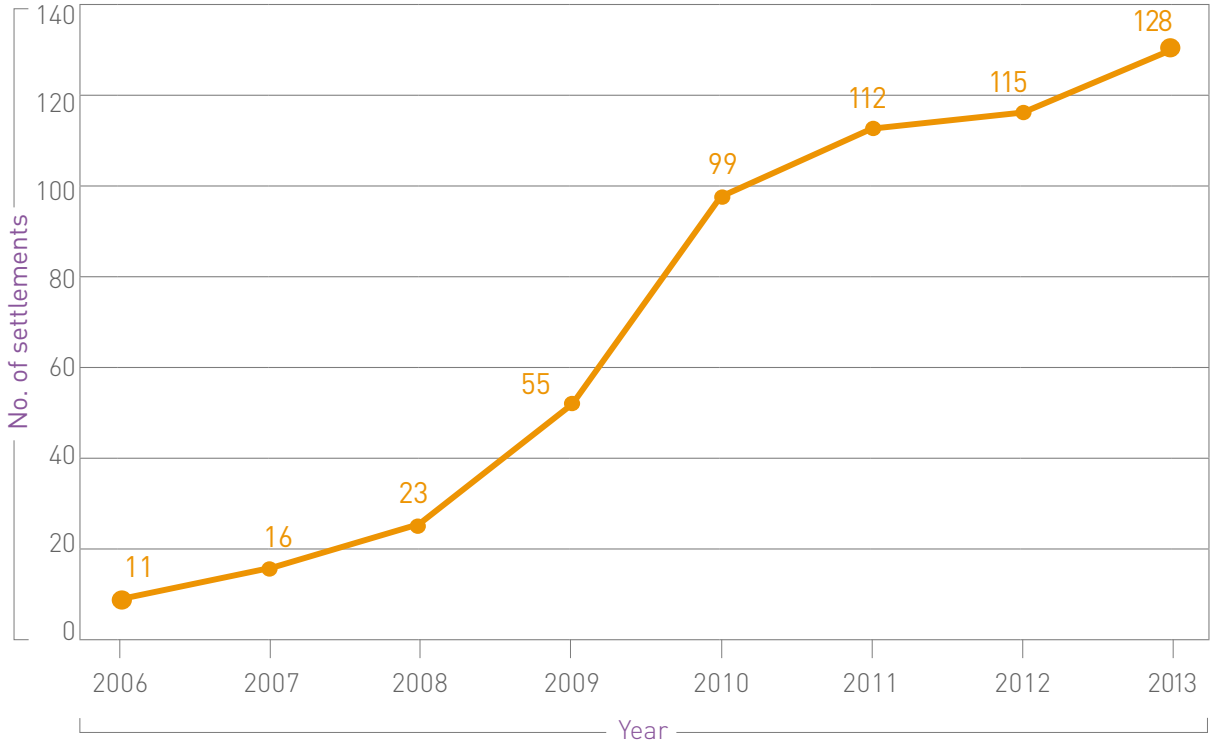
Ambrosia confertiflora is a perennial herb originating from south and southwest United States. usually the source of the invasion of Ambrosia is seed mixtures used in agriculture, but in some cases it has been shown that the seeds of Ambrosia came from birds feeding.

Since this species was prioritized for action as the most harmful among the invasive plant species in Israel, a plan to reduce its spread was published by INPA, MoEP and MoA in 2014. Resources for implementing this plan are currently sought after. An Internet tool http://deshe.maps.arcgis.com/apps/GeoForm/index.html was developed for reporting new invasion locations.

2.3.2.4.4. Treating the fire ant invasion

The little fire ant *Wasmannia auropunctata* is originated from South America, and has spread to many areas of the world, including Israel. This species is a serious nuisance to humans because of its painful sting, and it harms nature by competing with other species of ants and arthropods and by causing death to animals of various groups, including reptiles and mammals. It may also cause severe eye diseases in animals, such as dogs, cats and rabbits (23).

Figure 16 The spread of fire ants expressed as cumulative number of settlements affected over the years.



Experiments for eradication of the little fire ant were carried out using Indoxacarb, which is considered to have a low risk to the environment, and has shown good results in the laboratory. It was decided to try spraying the field using a gel-like material to reach the entrance to the nests and to dissolve the soft material in the form of many small droplets instead of a few large granules. There Indoxacarb spray or gel had no effect on the little fire ant in the field, and it is possible that the material is not effective alone, and may be used in combination with other materials. Eradication experiments are still being carried on.

2.3.3. Biodiversity monitoring

2.3.3.1. Foundation of a program for monitoring and evaluation of biodiversity

www.hamaarag.org.il/en/content/inner/hamaarag-israel%E2%80%99s-national-ecosystem-assessment-program

HaMaarag is Israel's National Nature Assessment Program. This is a joint operation of organizations responsible for natural resource management in Israel, as well as independent scientists, and operates under the auspices of the Israel Academy of Sciences and Humanities.

HaMaarag has been acting within its current framework since 2011. Since its establishment, HaMaarag's primary mission has been to assess the state of nature in Israel for knowledge-based management of open landscapes and biodiversity.

The partners of HaMaarag include: MoEP, INPA, Keren Kayemeth LeIsrael – the Jewish National Fund, and it is supported by a private fund and by the Heritage Project of the Prime Minister's Office.

OBJECTIVES AND VISION

HaMaarag aspires to contribute to the advancement of knowledge-based management of open spaces and natural resources, via continuous production of scientific knowledge on the state of ecosystems and biodiversity in Israel. This knowledge will be accessible to both decision makers and the general public. Correct planning of land use and intelligent management of open landscapes will contribute to human wellbeing and to long term sustainability of nature in Israel.

The mission of the HaMaarag is to improve ecosystem management and policy with emphasis on biodiversity conservation based on monitoring, ecosystem assessment, and synthesis of knowledge obtained from studies in open areas and their management. Hence, the 3 main projects of the HaMaarag are: 1) The terrestrial biodiversity monitoring program (see section 2.3.3.1.1.); 2) The state of Nature report (see section 2.3.3.1.2.); and 3) The Israel National Ecosystem Assessment (see section 2.3.4.1.).

2.3.3.1.1. The national biodiversity monitoring plan

Based on continuous long-term monitoring of selected biodiversity elements according to defined ecoregions in Israel, monitoring is used to evaluate the state of biodiversity in the major Israeli ecoregions and to quantify a number of processes involved in determining the diversity. Terrestrial, wetlands and the Mediterranean Sea ecosystems are being monitored.

The goal of the national biodiversity monitoring plan is to produce a quantitative evaluation of the state of nature in Israel in order to identify significant changes, in particular those that express deterioration of and decline in biodiversity and its function (on various scales – species, ecosystems, landscape). This is in order to propose means for conservation and prevention of biodiversity decline. The national monitoring program might suggest means to reduce anthropogenic stresses on biodiversity.

THE TERRESTRIAL MONITORING PROGRAM – REGIONAL AND NATIONAL MONITORING

The guiding principle of the program is that since ecosystem processes and threats on biodiversty vary between ecoregions, each ecoregion in Israel should be treated

independently, with possibly different indicator groups monitored. Independent monitoring in different parts of the country will enable tracking major changes in the ecosystem structure and function, and its species diversity in each ecoregion. The integration of monitoring results from all the ecoregions will then provide a nationwide picture. There are a number of aspects that characterize the ecosystems in all regions.

The units for monitoring eco-regions are as follows:

- Golan Heights-Eastern Galilee: herbaceous and shrub *bathas*.
- Mediterranean *maquis* (throughout the country).
- Coastal Plain sands.
- Mediterranean-desert ecotone (Northern Negev).
- Negev Highlands: "rocky" desert.
- Inner desert sands.
- Extreme desert – Arava, large *wadis*, low eastern Negev: Acacia savannas.
- Extreme desert – Eilat Mountains.
- Planted conifer forests (throughout the country).
- Planted forests in the Mediterranean-desert ecotone in the northern Negev ("savannization").

In addition, a monitoring program in agricultural systems is included in the open areas monitoring program, because a substantial part of biodiversity exists in or reacts to agricultural processes. Many species use both natural and agricultural areas as habitats. Most of the existing information on agricultural systems, however, is related to pests, and very little is known about the interactions and contribution of agricultural systems to biodiversity.

The monitoring cycle is bi-annual, and for most units the first cycle, representation of the baseline was completed by the end of 2014.

PRODUCTS

The monitoring products are presented as an annual report consisting of text, tables and graphic forms and consist of temporal variation data for a number of variables. The data and their fluctuations in the report are interpreted in order to clarify if the deviation

from normal values (and there is usually some variance) is a cause for concern. The report identifies undesired trends in ecosystem function and biodiversity state.

Three monitoring reports were produced by now (2012, 2013, 2014) serving as the baseline for evaluation.

MEDITERRANEAN SEA MONITORING AND RESEARCH PROGRAM

The marine biodiversity monitoring system in the Mediterranean Sea is more complex than that of terrestrial ecosystems. This is mainly due to the complex technical and financial means needed for implementation of the monitoring program. In marine environments, existing information is limited to a relatively small number of sites.

The MoEP is responsible for the marine ecosystem monitoring program in the Mediterranean Sea, similar to the one described for terrestrial ecosystems. The monitoring is performed by the IOLR, with some special assignment carried by HaMaarag. A number of major units are considered: the intertidal zone (littoral and infra-littoral); the relatively deep submerged calcareous sandstone ridges (40-60m deep); the deep sandy/muddy sea floor; the pelagic zone; canyons and other unique habitats.

The program identifies a seascape similar to the landscape description. "Seascape" knowledge requires a plan including numerous surveys with modern equipment that can provide a visual description of selected parts of the sea.

WETLAND MONITORING PROGRAM

MoEP and INPA conduct physical-chemical monitoring of streams in Israel. This provides an estimation of the pollution in streams, but does not reflect the state of the stream ecosystem and its biodiversity. This is probably due to the fact that signs of physical and chemical damage are washed out of the stream relatively quickly. Consequently, it is possible that the effect of pollution will not be felt in the physical and chemical indicators a short while following the polluting event. A considerable part of the stream biodiversity changes immediately following the polluting event, and the presence or absence of these biodiversity components is often a better indicator of the stream's state than non-biological indicators. The combination of physical-chemical data and the frequency of indicator species can provide a rapid and relatively highly reliable indication of the state of the stream.

2.3.3.1.2. The State of Nature Report

A comprehensive periodical report that assesses the state of the ecosystems is planned to be published every 3 years. So far, baseline reports have been prepared by the HaMaarag for the terrestrial (2010), marine (2013) and wetland (2014) ecosystems. The report provides a major tool for formulating natural resource management policies

and reporting. Starting in 2016, it will use mainly the data from the national biodiversity monitoring program and its synthesis, as well as analyses by scientists and experts, complemented with nation-wide indicators and monitoring data on specific species or species groups that is routinely collected by different organizations.

2.3.4. Research and bridging knowledge gaps – Infrastructure and projects

In the years since the last report, the growing awareness of the importance of protecting biodiversity and sustainable development resulted in many projects, both research and applied ones, to help management and decision making, as well as production of guidelines to help managers in their work. Some of the main projects and guidelines are presented here.

NATIONAL MONITORING OF BIODIVERSITY

Over the last five years HaMaarag has been running the national program for monitoring biodiversity in open areas. The plan was formulated during the first two years, and in the following three years the first monitoring cycle has been accomplished. For that purpose Israel was divided into geographic units or ecosystems.

The purpose of the monitoring program is a qualitative and quantitative characterization of the biodiversity in Israel, on a systematic basis over time. Out of this will be an assessment of the state of nature in Israel and identification of significant changes, particularly those that express deterioration and damage to biodiversity and ecosystems function. The results may be the basis and insight to propose ways and solutions to cope and slow down the deterioration of affected habitats.

2.3.4.1. Israel National Ecosystem Assessment

In order to raise awareness to the value of nature for humans and to develop a knowledge base that will assist policy designers to assimilate the values of ecosystem processes and services, the 'Ecosystems and Human Wellbeing – A National Assessment' project was initiated by MoEP on 2012 and is coordinated by HaMaarag. Within the framework of this project, a staff of over 100 scientists and experts was put together to write a report that will present a national picture of the benefits that Israel's residents receive from the ecosystems within its territory. The assessment will also present information about the importance of biodiversity for providing these benefits, threats to continued service provision, and quantification of the value of ecosystem processes for humans from economic, health, and social-cultural perspectives.

Partners on the project's work include the project's council headed by MoEP's chief scientist, comprising representatives from 40 organizations and institutions that have an interest in the project and are likely to use its products: governmental offices, local

government, public institutions, the business sector and the public. Representatives from the project's council and management staff comprise the assimilation staff, which works to ensure that knowledge about ecosystem services in Israel will not remain on paper alone; its aim is to determine appropriate ways of assimilating the ecosystem service approach in general, and the project's products in particular, into decision making processes and into the public eye.

The project on ecosystems and human wellbeing, a national evaluation, is now on its way and will contribute to the quantitative evaluation of benefits and trends from the provided services.

6 ecosystems were defined:

- Marine ecosystems;
- Agricultural ecosystems;
- Desert ecosystems;
- Urban ecosystems;
- Mediterranean Region ecosystems;
- Inland Water ecosystems.

For each there is an evaluation of:

- Providing services;
- Regulating services;
- Cultural and spiritual services;
- Supporting ecological processes.

Each evaluation considers:

- Benefits;
- Human wellbeing;
- Economic value;
- Social value.

The outcome of the project is a report consisting of a series of 16 chapters, which will present information on the state and trends in the following issues:

- The different services provided by each of the ecosystems in Israel;
- The biodiversity involved in production of these services;
- Vectors of change in service production.

Similarly, the assessment outcomes will include:

- Quantifying the contribution of ecosystem services to human wellbeing;
- Future scenarios – examining possibilities for future changes in service provision.

Moreover, the assessment will contribute to identifying knowledge and information gaps, and to creating a baseline for monitoring future changes in ecosystem service provision.

The assessment will deal with information at two levels:

- Examining the state and trends of ecosystems in Israel and the services provided by each one;
- Examining the state and trends of the different services at the national level, and a comparative perspective on provision of these services by the different ecosystems in Israel.

Prior to publishing, the project's outcomes will undergo a strict peer-review process. Beyond the professional peer-review, advanced drafts of the different chapters will be sent to interested council members for examination, comments and direct feedback, towards the end of the chapter-writing period.

The final report is due by the end of 2016. Some advanced reports on inland water quality, marine, fisheries arid desert and extreme desert ecosystems are available and presented in Q4.

2.3.4.2. Taxonomy initiative

This program was presented in the former report, and is currently in operation. Details may be found in http://taxonomy.tau.ac.il/eng.

The program was established to promote the training of a new generation of taxonomists and to enrich the basic knowledge of the biodiversity in Israel. The main goal of the initiative is to revive taxonomic studies in Israel and to improve our understanding of biodiversity, thus expanding the contribution of science to the study, conservation and sustainable use of ecosystems in Israel.

The initiative furthers its aims by:

- Awarding doctoral and post-doctoral fellowships;
- Providing travel grants for training of graduate students overseas with expert taxonomists;
- Providing grants for biodiversity surveys;
- Hosting expert taxonomists from overseas to teach short courses in Israel on various local taxa.

Over 10 research projects and 25 taxonomic surveys have been done so far as part of the initiative, and there are calls for more activities, including:

- PhD scholarships: 4 years in an Israeli university;
- Post Doctoral fellowships: 1-2 years for Israeli scholars abroad;
- Biodiversity surveys: Israeli researchers may apply for systematic surveys in Israel. To date, 6 surveys have been funded every year;
- Travel funds: ITI will assist in travel expenses of Israeli PhD students who train to become taxonomists, for purposes of research and studies in leading institutions;
- Visiting Scientists: Experts from around the world are invited to give taxonomy courses in Israel.

2.3.4.3. Museums and information centers

NATURAL HISTORY MUSEUM

The Steinhardt Museum of Natural History http://smnh.tau.ac.il/eng/content and Israel National Center for Biodiversity Studies is a key project that will house and preserve TAU's natural history collection of over five million specimens. The 8,000m² building will contain laboratories and an auditorium, and will be used by hundreds of researchers from Israel and abroad.

The museum will form the centerpiece of the largest and most comprehensive center in Israel for biodiversity research, education and conservation. Operating under the auspices of the Israel Academy of Sciences and Humanities, it will serve as an important resource for thousands of Israeli and international visitors and researchers each year.

Upon completion, the Steinhardt Museum will incorporate four existing units at Tel Aviv University: the Zoological Museum, the Biological Anthropology Museum, the National Herbarium, and the public education program.

Report on its activity may be found in:
http://mnh.campusteva.tau.ac.il/sites/default/files/qdmyh_dvkh_mdy_2012-3.pdf

BIOGIS

BioGIS is a Geographical Information System established to create a national database of the flora and fauna in Israel. The database is open to the public and provides advanced tools for querying, analyzing, modeling, and visualizing patterns of species distribution in Israel.

The main goal of BioGIS is to integrate the information available on the composition and geographical distribution of the flora and fauna of Israel in a unified Geographical Information System (GIS) that will be open to the public, accessible through the Internet, and equipped with user-friendly, state-of-the-art tools for data analysis and visualization. The system is being developed as a long-term, dynamic database, and will reflect the current state of knowledge on the distribution of plant and animal species in Israel.The BioGIS site is http://www.biogis.huji.ac.il/, and it is currently the Israeli node to the GBIF.

2.3.5. Public awareness

The extensive exposure of young adults to the education system, the activity in social networks and the awareness of recycling have led to an internalization of environmental values including biodiversity, an effort to avoid causing environmental damage, and an awareness of health aspects related to the environment.

Ongoing workshops led by SPNI and published guidelines help senior government officials and businessmen to incorporate conservation of biodiversity into their respective activities and responsibilities.

GREEN SCHOOL ACCREDITATION

Over the past decade Israel has invested major resources in greening its schools, from kindergarten to university, not only through environmental studies but also through environmental action. The Green School program encourages schools – with cooperation of the administration, students, parents and community – not just to teach environmental subjects, but to act in a sustainable manner, to conserve resources and to advance eco-efficiency. Based on the recognition that education is a prerequisite for sustainability, a comprehensive program was launched to integrate sustainable development into the educational system. The hope is that as the schools turn more and more green, a generation that is committed to the ideals of sustainability will emerge.

Various SPNI projects create a wide base of informed and involved young leadership. They form the basis for a national children's network for environmental activism. Over 15,000 elementary and middle school children, from some 500 classes, participate yearly in the Children Leading Change educational series. This multi-year program promotes fundamental change in the relationship between society and the environment by raising awareness of environmental issues and encouraging community activism during these formative years.

The children participate in 15-30 field and classroom-based meetings throughout the academic year, focusing on recycling, community gardens, energy efficiency, sustainability and other environmental issues. The project aims are increasing environmental awareness, educating for sustainable living, developing an emotional connection, a sense of belonging and responsibility towards one's community and surrounding environment, and empowering youth towards leading social and environmental change.

SPNI guides both lead the classes and work with school staff to develop the environmental curriculum and activities. In parallel, the children devise plans for improving their surrounding environment, increasing awareness and community activism, and creating a community event aimed to advance a specific topic.

2.3.6. Economic aspects

A document reviewing the subsidies and incentives that might have negative effects on the environment was ordered by the MoEP and produced in 2012 by EcoFinance. Four main sectors were considered – energy production, transportation, agriculture and industry. Negative subsidies with direct or indirect outcome were found for each of the sectors. In any case, the amount of subsidies that negatively affect the environment is small, and none was found to have a clear and unjustified influence.

2.3.6.1. Fund for Open Areas Conservation

The fund was established in 2012 by the Israel Land Authority as an instrument to facilitate funding for protection, environmental development and maintenance of open areas out of the municipal built areas, including areas important for biodiversity and ecosystem conservation, for public parks, and recreation areas. The fund allocates 1% of the Land Authority income from land sales towards these goals, considering that most lands are owned by the State. The fund administrates an annual call for planning and implementation projects, and is open to the governmental sector – ministries, national and local authorities. The formal goals of the fund are:

- Planning / rehabilitation / conservation / nurturing and development projects appropriate for the purposes of the Foundation, including projects for the benefit of public open landscapes, among which are also areas of parks and recreational areas in metropolitan areas;

- Sustain and enhance rivers and their surrounding areas, including dealing with the return of "water for nature", recreation in nature, accessibility and paths, waste management and other environmental hazards;

- Enhancing supervision and control to guard open areas, including pastures, participation in the maintenance management and operations of projects carried out by the Fund;

- Collection and processing of data, participation in surveys, monitoring and research. More than 60 million NIS have been allocated in 2014 to projects fulfilling these goals.

2.3.6.2. Quarries Rehabilitation Fund

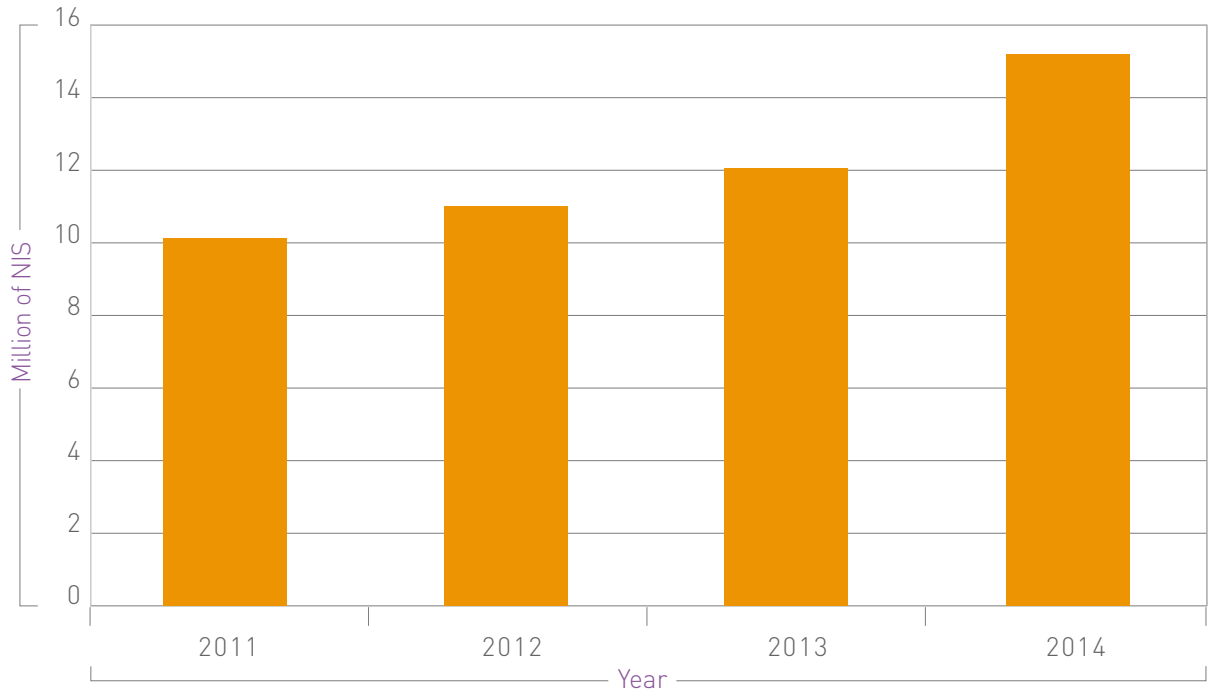
The Fund was established in 1978, and its purpose is to rehabilitate abandoned quarries and to prepare their infrastructure for future land usage. The Fund's income comes from fees imposed on those exploiting quarries and from a percentage of the wholesale price of the material extracted from them. The Commissioner of Mining at the Ministry of National Infrastructures, Energy and Water Resources acts as the chairman of the Fund.

The Fund also finances planning and infrastructural works of quarries which have operated prior to its establishment. Another option, which is implemented in big active quarries, is that of partial reclamation, especially if they are visually prominent.

A few examples of rehabilitation objectives are: agricultural land, forest, waste disposal site, park, nature reserve and industrial plant.

The expenditure of the fund on quarries rehabilitation has increased in each of the reporting years and stands as follows:

Figure 17 Yearly investment in quarries rehabilitation (in millions of NIS).



Nearly 40 projects were funded yearly, so that the damaged ecosystem has a chance to recover.

2.3.6.3. Pilot projects for environmentally-supportive agriculture

A pilot call for regional-council level projects for environmentally supportive agriculture was carried out by the Ministry of Agriculture and Rural Development in 2012. 3 regional councils have won and are engaged in the projects – Emek Yizrael, Emek Hefer and Lev Hasharon.

Environmentally friendly agricultural practices have drawn growing attention in recent years, for example less use of chemicals for pest control and greater use of alternative techniques and methods. Recycling of agricultural residues has been adopted to better preserve the agro-ecology. More legal instruments have been introduced, such as the Packaging Waste Reduction Law and the Plastic Recycling in Agriculture Law.

The Ministry of Agriculture and Rural Development welcomes the "Green Revolution" – sustainable agricultural development on a number of different levels. Among the actions are reduction in pesticide use, promotion of techniques for working lands conservation, increase of the use of purified wastewater while improving the efficiency of water usage, and preservation of the open spaces in Israel.

2.3.7. Legislation and governance

At present, Israel requires environmental impact assessments (EIAs) to be carried out for all major development projects and investments, with the explicit requirement to account for the impact of development plans on biodiversity. Current regulations require EIAs for proposed development in environmentally sensitive areas such as coasts, riverbanks and stream corridors. Most EIAs consider species and habitat diversity, endangered species, and connectivity issues (i.e. with regard to ecological corridors).

2.3.8. International cooperation

As part of its activity in the various UN and biodiversity conventions and agreements, Israel takes part in many cooperation projects. Cooperation with both governments and non-governmental organizations around the world is an important component of the environmental agenda in Israel. Over the years, Israel has ratified many of the major international environmental agreements, and has just joined the Eurobats agreement under the Convention of Migrating Species and to the IPBES. Israel also ensures that its national legislation is compatible with its international obligations.

2.3.8.1. Bilateral agreements

Israel's involvement in environmental protection has led to more than 25 bilateral agreements that provide a framework for the exchange of information and expertise in numerous environmental fields, including general environmental protection, nature conservation, desertification, green growth, and climate change. Implementation of these agreements takes different forms, including exchange visits of professionals, workshops, research studies and joint projects on environmental problems of common interest. 11 new agreements and MOU's have been signed between the MoEP and various states since 2011.

2.3.8.2. Regional activity

Israel's environmental actions implicate and have consequences for the neighboring countries, just as their actions have implications on Israel. Thus, regional cooperation on environmental matters is crucial in order to achieving environmental successes. Through regional programs and projects, Israel has managed to make to its own surroundings and its natural resources, and has likewise contributed to environmental improvements in the region, mainly through the MAP program but also other collaborations.

2.3.8.3. OECD Environmental Performance Review

As part of the procedure of Israel becoming a member of the OECD, an EPR was conducted in 2011, with the main recommendations on biodiversity being:

- To undertake a comprehensive national assessment of Israel's ecosystems and biodiversity, including their economic value; to analyze how the main pressures on biodiversity are likely to evolve and how they could be mitigated by alternative policies;

- To establish measureable biodiversity targets; to consolidate the national biodiversity monitoring system to measure progress in achieving these targets and to support future policy development;

- To strengthen and broaden biodiversity conservation in and around nature reserves, e.g., by establishing buffer zones, ecological corridors, and biosphere reserves;

- To identify specific measures to reduce the introduction of invasive alien species from all sources;

- To expand the use of market-based instruments like fees, charges and payments for ecosystem services in key economic sectors, such as housing, infrastructure development, agriculture, fishing, and forestry; to examine ways to create new market opportunities to further involve the private sector in biodiversity protection, e.g., in the tourism sector;

- To assess how trade-offs between biodiversity and other key policy areas, notably climate change, should be addressed in implementing the National Biodiversity Strategy and the National Strategy and Action Plan for Climate Change Adaptation.

During the last few years, Israel has participated in several important EU-led multinational projects for mapping and monitoring habitats, such as the EBONE project,the main objective of which is to establish a pan-European biodiversity monitoring mechanism.

Q8 How effectively has biodiversity been mainstreamed into relevant sectorial and cross-sectorial strategies, plans and programs?

2.4.1. Cross-sectorial strategies and plans

2.4.1.1. National Plan for Green Growth

The governmental resolution on sustainable development form 2003 was updated in 2011 to focus on Green Growth. The new National Plan for Green Growth led by the MoEP and the Ministry of Industry, Commerce and Employment helps reducing environmental impact of development, and therefore reduces impact on biodiversity.

The decision of the Israeli Government to prepare a national green growth strategy defines green growth as "socio-economic growth and development that does not harm the environment, makes efficient, economical and sustainable use of natural resources, and creates green jobs while maximizing opportunities for the use of clean growth engines and emphasizing the decoupling of economic growth from environmental deterioration."

The national plan, submitted in 2012, outlines current and future measures for achieving green growth, reviews the cost/benefit of each of the recommended steps, sets forth targets and tools for their implementation, and defines economic, social and environmental outcome indicators to track the success of the plan in achieving its targets.

In line with the government's decision, an inter-ministerial directors-general committee was established to formulate Israel's green growth strategy, with the help of a round table comprised of representatives of government ministries, the business sector, social and environmental non-governmental organizations, and academia. The round table, in turn, looked at three crucial elements which are necessary to advance a green economy – green production, green consumption and green innovation.

The main points of the government decision are:

- Removing obstacles to green growth, including regulatory failures;
- Promoting clean-tech industries, including developing markets for green products and services, and accelerating green innovation;
- Advancing green employment, including academic and professional training;
- Transitioning to green consumption, including green construction and increased public awareness and education;
- Transitioning to sustainable industry, including green branding of Israeli industry in the global market;
- Transitioning to a more environmentally-friendly business sector.

ROUND TABLES FOR GREEN GROWTH

To identify the measures that would best lead to a future of green growth, representatives of government, industry, academia and the third sector met together around a physical round table and a virtual round table – a dedicated interactive website – to voice their responses to key questions targeted at compiling insights and coming up with recommendations for green growth in Israel. The question of how to best influence production, consumption and innovation patterns, so as to promote growth without degrading the environment stood at the very heart of the round table process.

Sample questions that were included in the discussion were:

- What policy changes are necessary to increase the number of factories in Israel while minimizing their environmental impacts?
- What can the government and businesses do to influence consumers to buy green?
- What will encourage more Israelis to develop eco-innovation projects with global impact?

Based on the responses to these and other questions, hundreds of insights emerged, all of which contributed to the formulation of green growth levers. Consultations around the round tables focused on overcoming obstacles, changing behavioral patterns, and promoting investments that can yield both environmental advantages and technological breakthroughs. The participatory discourse highlighted the need for improving information management, catalyzing innovative technologies, and promoting more sustainable consumption patterns, to name but a few examples.

Over time, specific branches in the Israeli economy which could contribute to green growth have been identified for further discussion in separate round tables, including petrochemicals, agriculture, waste, and green construction.

FORMULATING GREEN GROWTH INDICATORS

The development of a set of indicators for measuring the progress toward green growth came early in the round table process. The formulation of outcome indicators provided a means of translating goals into actions and facilitating the selection of the measures best suited to bring about the necessary changes. A special team was appointed to prepare the indicators that would help shape Israel's future decision making on green growth, and would contribute to information-based public discourse.

Identified outcome indicators include the following:

- Growth in the environmental investments of economic sectors;
- Growth in the export of local green initiatives;
- Reduction in environmental impact relative to gross product;
- Number of eco-innovation projects;
- Growth in the number of beta sites of Israeli environmental technologies;
- Number of "green tenders" in green public procurement;
- Growth in green employment.

These outcome indicators are meant to reflect the impact of the green growth strategy on producers, consumers and entrepreneurs. They aim at measuring progress within a short timeframe – up to five years – in order to demonstrate whether the desired changes have, in fact, occurred.

LEVERS FOR CHANGE: MAKING GREEN GROWTH HAPPEN

- **Green licensing law:** A green licensing law should be formulated. That law would serve as a one-stop shop, providing certainty to the drivers of change in the industrial sector, facilitating high environmental performance and serving as a green track to innovation.

- **Centers of green growth:** Green growth centers comprised of academic, industrial and governmental experts should provide guidance and information during all stages of green licensing, and should validate local innovation initiatives and Israeli Best Available Technologies.

- **Green procurement tenders:** Major procurement contracts should incorporate environmental criteria and should give preference to bidders who integrate eco-innovation in their products or services.

- **Grants and assistance to green industrial plants:** A dedicated program for environmental investments should be set up, and funding should be made available for eco-innovation projects, including the establishment of beta sites.

- **Green training for employment:** Green jobs should be promoted through the training and re-training of managers, academics, procurement and logistics officers and others, as well as through the development of a dedicated green jobs website.

- **Support to eco-innovation:** A dedicated track in the green licensing law coupled with budgetary allocations should be available for the latter stages of research and development, including construction of demonstration sites and pre-commercial installations.

The translation of these and other levers into operative action plans will, to a large extent, determine Israel's progress toward green growth in the coming decade.

2.4.1.2. Climate Change Adaptation Strategy and Action Plan

In accordance with government resolutions, in order to accelerate the formulation of a climate change adaptation plan for Israel, an inter-ministerial committee on climate change, headed by the Director General of MoEP, was appointed. It is currently finalizing its recommendations on a Climate Change Adaptation Strategy and Action Plan, which will be presented to the government. The goal is to link science and policy by mainstreaming research-based adaptation strategies into master plans and action plans in a wide range of fields, including biodiversity, water, agriculture, green construction, economy, public health and more.

In 2011 MoEP established the ICCIC, Israel Climate Change Information Center on adaptation to climate change, at Haifa University. The center is multidisciplinary, and its goal was to gather and coordinate the scientific knowledge available on climate change issues in Israel in seven areas: regional climatic forecasting, impacts of climate change on the water sector, urban planning and building, public health, biodiversity, the economy, and regional geo-strategic issues. Expert teams in each area assessed the gaps in existing knowledge on the impacts of climate change in Israel based on different

scenarios, surveying available means for minimizing damage and vulnerability, and organizing seminars on each of these areas.

The reports of the ICCIC gave recommendations in each of the above areas, including biodiversity, as synergy with the strategy developed for the UNFCCC. The main recommendations in the area of biodiversity are as follows.

As the impacts of climate change on the biodiversity are complex and the existing knowledge is poor, it is important to manage the natural ecosystems with full consideration of the levels of uncertainty. Measures and strategies that are known for having a positive effect on ecosystem stability should be adopted in any scale, pace or trend of climate change. Non-fragmented ecosystems are more stable and more resistant to changes. Therefore, the most important strategy for preserving biodiversity under climate change is adopting a managerial policy that will reduce the sources of negative impacts that are not necessarily connected to climate change. The main "No Regret" strategy is reduction of the pressure on freshwater ecosystems and realization of the natural right to freshwater as stipulated by the government, and conservation of open areas and the corridors between them. The protected areas in Israel must be updated and ecological corridors must be secured between them. Also, development and construction should be limited in accordance with the National Master Plans, and illegal construction should be prohibited and "legitimization" of such offenses should be stopped.

Within the legal system, laws that prevent or limit negative effects on open areas and nature in marine and terrestrial ecosystems must be enforced, and public awareness must be reinforced in this regard. Furthermore, current legislation must be updated and a specific targeted policy for biodiversity conservation must be developed, while improving coordination among legal measures which were established for the preservation of biodiversity.

In order to improve the capacity to adapt to future changes, the existing knowledge must be reinforced. There is a special need for long-term monitoring research on thresholds of climatic variables which may destabilize ecosystems, and for targeted research on managing the sustainability of natural habitats and ecosystems in a more arid climate, as well as for the development of strategies to rehabilitate affected ecosystems.

There is also a need to reinforce the multi-source ecological data system as a national body that will strengthen the ties between science and management, and apply the acquired knowledge in the management of natural ecosystems.

2.4.2. Main sectors

Many sectors may influence the state of biodiversity. Most of them have negative impact unless they include in their policy elements of biodiversity conservation. Some of these sectors are represented as follows.

2.4.2.1. Agriculture

In 2014 the Ministry of Agriculture and Rural Development published its new planning policy for agricultural and rural development. Sustainability was a basic foundation in the development of the plan, and as a result, it includes recommendations on the protection of the variability of agricultural landscapes, designing ecological corridors and biodiversity.

As stated in the publication, the Ministry has prepared a strategic plan for sustainable development, published in May 2010. The plan relates to the activities of all Ministry divisions, and presents recommendations for action in accordance with the principles of sustainable development. Since its publication, the Ministry established a new Agro-ecology Department to deal with agriculture and environment issues. The Planning Policy Document adopts the recommendations of the Strategic Plan for Sustainable Development of the Ministry of Agriculture and Rural Development regarding regional planning issues, and currently acts to grant a statutory foundation suitable for implementation of these recommendations.

- The document presents recommendations to suit a wide variety of conditions in the agricultural sector in Israel, including changes in the numbers of active farmers, structure of communities, industries, type of agriculture production, and so on;

- The Israeli agriculture should be characterized by economic, productive, social and environmental sustainability. Interfaces need to be sustainable in all aspects, and not affect the ability of the farmer to earn his living. The farmer should not suffer as a result of environmental requirements, and the public funding will take on the existence of Public benefits such as environmental values;

- The maintaining of healthy ecosystems is in favor of agriculture. Biodiversity and other ecological functions that contribute to agriculture and proper planning can strengthen the mutual contributions of agriculture and nature.

The document was revised in 2014 but still has no action plan.

2.4.2.2. Fisheries

The fishing sector in the Mediterranean has an integrated crisis: ecological, economic and social, due to incorrect management that causes overfishing. It seems that a small group of fishermen have been taking advantage of a significant part of the fisheries resource, competing with other users and causing economic damage. In addition, a vast widespread damage occurs in the marine environment as part of fishing operations, including damage to marine habitats and approximately 100,000 protected animals per year.

A new code of conduct for sports fishing has been formulated. Launched this summer, over 3,000 sports fishermen have already voluntarily signed it, pledging not to catch endangered fish, or other species, below the minimum catch size; to release any endangered species they catch back into the sea; to respect a daily catch limit, and not to fish near underwater caves.

The Ministry of Agriculture and Rural Development has prepared a multi-year master plan for the local fishing industry. The plan was designed in light of the Ministry's goals and targets, to provide high quality healthy food to the population, while preserving the agriculture and the development layout.

According to the plan, the ministry will work towards a controlled reduction of trawling in return for a compensation which will be given, the reduction of the allowed mesh size of fishing trawls and the distancing of the activity of fishing trawlers from the beach. These steps will be accompanied by an examination of the possibility to design a mechanism which will assist fishermen who use fishing trawls, by offering them incentive to integrate into the aquaculture industry instead of continuing to work as individual fishermen. At the same time, the effectiveness and influence of these actions will be professionally reexamined by the fishery and aquaculture division in order for long term conclusions to be drawn.

The plan also calls for the defining of protected maritime areas in cooperation with the INPA, and for making the distinction between professional and recreational fishing, with accordingly-issued licenses.

2.4.2.3. Pest control

New guidelines for reducing mosquitoes' nuisance and damage were published and implemented, stressing the need to monitor the result of each action and recommending usage of environmental friendly pesticides and habitats modifications to solve problems.

Pesticides and their use are an important aspect of agriculture. Unintelligent use of these agents may cause damage to the environment, the users, plantations and food consumers. To ensure safe, efficient use of pesticides, many regulations have been passed, including the regulation dealing with the observance of instructions on the packaging label of agents.

The Ministry offers financial grants to farmers who are interested in switching from conventional pest control, based on chemical agents, to control that incorporates environmentally friendly measures. This move will allow farmers to continue coping intelligently with pests and lesions while reducing environmental damage. Combined pest control will ensure an environment and agricultural produce that are free of pesticide traces.

2.4.2.4. Forestry guidelines and planning

Planting forests on open landscape may cause conflict with biodiversity conservation when agricultural methods are implied or alien trees are planted. Following the guidelines of the national master plan for the forest (22), Keren Kayemeth LeIsrael – the Jewish National Fund, acting as Forestry Service of the State of Israel, has published a new policy document for forest planning and management in 2014. The document tries to solve the ecological conflict with forestry, to prepare plans for plantations, and to face control committees concerning planning and management of the forests. It poses new challenges for decision makers and managers of forest areas. A key part of the document focuses on the principles for preparing management plans for forests. The process of preparation is long and complex, and requires the cooperation of many professional bodies.

The document defines the objectives of forest management and afforestation in the country, the types of forests and principles in their planning and management, focusing on sustainable management, as detailed in the following sections.

Sustainable management of forest and forestry goals requires a structured process of long-term planning. The planning process is based on the distribution of forest land area and on "designation units". Planning and management of forest lands will be subjected to valid statutory schemes, including 22 regional master plans, detailed plans for the forest, and other programs. By setting the designation of the land and forest destination, the planning process provides a higher level of details than the existing Statutory plans, proper management of the area, and strict definitions of existing statutory plans.

The primary purpose of afforestation, according to the document, is to provide a range of ecosystem services to the residents of the country, in recognition of the existence and wellbeing of humans that depend on biodiversity and services provided by the ecosystems. Under the primary purpose, forest management theory defined the following goals: the provision of hiking and recreation in nature, varied landscape designs, provision of various support services and control (carbon sequestration, primary production(, provision of support to the unique biodiversity of Israel, soil and water conservation (prevention of soil erosion, increasing water permeability), provision of various economic benefits to the community (pasture, output of wood, the economic contribution of tourism), maintaining open spaces, protecting Israeli trees and tree species reintroduction to nature, conservation and restoration of heritage landscapes, ecological restoration of damaged habitats, creation of buffer zones to prevent noise and air pollution hide damaged landscapes and to protect against the spread of fires, strengthening of public outreach and education for nature and forest protection and for management principles.

Implementation Examples

Four Programs on different scales of space and time are needed for optimal management of the forests – a master plan, a multi-year work plan, an annual work plan and a detailed operation plan.

These principles are currently implemented, and several plans have been published accordingly. Saints Forest in the Judean Hills was used as a model for building a forest management master plan, according to the principles of forest management. The plan was approved in 2013, and included a number of major chapters: Analysis of the area, master plan for the forest (forest vision, design principles, a program for uses of the area, map of configurations and desired forest plants), a multi-year management plan (including actions and their prioritization), and thematic master plans that relate to the biodiversity of the area (defense from fire, recreation and tourism, natural values and unique habitats). Following the success of the plans for forests, in 2014 KKL completed the preparation of two more management master plans – Sataf and Adulam Parks (Judean Hills), and during 2015 the plan was to accomplish the preparation of three additional programs (Biria Forest in the Upper Galilee, Zor'a and Eshta'ol lowland forests, and the river beds forests of Grar and Hanun in the north-western Negev.

2.4.2.5. Rivers management and rehabilitation

There are 12 rivers flowing to the Mediterranean Sea and 15 to the Rift Valley. Israel's attitudes toward its streams have changed significantly over the course of the country's short history. Once viewed primarily as a convenient means for evacuating sewage, with little inherent value, streams are now increasingly recognized as beneficial assets to local communities and the nation as a whole. For an increasingly urban country, they can provide greenways and parks that allow visitors living in crowded areas in Israel and abroad to enjoy some direct connection with nature and the historic countryside. Since the last report, laws have been amended, rehabilitation plans developed, and some preliminary projects initiated. The challenges to meaningful rehabilitation of the country's streams, however, remain numerous and formidable. The pervasiveness of past neglect makes it a long-term, expensive prospect. But it appears that the country has turned a corner, and that lip service has finally begun to be replaced by actual commitments and investment in programs and in their implementation.

Several local river administrations have been established so far: Lachish, Soreq, Yarkon, Kishon, Alexander, Taninim, Harod, and additional two for separate sections of the Jordan River. Treatment of specific rivers is contingent on a binding agreement between the Rivers Rehabilitation Administration and the municipality or regional council under whose jurisdiction the treated section lies. The following rivers are under rehabilitation – Naaman, Zipori, Kishon, Taninim, Hadera, Alexander, Yarkon, Ayalon, Soreq, Lachish, Besor, Be'er Sheva, Harod, the Jordan and its sources, and the Dead Sea and Negev rivers. The projects relating to rehabilitation in the Harod, Taninim and Hadera rivers have been completed, and work on the other rivers still continues.

2.4.3. The business sector

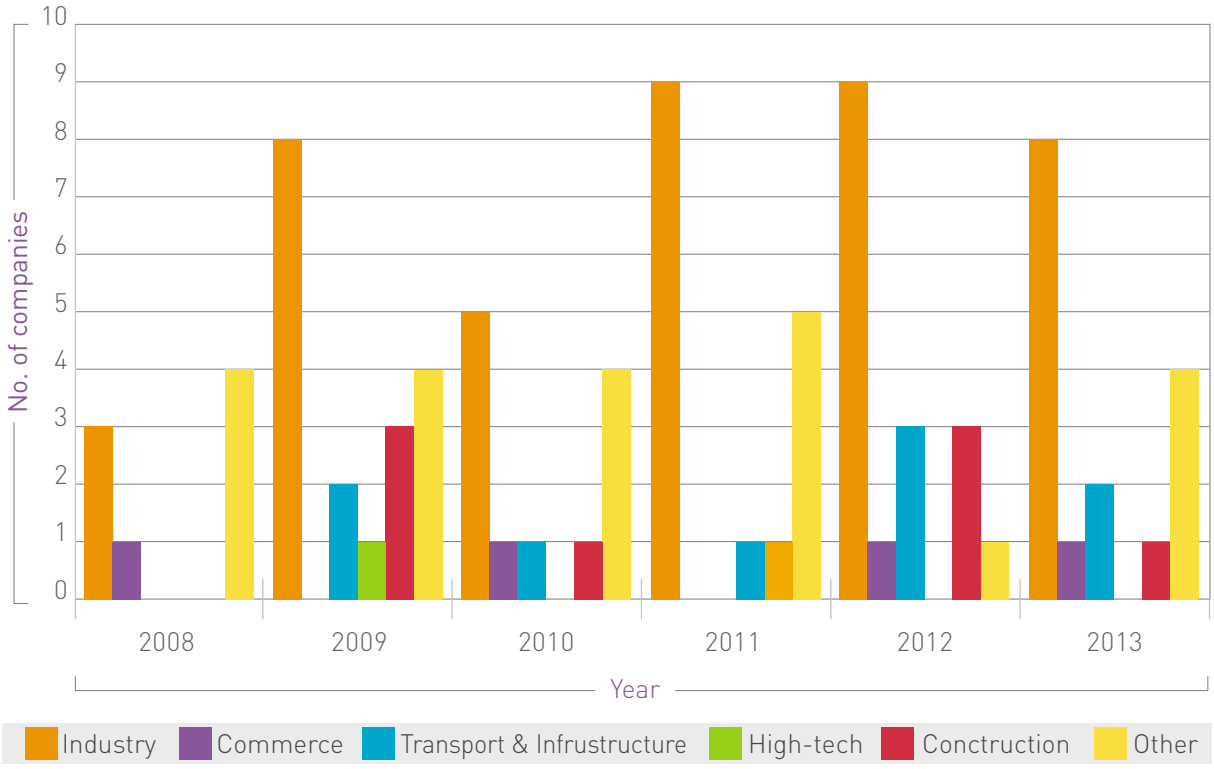
2.4.3.1. Sustainability reports – governmental companies

In order to implement the 2003 government resolution on sustainable development, the Government Companies Authority, operating as a unit on the Ministry of Finance, issued a rule in 2009, according to which all companies have to build a sustainable development strategy, publish it for the public, and compile reports on its implementation.

2.4.3.2. Social responsibility reports – private companies

Other players in the business sector have no mandatory sustainability reporting duties, but in recent years corporations have adopted social (including environmental) responsibility reports as a strategy that allows the corporation to reach out to the community, as well as increase their annual profit. The main aspect of Corporate Environmental Responsibility is that corporations voluntarily improve their environmental performance, and reduce different negative impacts that their activities might have on the environment. According to the Global Report Initiative, a voluntary report will assess the management approach while taking into account the following parameters: materials, energy, water, biodiversity, emissions, effluent, wastes, transport and legal compliance. The common denominator for all these parameters is a legal study that checks the company's compliance with environmental law and standards. Once the legal environmental review is completed, the company can decide if and how it can voluntarily improve its environmental performance beyond compliance. If the firm also decides to report voluntarily to the public on its environmental performance, it should take into account the accompanying legal risks, such as class action suits from citizens or NGOs, or a claim of partial or misleading reports from a shareholder or a third party. Summing up: voluntary environmental responsibility initially requires a big monetary investment, but brings long term benefits. Quite often it has led to improvements in the technology of production, the company's public relations and the competitiveness of the product.

Figure 18 CSR reports over the years by business sectors (38)



It can be seen (Fig. 18) that there have been several reporting companies, and that their number is more or less steady.

2.4.4. Urban biodiversity

One of the main factors affecting Israel's ecosystems and biodiversity is intense urban development. The accelerated development of megacities and metropolitan areas harms large areas of vulnerable habitats due to the massive consumption of land and natural resources needed to sustain a large urban population. As Israel's cities continue to expand to house Israel's growing population, the impact on nature will increase. It is recognized that the role of proper management of urban nature is essential in Israel's national strategy to develop Israel's biodiversity and to devote resources to studying urban nature.

Urban nature surveys are conducted in all of Israel's major cities. Their results will serve as the scientific foundation for the creation of an optimal strategy to preserve and protect urban nature and ecosystems for the benefit of all Israel's citizens.

MoEP has published guidelines for identification, survey and plan, and manages important urban nature areas, and several local municipalities already act according to these guidelines. MoEP has further allocated funds to perform urban nature surveys that will recommend on management acts and inclusion in the municipal master plan.

More than 20 municipalities, including the major cities of Israel, have already conducted such surveys. 13 municipalities have completed the surveys, and additional 12 were selected in 2014, based on a national call, to get matching funds from MoEP and their completion is due in 2016. Three of the major cities now employ a municipal ecologist – Jerusalem, Tel Aviv and Netanya.

2.4.5. Infrastructure and Energy sectors

Any major construction requires an Environmental Assessment procedure. A new challenge is the renewable energies, of which wind turbines are of a special consideration, since Israel is a main migratory route for birds. Special guides have been published by the MoEP on birds and bats according to those published by CMS and Eurobats.

Several guides have been recently published in order to cope with sustainable development and conservation of biodiversity. Among them are the road construction and planning guide produced by the National Roads Company, to reduce conflicts and destruction of biodiversity by road construction; the Environmental Planning Guide Implementation of environmental aspects in the planning process, produced by MoEP and the strategic environmental impact assessment of the MoIS, in the deep sea as part of issuing permits for gas search that includes ecosystem service and economic assessments.

Q9 How fully has the NBSAP been implemented?

2.5. Implementation of the NBSAP

The 2010 NBSAP of Israel contained 8 chapters, focusing on different dimensions and tools for biodiversity conservation. Most of them were fully or partially implemented, although not yet accomplished.

1. **Updating the National Master Plan for Development.** A reevaluation of the NMP 35 is presently taking place, but a better representation of the various ecosystems in protected areas is not yet considered in this framework.

2. **Action plan for direct protection and management of biodiversity.** Actions concerning various issues have been suggested and implemented, such as damage from wildlife to agriculture, invasive alien species, endangered species, outbreaking species, endemics and charismatic species, and rehabilitation of biodiversity, including reintroductions, wetlands, and genetic diversity. As implied by this report - not all plans have been successful.

3. **Action plan for biodiversity monitoring.** It has been suggested to have a national, country-wide monitoring system, operating by accepted protocols and funded centrally, the data of which would be available to everyone. For terrestrial ecosystems, this was done and is currently operated by HaMaarag, which was already mentioned above.

4. **Action plan for bridging over knowledge gaps.** This concerns the academy and research institutes. It has been suggested to have a consulting committee on biodiversity, a national fund, and assimilation of research results and recommendations for the conservation and management actions, encouragement of research fields supporting biodiversity, such as taxonomy, nature collections and data banks by the taxonomic initiative, promoting the national collections, supporting the biodiversity databases, and the botanical gardens and gene banks. As reported, there are programs within the taxonomy initiative, a project carried out by the Gene Bank and a new collections-based nature museum in Tel Aviv University. The committee and fund have not been implemented. Instead, MoEP allocated research funds for biodiversity research.

5. **Action plan for raising the public awareness on the importance of biodiversity.** Various sectors should be involved, such as the school education system, the higher education institutes like universities, colleges and teachers seminars, museums,

botanical gardens, and children and municipal zoos. Each was supposed to have an awareness program, coordinated with the local communities and cities to promote the protection and knowledge of biodiversity. Many teaching programs and materials within the environmental studies at school and in the universities have been produced so far, but there is no evaluation of their success.

6. **An action plan for economic incentives to promote conservation and management of biodiversity**. A study of cost-benefit of biodiversity in Israel has been suggested, a plan for resource allocation for the protection of biodiversity in open landscapes, agriculture and forestry, but all with minor implementation.

7. **Actions to reinforce legislation and governance for biodiversity.** Two actions have been suggested to advance biodiversity targeted legislation and to synchronize the legal tools existing in the various authorities. This part of the action plan has not been implemented so far.

8. **Actions to better benefit from the international cooperation.** Israel is party in most of the international bodies and conventions dealing with biodiversity. A deeper involvement in these bodies would benefit Israel, as well as the other parties, since Israel has accumulated a great deal of experience in the relevant fields. As planned, Israel is currently more involved in the CBD agreements, it has recently joined the bat agreement and increased its participation in the Convention meetings.

Table 2 The actions recommended in the NBS of 2010, and evaluation of their implementation

	Action plans recommended by the NBS	Degree of implementation
Regional planning and future threats		
1	Action plan to update and adapt national master plans in BdC aspects. It involves preparing or updating national plans:	Partial
	• Updated plan for protected areas;	Partial
	• Plan for biosphere regions;	In preparation
	• Plan for ecological corridors;	Prepared
	• Updated Species-specific protection action plans.	Partial
Direct protection and management		
2	Action plan for in-situ conservation and management that will include specific plans.	In preparation
	Species whose populations show alarming trends:	
	• Management plans for endangered and rare species;	Partial

	Action plans recommended by the NBS	Degree of implementation
	• Management plans for charismatic and endemic species;	Partial
	• Management plan for outbreaking species.	Partial
	Handling species that convey damage:	
	• Management plan for agricultural pests;	Partial
	• Management plan for alien species.	Partial
	Biodiversity restoration plans:	
	• Update of reintroductions plan;	Prepared
	• Action plan for conservation and restoration of freshwater ecosystems;	In preparation
	• Action plan to address fragmentation by infrastructure.	Prepared
	Genetic diversity conservation:	
	• Action plan to conserve and manage intra-specific biodiversity (management protocols and gene bank activities);	Partial
	• Management plan for ex-situ conservation in botanic and zoological gardens and the gene bank (may be dealt with under #4, see below).	In preparation

Biodiversity Monitoring		
3	**Action plan to monitor biodiversity. It includes:**	Prepared and established for terrestrial, in preparation for marine
	• Establishing and operating a national monitoring system (network of monitoring stations);	
	• Managing and budgeting of the national monitoring system;	Done
	• Managing and analyzing monitoring data.	Done

Research		
4	**Action plan for bridging over knowledge gaps. The plan includes:**	
	• Establishing an advisory forum for biodiversity research and resource allocation;	Not yet
	• Establishing a national fund for budgeting of biodiversity research and monitoring;	Not yet
	• Embedding research results and monitoring in management and conservation activities;	Partial
	• Plans to promote taxonomical research, biological collections and databases.	Partial

	Action plans recommended by the NBS	Degree of implementation
Education and public involvement		
5	**Action plan to increase public awareness, support and involvement in BdC and management. It includes:**	Partial
	• Plans to promote biodiversity education in education systems (schools, universities, museums, zoos and botanical gardens);	In preparation
	• Plan to promote awareness to BdC through the media;	Not yet
	• plans to promote local community activities (e.g., capacity-building, activism);	Partial
	• Plan to promote public awareness and involvement in protecting urban biodiversity;	Prepared
	• Plans to involve economic sectors in biodiversity protection;	Partial
	• Plan to expose governmental decision makers to BdC issues;	In preparation
	• plan to monitor public awareness and attitudes towards BdC.	Not yet
Economic aspects		
6	**Action plan for economic incentives to the promotion of BdC. It includes:**	
	• Cost-benefit research;	Partial
	• Plans for incentives to biodiversity-friendly uses in open landscape;	Partial
	• Establishment of the Open Landscape Fund.	Done
Legal and institutional aspects		
7	**Action plan to promote legal and institutional tools for BdC and management, including:**	Partial*
	• Plans to promote designated legislation;	In preparation
	• Institutional framework to coordinate the implementation of legal tools.	In preparation
International aspects		
8	**Action plan for the international commitment.**	Partial

*There is a need for coordinated inter-ministerial action to promote legislation and biodiversity related policy, although some inter-ministerial round tables are at work – e.g., for invasive species and sanitation.

Part III

Progress towards the 2020 Aichi Biodiversity Targets and contributions to the relevant 2015 targets of the Millennium Development Goals

Q10 What progress has been made by the country towards the implementation of the Strategic Plan for Biodiversity 2011-2020 and its Aichi Biodiversity Targets?

3.1. Progress made

Progress was made in three main directions. First – public awareness and formulation of guidelines, second – incorporation of biodiversity into sectorial and cross-sectorial policies, and third – the knowledge base on biodiversity and ecosystem services status and trends and knowledge-based management.

3.1.1. Implementing the Aichi Biodiversity Targets in Israel

In 2012 Israel published a comprehensive report on the implementation of AICHI biodiversity targets, enclosed as an annex to this report. Here, an update is provided until the end of 2014.

Table 3 Mid-term assessment of progress towards the 2020 targets (extent to which each target has been achieved)

AICHI target	Actions	Overall progress	Paragraph in report
Target 1 By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.	1) Green School accreditation by MoEP. 2) Public awareness through NGO projects and community activities.	The Green School program was shown to be effective in influencing environmental attitudes of the students. Other effectiveness indicators still remain untested.	2.3.5. 1.1.1.
Target 2 By 2020, at the latest, biodiversity values are integrated into national and local development and poverty reduction strategies and planning processes, and are being incorporated into national accounting, as appropriate, and reporting systems.	1) Environmental impact assessments (EIAs) for major development projects consider the impact of the development on biodiversity. 2) Strategic Environmental Assessment of the marine environment, including assessment of ecosystem services and their values, is performed by the Ministry of Infrastructure.	The national ecosystem assessment will serve as the base for evaluating biodiversity values and examining their incorporation into national accounting.	1.4.1. 2.3.4.1.

AICHI target	Actions	Overall progress	Paragraph in report
Target 3 By 2020, at the latest, incentives that are harmful to biodiversity, including subsidies, are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.	1) Open areas conservation fund – offset for land development projects. 2) Quarries rehabilitation fund.	Incentives and subsidies harmful to biodiversity, such as housing subsidies or subsidized water to agriculture, have not yet been eliminated or reformed. Positive incentives, such as rehabilitation funds, are now operational. Positive incentives in the agricultural sector are still, by large, lacking.	2.3.6.
Target 4 By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption, and have kept the impacts of use of natural resources well within safe ecological limits.	1) Government resolution on sustainable development from 2003 requires all ministries to prepare and implement sustainability strategies. Governmental companies are required to prepare such plans as well. 2) Green Growth strategy was adapted in 2011.	Several ministries and governmental companies have prepared sectorial sustainable development plans. Implementation is in initial phase.	2.4.3.

AICHI target	Actions	Overall progress	Paragraph in report
Target 5 By 2020, the rate of loss of all natural habitats, including forests, is at least halved, and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.	1) Protected areas are declared (see goal 11). 2) A new forest management department is operational in the Israel Nature and Parks Authority to manage forest fires risks and recovery. 3) Mapping of essential ecological corridors has been carried out, and implementation in regional planning has commenced.	Habitat loss and fragmentation continues to be the single highest threat for ecosystems. The rate of loss of open areas, including natural habitats, has not declined as yet since land, especially in the Mediterranean region, is scarce, and the population growth rate is high. However, the amount of areas protected and managed for biodiversity conservation increases steadily.	2.3.2.1. 2.4.2.4.
Target 6 By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally, and applying ecosystem-based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species, and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.	1) Plans for sustainable fisheries are currently formulated by MoA, not yet approved and implemented. 2) A new voluntary code of conduct for sports fishing has been formulated.	Achieving the target requires implementation of fishery reform.	2.4.2.2.

AICHI target	Actions	Overall progress	Paragraph in report
Target 7 By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.	1) Following guidelines of the national master plan for the forest (22), JNF compiled a forest management theory and practice. The primary goal of afforestation was defined as ecosystem services provision. 2) The Ministry of Agriculture and Rural Development established a new Agroecology department to deal with the interfaces of agriculture and environment.	Forestry management is currently more biodiversity-sensitive, yet safeguarding local biodiversity is in places in conflict with afforestation, especially in the semi-desert and desert ecosystems. Pilot projects on environmentally-sensitive agriculture had commenced, and serve as case studies for possible wider implementation.	2.4.2.4. 2.3.6.2.
Target 8 By 2020 pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.	Regulation on river and marine pollution is continuously implemented by MoEP.	There is a need to better monitor the effects of the current pollution reduction actions on biodiversity.	1.3.2. 2.4.2.5.
Target 9 By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.	1) List of invasive and potentially invasive plants, prioritization of actions, strategic plan for eradication of the most invasive species. 2) Guidelines for monitoring and eradication of invasive plants in development project plans.	Plants – prioritization for action in place, implementation of eradication plans initiated. Gaps – legislation, prioritization of action for animal invasive species, pathway analysis and management, action against dispersal of invasive plants.	2.3.2.4.

AICHI target	Actions	Overall progress	Paragraph in report
Target 10 By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification, are minimized, so as to maintain their integrity and functioning.	In Eilat Gulf of the Red Sea anthropogenic pressures are reduced, including cessation of marine aquaculture.	The state of Eilat's coral reefs, as indicated by proportion of live coral cover, has improved over the last 7 years. The state of Meditteranean Sea Magilus snail reefs is deteriorating.	1.2.2.3.
Target 11 By 2020, at least 17% of terrestrial and inland water, and 10% of coastal and marine areas – especially areas of particular importance for biodiversity and ecosystem services – are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.	1) New terrestrial protected areas are declared. 2) A new master plan for reserve establishment was formulated for the marine ecosystems. The first large scale reserve was approved. 3) A new biosphere reserve, Israel's second, was declared. 4) Essential corridors were identified, and preparation of management plans had commenced.	The area of terrestrial protected areas exceeds the Aichi target, yet the representativeness of ecosystems in protected areas needs to be improved. Marine protected areas are still limited in area. Connectivity planning and implementation has commenced, but significant bottlenecks remain.	2.3.2.1. 2.3.2.1.1.1. 2.3.2.1.3. 2.3.1.

AICHI target	Actions	Overall progress	Paragraph in report
Target 12 By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.	1) Most vertebrate endangered species are protected by law, and management plans and monitoring schemes were formulated and implemented for most of them, including captive breeding and reintroduction programs. 2) The recommendation of the Red Plants conservation committee are being implemented. 3) An endemic amphibian species that was thought to be extinct was recently rediscovered.	The status of many threatened species is still deteriorating. Gap in law protection of freshwater fish, Red List plants, and invertebrates.	2.3.2.2. 2.3.2.2.1.
Target 13 By 2020, the genetic diversity of cultivated plants, farmed and domesticated animals, and of wild relatives – including other socio-economically and culturally valuable species – is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.	Israel Gene Bank maintains a seed collection of local wild relatives of cultivated plants and ancient cultivars, as well as of most species of wild plants, focusing on threatened populations of the species.	Israel Gene Bank takes care of the state of important plants for agriculture, as well as species of conservation importance. No action was taken so far concerning the genetic diversity of farmed and domesticated animals.	2.3.2.3.

AICHI target	Actions	Overall progress	Paragraph in report
Target 14 By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and wellbeing, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, as well as the poor and vulnerable.	Restoration plans and projects are implemented in order to clean up and restore most of the degraded rivers.	The state of the restored rivers has improved. The project of ecosystem evaluation may contribute to this target. The outcomes of this project are presently formulated, and are expected to help prioritize safeguarding of essential ecosystem services.	2.4.2.5. 1.4.1.1.
Target 15 By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.	Restoration and rehabilitation projects are parts of nature management, including quarries, polluted water bodies and burned areas.	Degraded ecosystems are currently managed, the detailed outcomes will be presented in following reports.	2.3.6.1. 2.3.6.2.

AICHI target	Actions	Overall progress	Paragraph in report
Target 16 By 2015, the Nagoya Protocol on Access to Genetic Resources and the fair and equitable sharing of benefits arising from their utilization is in force and operational, consistent with national legislation.	Inter-ministerial consultations on joining the protocol have commenced.	Israel is not yet a party to the protocol.	
Target 17 By 2015 each Party has developed, adopted as a policy instrument, and commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.	New NBSAP targets were formulated to incorporate all sectors in the implementation of the Convention.	NBSAP in process of updating, will not be completed by the Aichi target due date.	2.1.

AICHI target	Actions	Overall progress	Paragraph in report
Target 18 By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention, with the full and effective participation of indigenous and local communities, at all relevant levels.		Traditional knowledge, whenever exists, is respected and integrated in management plans, but indigenous communities are an irrelevant factor in Israel.	
Target 19 By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, as well as the consequences of its loss, are improved, widely shared and transferred, and applied.	1) A collections-based Museum of Natural History museum was founded in TAU. 2) An institution responsible for terrestrial biodiversity monitoring and national ecosystem services assessment was established and is operational. 3) National biodiversity portal is established.	Considerable progress. A gap in biodiversity research faculty in the universities was identified and only partly treated.	1.1.1.2. 2.3.4.

AICHI target	Actions	Overall progress	Paragraph in report
Target 20 By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from its current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by parties.	Funding for monitoring, research, and protected areas management had increased, however funding is still lacking, especially for management outside of protected areas and for mainstreaming.	The updated NBSAP will include mobilization of financial resources for its implementation.	2.2.

Q11 What has been the contribution of actions to implement the Convention towards the achievement of the relevant 2015 targets of the Millennium Development Goals in the country?

3.2. Green Economy as contribution to sustainable development

Contributions of the implementation of the Convention and its Strategic Plan for Biodiversity (2011-2020), including its Aichi Biodiversity Targets to the achievement of relevant 2015 targets of the Millennium Development Goals, are:

To ensure environmental sustainability, Israel currently develops a strategy on the subject of green economy.

Green economy can be defined as an economy that results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities. Green Economy typically includes aspects of:

1. New economic tools reflecting costs and benefits of environmental and social impacts:

    a. Ecosystem services;

    b. Biodiversity;

    c. Poverty eradication.

2. Mitigation of climate change and energy independence:

    a. Effective mitigation of greenhouse gas emission;

    b. Reduction of fossil fuel use.

3. Climate change adaptation capacity.

4. Creation of new engines for economic growth:

    a. Development of green technologies;

    b. Greening of industries;

    c. Resource efficiency.

5. Sustainable Consumption and Production.

In 2011, after signing the OECD Declaration on Green Growth in 2009 and becoming a member of the Organization in 2010, the Government of Israel launched a comprehensive consultative process to develop a National Green Growth Strategy for the years 2012-2020, and took the decision to call on the Ministry of Environmental Protection and the Ministry of Economy, to jointly formulate the strategy (decision no. 2768). The decision defines green growth as "socio-economic growth and development that does not harm the environment, makes efficient, economical and sustainable use of natural resources, and creates green jobs while maximizing opportunities for the use of clean growth engines and emphasizing the decoupling of economic growth from environmental deterioration."

The process was put forward by the two Ministries. In total, 500 stakeholders from different groups (representing different sectors of Israeli society, including business and civil society) took part in the process through round tables, conferences and meetings, and in some cases via the website. Their insights helped sharpen issues and facilitated the formulation of a package of optimal tools and policies for implementation. At present, Israel translates the recommendations into legislative, budgetary, administrative and educational reforms, which will aid the country in its progress on the road to green growth. Based on their comments, insights emerged and contributed to the formulation of the major levers for change which shape the entire plan.

As a country poor in natural resources, Israel developed technologies in a wide variety of fields, including water management, seawater desalination, desert agriculture and solar energy. Furthermore, as an island economy characterized by high population density and growth rates, Israel has recognized the necessity to decouple the destructive link between economic growth and environmental degradation, and is forging ahead with a green growth agenda. The implementation of the national green growth strategy is expected to contribute to both the development of the economy and to the protection of the environment.

In line with the government decision, an inter-ministerial directors-general committee, headed by the Ministry of Environmental Protection and the Ministry of Economy, was established to formulate an operative plan with indicators and outputs aimed at bringing about both economic and environmental growth.

MAIN POINTS OF THE GOVERNMENT DECISION:

- Removing obstacles to green growth, including regulatory failures;
- Promoting clean-tech industries, including developing markets for green products and services and accelerating eco-innovation;
- Advancing green employment, including academic and professional training;
- Transitioning to sustainable consumption, including mainstreaming of green construction codes and increased public awareness and education;
- Transitioning to sustainable industry, including green branding of Israeli industry in the global market;
- Transitioning to a more environmentally-friendly business sector.

The process initiated following the government decision in October 2011 has led to policy and regulatory initiatives aimed at implementing the green growth strategy. Israel is moving forward on a number of fronts: drafting a green licensing law, planning for a green growth knowledge center, advancing green taxes, designing training programs for green jobs, promoting green procurement, publishing anti-greenwashing guidelines, and launching a material and waste management research center.

The development and implementation of a green growth policy in Israel means economic growth accompanied by environmental protection. The outcome indicators, which were set at the beginning of the process, reflect the vision of all stakeholders: green growth in terms of sustainable production, sustainable consumption and innovation.

In a world of depleting resources, the transition to sustainable production and consumption is a must, not an option. One way to close the loop between supply and demand and move to a circular economy is eco-innovation. As it continues to implement its green growth strategy, Israel hopes to emerge as an important player in the growing market of environmental technologies. The green growth process has opened up a window of opportunity for the environment to emerge as a powerful engine of growth.

Q12 What lessons have been learned from the implementation of the Convention in the country?

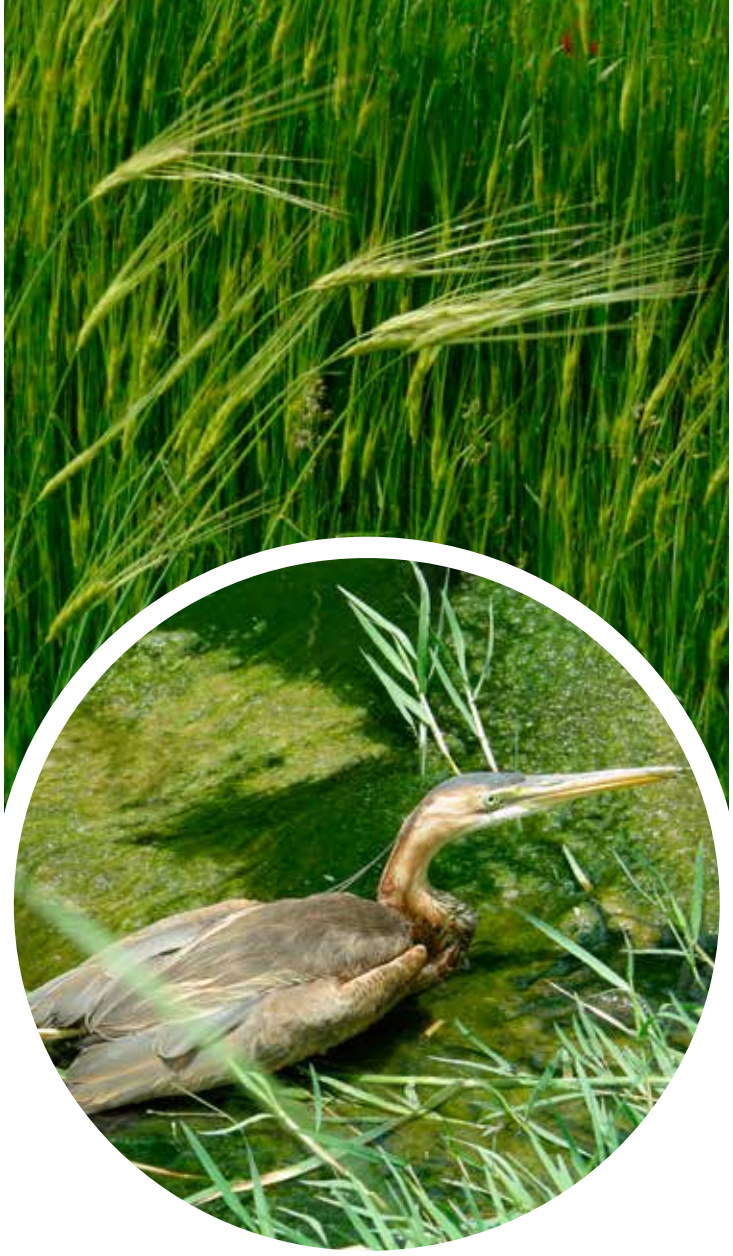
3.3. Main lessons learned from implementing the Convention

The main lesson learned and an ongoing challenge is that in order to conserve biodiversity and the vital ecosystem services it provides, there is a strong need to mainstream biodiversity considerations into different sectors. Israel has extensive legislation regarding protected areas and protected species, which has been thoroughly implemented over the last decades. Yet, as the pressures on open areas and on terrestrial and marine ecosystems increase and are expected to continue to do so due to population growth and increased natural resources exploitation, there is a growing understanding that accounting for the effects on biodiversity should be considered in sectorial and cross-sectorial policies.

Accordingly, the main steps taken in recent years have been: establishing the Open Areas Conservation and Rehabilitation Fund, integrating biodiversity into Israel's Climate Change Adaptation Strategy, and emphasizing ecological corridors in regional planning policy. Initial progress has also been made in the agricultural, forestry and infrastructure sectors. The new Israel NBSAP is in the making – targets have been updated to reflect the CBD Strategic Plan for 2011-2020, and now stress the need in cross-sectorial mainstreaming.

The other lesson learned is that biodiversity policy needs to be based on solid scientific information. Considerable progress has been made towards this end, including establishing the Israel Natural History Museum and HaMaarag – Israel's National Nature Assessment Program. The National Ecosystem Assessment is currently being carried out, the National Terrestrial Biodiversity Monitoring Program is now functional, and periodical State of Nature reports are being prepared.

Major future challenges are the need to enact legislation on the prevention and treatment of invasive species; the preparation of Israel's Biodiversity Action Plan with the participation of relevant stakeholders; development of additional economic tools for biodiversity conservation; integration of biodiversity considerations into national accounting, and slowing down the conversion of natural open areas into built or agricultural areas.



Part IV:

Appendices

4.1. Contact information

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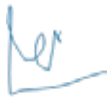
Signature of officer responsible for submitting national report	
Date of submission	31.03.16

4.2. Preparation process

4.2.1. The process of preparation of the report

The report was prepared by the Israel Ministry of Environmental Protection in consultation with the Israel Nature and Parks Authority and HaMaarag (Israel's National Nature Assessment Program).

The report relied mainly on publications and data produced by these institutions, as well as from other official organizations and the academy.

4.2.2. Sources of information

(1) Bendas-Jacob, O., Dunitz, D., Reznikovski, A., Levy, R. and E. Yaar, 2012. A Green Outlook: Social Types and Moral Attitudes toward Environmental Commitment in Israel. Henrietta Szold Institute, 176 pp.

(2) Tal, A., Leon Zchout, S., Frankel Oshri, L., Greenspan, I. and S. Akov, 2011. Israel Environmental Movement: Trends, Needs and Potential. BGU, 48 pp.

(3) Yahalom Document, 2012. Biodiversity Research and Higher Education in Israel. Israel Academy of Science and Humanities. 52 pp.

(4) Kark, S., Levin, N. and U. Sheines, 2011. Israel biodiversity 50 questions and horizon scanning. 16 pp. (Hebrew).

(5) Shmida, A., Pollak, G. and O. Fragman-Sapir, 2011. Red Data Book: Endangered Plants of Israel. INPA, 1068 pp. (Hebrew).

(6) Berg, N. and A. Perleberg (eds.), 2015. A Report of the State of Nature in Israel. HaMaarag, 90 pp. (Hebrew).

(7) Herut B. and all scientific group of IOLR, National Institute of Oceanography, 2015. The National Monitoring Program of Israel's Mediterranean waters – Scientific Report for 2013/14, IOLR Report H21/2015.

(8) Kaplan, D. and R. Federman, 2014. A report of the state of nature: wetlands in Israel. HaMaarag, 118 pp. (Hebrew).

(9) Sheinin, A. (ed.), 2013. A Report on the State of Nature in the Mediterranean Sea. HaMaarag, 130 pp. (Hebrew).

(10) Shaked, Y. and A. Ganin, 2015. National Monitoring of the Gulf of Eilat, 2014 Report. 170 pp. (Hebrew).

(11) Perevolotski, A. and N. Berg (eds), 2013. Biodiversity Monitoring in Agriculture Ecosystems, a conceptual framework and literature survey. HaMaarag, 31 pp. (Hebrew).

(12) Hatzofe, O. and A. Meroz, 2014. Summary of waterfowl winter census of 2013. INPA, 19 pp. (Hebrew).

(13) Amichai, E., Yidov, S., Dolev, A., Sabah, A., Malihi, Y. and N. Leader, 2014. National Monitoring Plan for Israel's Bat Species: Insectivorous bat survey in Israel 2013. INPA, 49 pp. (Hebrew, w. English summary).

(14) Shahal, R., Yidov, S. and A. Dolev, 2014. Summary of Otters Survey 2014. INPA, 18 pp. (Hebrew).

(15) Dolev, A., Hatzofe, O., Goldstein, H., Sinai, Y., Oron, T., Rosenberg, B., Millet, Y., Shaked, I., Gamla and Hai-Bar Carmel teams, 2015. Summary of Griffon vulture census in Northern Israel. INPA and SPNI, 7 pp. (Hebrew).

(16) Artzi, Y., Kaplan, A. and O. Hatzofe, 2014. Summary of the pelican season 2013. INPA, 8 pp. (Hebrew).

(17) Berg, N. (ed.). 2012, 2013, 2014, National monitoring reports. HaMaarag (Hebrew).

(18) EEA, 2014. Horizon 2020 Mediterranean Report. Annex 3: Israel. 14 pp.

(19) Dufour-Dror, J-M. 2012. Alien Invasive Plants in Israel. TMENCPA, 218 pp.

(20) Yanai, Z., 2013. Non-indigenous freshwater mollusks in Israel: introduction pathways and biological traits. MSc thesis, TAU, 112 pp.

(21) Coll, M., Piroddi, C., Steenbeek, J., Kaschner, K., Ben Rais Lasram, F., et al. (2010). The Biodiversity of the Mediterranean Sea: Estimates, Patterns, and Threats. PLoS ONE 5(8): e11842. doi:10.1371/journal.pone.0011842

(22) Zaban, S. and T. Kutinsky, 2013. Invasive plants in Israel: cost and benefit. Znobar, 83 pp. (Hebrew).

(23) Sternberg, M., Gabay, O., Angel, D., Barneah, O., Gafny, S., Gasith, A., Grunzweig, J.-M., Hershkovitz, Y., Israel, A., Milstein, D., Rilov, G., Steinberger, Y. and T. Zohary, 2014. Impacts of climate change on biodiversity in Israel: an expert assessment approach. Reg. Envir. Change. Springer. 12 pp.

(24) Berman, T., Karkis, I. and S. Reicher, 2014. Health and Environment in Israel. MoH, 85 pp. (Hebrew).

(25) Rilov, G. and D. Disney, 2015. Israel marine ecosystem assessment. HaMaarag. 71 pp. (draft, in Hebrew).

(26) Sheinin, A., 2013. A Report on the State of Nature in the Mediterranean Sea 2013. HaMaarag. 128 pp. (Hebrew).

(27) Edelist, D., 2013. Fishery management and marine invasion in Israel. A thesis submitted for the degree of PhD at Haifa University, 204 pp.

(28) Gruner, E., Ben Shlomo, H., Shalmon, B., Morris, A. and A. Gotlieb, 2015. Hyper-arid sub system. HaMaarag, 46 pp. (Draft, in Hebrew).

(29) Brachia, V. (ed.), 2012. Sustainability Outlook for Israel 2030. MOEP and JIORI, 176 pp. (Hebrew).

(30) Assif, S. 2007. Principles of Israel's Comprehensive National Outline Plan for Construction, Development and Conservation. NOP 35, 9 pp.

(31) Dufour-Dror, J.-M., 2013. Israel's Least Wanted Alien Ornamental Plant Species. MoEP, 21 pp.

(32) Walzak, M. and N. Engert, 2012. Management of invasive and outbreaking plant species in infrastructures development. INPA, 37 pp. (Hebrew).

(33) Nemtsov, S. and Y. Gendler, 2014. A field experiment on eradication of the invasive fire ant. INPA, 9 pp. (Hebrew).

(34) Pilkowsky, I. and Class, K. 2014. From planning to operation – the ecosystem and human well-being project. HaMaarag, 76 pp. (Hebrew).

(35) OECD, 2011. OECD Environmental Performance Reviews: Israel 2011, OECD Publishing, Paris. DOI: http://dx.doi.org/10.1787/9789264117563-en

(36) Moisa, S. (ed.), 2012. Israel's Agriculture. Export and International Cooperation Institute, 58 pp.

(37) Hershkoviz, Y., Shnidor, Y., Shapira, A. and I. Haan, 2013. Development of sustainable management for mosquito control and biodiversity protection in wetlands of Israel. MoEP, 55 pp. (Hebrew).

(38) Bar-Haim, A. and O. Karrasin, 2014. Corporate social responsibility in Israeli industry: uncovering the determinants. Open University, 125 pp.

(39) Gotlieb, A., 2012. Implementing The Aichi Biodiversity Targets In Israel. MoEP, 24 pp.

(40) http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/europe-north-america/israel/ramot-menashe/

(41) Federman, R. 2013. National plan for treatment of ambrosia, recent and planned actions. Report to MoEP and INPA (Hebrew).

(42) Galil, B.S. 2007. Seeing Red: Alien species along the Mediterranean coast of Israel. Aquatic Invasions Vol. 2(4): 281-312.

(43) Rothschild, A., Schultz, D., Sass, R., Har Lev, A., Yaion, N., Alhasid, A., Zilberstein, R., Rosenzweig, G., Gafni, A. and M. Goren. 2014. Stop cutting the branch we sit on - the needed reform in fisheries. Ecology and Environment 5, 98-105 (Hebrew).

(44) Rotem, D. and G. Weil, 2014. Natural ecosystem-units in Israel and the Palestinian Authority – representativeness in protected areas and suggested solutions for biodiversity conservation. Journal of Landscape Ecology, Vol. 7 (1).

4.2.3. Photographs Credits

Front cover:

Wild barley (*Hordeum spontaneum*), the closest wild relative of cultivated barley. In Israel it reaches the southern periphery of its distribution. The peripherial populations are genetically and phenotipically unique, being more water stress-resistant. This is one of the species in the collections of Israel Plant Gene Bank (see 2.3.2.3).

Photo: Dr. Ori Fragman-Sapir, Head Scientist, The Jerusalem Botanical Gardens

Part I cover

The Hula painted frog (*Lantonia nigriventer*), an endemic species considered to be extinct for circa 75 years, recently rediscovered (see 1.2.3.2.3).

Photo: Oz Rittner, from the NPA photo database

Part II cover:

French Lavender (*Lavandula stoechas*), a red species with medicinal and cosmetic uses. In Isreal distributed mostly in the coastal plain.The number of populations declined over the years, mostly due to habitat distruction. It is one of the endangered plant species griwn in shelter gardens (see 2.3.2.2.1)

Photo: Margarita Orlova

Part III cover

The coral reef in the Gulf of Eilat, showing signs of improved condition, correlated with reduced anthropogenic stresses (see 1.2.2.3.2).

Photo: Shahar Shabtai

Part IV cover

Purple heron (*Ardea purpurea*), a common migrant and rare wintering water bird species in Israel (see 4.3.).

Photo: Eyal Yaffe

4.3. Water birds yearly censuses results

Table s1 The number of all water birds in the all censuses from 2004 to 2013 (from (12)).

שם הכ	2004	2005	2006	2008	2009	2010	2011	2012	2013
Fulica atra	19,726	27,729	31,631	40,601	23,839	19,971	16,803	23,453	12,662
Anser anser	0	0	15	13	0	1	0	1	24
Anser albifrons	10	10	0	27	0	2	0	14	0
Anser sp.	0	0	0	0	0	6	0	6	0
Ardea cinerea	4,847	4,643	3,966	5,480	4,603	4,256	3,435	4,187	3,571
Ardea purpurea	1	8	2	3	0	1	1	2	4
Botaurus stellaris	0	1	1	7	11	2	0	0	1
Ixobrycus minutus	0	1	1	1	0	0	0	0	0
Ardeola ralloides	0	6	1	8	6	7	7	1	10
Nycticorax nycticorax	665	1,087	1,334	1,323	548	192	659	312	411
Arenaria interpres	50	79	119	83	143	158	97	51	67
Tringa erythropus	121	128	89	198	98	31	69	35	46
Tringa/Xenus/Actitis spp.	376	128	157	125	66	211	59	5	24
Tringa nebularia	8	39	73	38	22	59	48	55	55
Tringa totanus	781	697	794	737	983	1,059	755	648	880
Actitis hypoleucos	197	211	127	152	110	161	157	90	126
Tringa glareola	6	21	10	19	22	28	66	12	24
Tringa stagnatilis	35	35	89	102	83	82	122	87	66
Tringa ochropus	54	25	25	40	91	88	82	58	61
Cairina moschata	0	0	0	0	1	0	0	0	0
Cygnus olor	0	0	0	3	0	0	0	0	0
Cygnus columbianus	0	2	0	0	0	0	0	0	0
Anas strepera	182	487	257	346	595	267	174	458	382
Anatidae spp.	2,992	255	488	357	5	5	0	0	48

Anas acuta	297	389	532	322	302	336	631	459	390
Marmaronetta angustirostri	92	43	33	97	28	33	20	36	3
Anas penelope	1,795	1,325	906	966	1,159	747	925	748	785
Anas platyrhynchos	14,315	19,556	10,028	11,947	14,657	8,208	10,367	9,784	8,885
Pluvialis spp.	99	0	2	183	0	0	3	0	0
Pluvialis apricaria	0	0	0	0	0	255	126	82	61
Pluvialis squatarola	41	42	12	16	29	39	29	44	33
Calidris alpina	92	590	187	357	518	838	362	305	194
Calidris spp.	54	40	59	44	1	120	0	0	3
Calidris temminckii	8	136	28	133	12	28	9	22	21
Calidris alba	73	92	39	48	37	88	31	4	10
Calidris ferruginea	0	0	0	0	0	1	0	0	0
Calidris minuta	244	561	745	1,034	887	2,726	1,697	1,436	1,237
Charadrius alexandrinus	12	24	1	139	229	116	76	78	85
Charadrius spp.	17	7	2,332	153	9	0	0	0	0
Charadrius dubius	4	88	2	50	27	84	47	2	37
Charadrius leschenaultii	0	1	203	66	14	67	31	21	0
Charadrius hiaticula	278	311	247	325	533	1,307	471	540	347
Ciconia ciconia	1,292	618	240	93	24	185	81	45	56
Ciconia nigra	122	1,749	2,099	2,329	1,576	1,169	1,380	1,155	705
Lymno./Gallinago spp.	39	4	4	0	0	0	0	0	0
Gallinago media	0	1	0	0	0	0	0	0	0
Gallinago gallinago	247	120	164	116	156	171	106	237	163
Lymnocryptes minimus	2	2	0	9	1	0	4	0	0
Numenius arquata	0	0	4	0	7	0	1	0	0
Numenius phaeopus	0	0	1	0	6	0	0	0	0
Tachybaptus/Podiceps sp.	0	0	27	6	0	1	0	0	0
Podiceps nigricollis	452	627	857	280	396	354	153	344	366
Tachybaptus ruficollis	2,746	2,954	2,667	3,277	2,851	2,569	3,728	2,631	3,214
Podiceps cristatus	136	1703	1,580	369	829	1,177	185	458	342
Tadorna tadorna	683	802	627	1,666	717	371	768	714	211

Alopochen aegyptiacus	6	5	4	100	19	11	15	49	43
Puffinus yelkouan	0	0	39	0	0	0	0	0	3
Platalea leucorodia	360	267	423	468	394	551	232	578	372
Halcyon smyrnensis	199	196	138	104	121	202	83	112	224
Egretta alba	3,259	4,431	5,977	5,487	4,702	3,027	2,067	1,609	3,252
Egretta gularis	0	3	0	2	0	3	2	1	1
Egretta garzetta	1,622	2,296	1,778	1,625	1,380	1,897	868	1,113	1,884
Philomachus pugnax	91	399	367	436	496	426	218	422	420
Limosa limosa	155	99	248	289	373	268	255	223	356
Plegadis falcinellus	1,330	1,758	1,584	2,632	2,192	2,283	2,231	1,443	2,141
Mergus serrator	0	0	0	0	0	2	0	0	0
Mergus albellus	0	7	0	4	0	0	0	0	0
Chlidonias sp.	0	0	1	0	0	0	2	5	0
Chlidonias leucopterus	0	0	11	5	13	22	40	40	0
Chlidonias hybrida	0	17	143	69	88	120	39	31	125
Anas clypeata	30,250	33,071	34,567	39,780	32,763	25,765	32,527	27,585	31,523
Netta rufina	0	1	0	2	2	0	1	3	0
Sula leucogaster	0	0	0	0	0	1	0	0	0
Gallinula chloropus	1,055	1,297	1,141	1,961	842	850	816	797	895
Recurvirostra avosetta	256	485	301	408	541	453	696	523	505
Vanellus spinosus	4,111	2,569	2,498	1,448	2,281	2,783	1,574	2,119	4,187
Porphyrio porphyrio	0	3	3	0	4	0	7	0	0
Phoenicopterus ruber	451	369	680	599	568	499	548	583	662
Ceryle rudis	418	368	383	424	600	361	349	235	345
Aythya spp.	0	196	4	10	0	0	0	0	0
Aythya nyroca	188	175	378	132	233	278	271	85	317
Aythya ferina	3,578	2,743	4,245	4,174	2,917	2,442	2,865	2,868	2,821
Aythya marila	0	1	0	0	0	0	0	0	0
Aythya fuligula	2343	3,802	8,223	5,189	3,909	6,011	415	3,153	3,212
Gavia arctica	0	0	0	0	2	0	0	0	0
Oxyura leucocephala	552	1,261	1,203	2,714	979	1,636	2,008	2,162	1,183
Phalacrocorax pygmaeus	77	406	321	417	469	426	274	557	1,386

Tadorna ferruginea	0	4	1	9	8	18	25	95	0
Chettusia leucura	0	0	1	0	0	0	0	0	0
Vanellus vanellus	2,075	1,215	3,391	930	3,249	2,311	1,402	1,885	1,585
Anas querquedula	69	13	15	20	11	0	41	6	0
Rallus aquaticus	0	7	6	31	4	3	0	1	0
L. michahellis/armenicus	6,483	9,482	4,495	2,631	778	0	2,280	1,934	1,075
Larus ridibundus	32,585	23,528	42,569	38,257	16,274	25,167	5,914	17,935	17,677
Larus canus	3	1	0	5	4	0	1	2	0
Larus armenicus	0	0	0	2,631	6,492	7,056	3,551	4,226	8,962
Larus minutus	3	0	4	0	2	32	0	0	0
Larus marinus			1	0	0	0	0	0	1
Larus leucophthalmus		16	32	9	2	45	22	0	2
Larus ichthyaetus	547	709	485	691	1,451	682	796	506	582
Larus cachinnans/ michahellis	0	0	0	6,259	3,317	1,606	38	84	1
Larus genei	46	0	535	84	156	237	346	216	405
Larus fuscus	33	243	72	67	103	558	10	20	14
Larus melanocephalus	4	1	0	0	0	0	0	1	1
Sterna spp.	0	110	30	0	0	0	0	0	0
Sterna caspica	0	4	3	0	7	1	0	0	0
Sterna nilotica	0	1	1	0	0	1	0	0	0
Sterna sandvicensis	15	0	52	6	10	4	21	55	77
Alcedo atthis	81	77	39	38	35	48	23	31	27
Pelecanus onocrotalus	68	207	271	265	271	232	301	367	292
Anas crecca	10,548	11,974	13,003	14,413	15,705	14,117	14,368	15,270	12,527
Himantopus himantopus	702	769	752	648	867	1,233	1,153	733	792
Total	156,754	171,963	193,223	209,161	160,865	151,245	122,460	138,284	135,487

State of Israel

Ministry of Environmental Protection

Implementing the Aichi Biodiversity Targets in Israel

Photos: Ilan Malester

The Ministry of Environmental Protection

October 2012

Table of contents

In October 2010, several months after Israel published its National Biodiversity Plan, it joined the other Parties to the Convention on Biological Diversity in adopting a revised and updated Strategic Plan for Biodiversity for the 2011-2020 period, which included the Aichi Biodiversity Targets. This 10-year plan aims to guide international and national efforts to save biodiversity.

Israel has implemented a range of activities toward achieving these targets. Actions were taken by both governmental and non-governmental bodies. This document lists some of these actions and is arranged according to the different goals of the global strategic plan.

1. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

<Contributions toward Aichi Targets 1-4 that make up Strategic Goal A>


Photo: A.Gotlieb

People from all segments of the population can assist in preserving biodiversity. According to the International Convention on Biodiversity, people must "be aware of the values of biodiversity and the steps that they can take to conserve it and use it sustainably."

The Ministry of Environmental Protection (MoEP), the Israel Nature and Parks Authority (NPA), universities, and non-governmental environmental organizations provide opportunities for both children and adults to see, appreciate and understand Israel's biodiversity and to take part in its protection. These opportunities include:

1.1. Public Awareness:

- The MoEP has 60 municipal environmental units throughout the country that serve as focal points for environmental activities. The units provide educational material for both teachers and interested citizens, promote informal environmental education by stimulating public involvement, initiate and coordinate lectures, seminars, environmental tours and training courses, and promote environmental events. [1]
- The MoEP has released a media campaign and a mobile application to instill environmental consciousness among the public. [2,3]

- The MoEP, the NPA, the Society for the Protection of Nature in Israel (SPNI), and other organizations offer activity projects to the public (e.g.: Green School programs, Clean Beach Action, Love of Nature Week, etc). [4]


Photo: A.Gotlieb

- Nature reserves and parks are visited by schoolchildren, families and adults year-round. The NPA is responsible for the 218 nature reserves and 74 national parks (approximately 21% of Israel's land area). An additional 246 proposed nature reserves and 73 national parks are in various stages of the planning and declaration process. The number of visitors in Israel's parks and reserves has increased continuously over the past decade, with more than 8 million visitors in 2011, compared with 7 million visitors in 2009.[5]

- Hikes, educational programs, workshops and public awareness campaigns are offered by SPNI (Israel's leading environmental NGO).[6,7]

- Several university facilities promote public and student awareness of Israel's biodiversity and actions for its preservation, including Tel Aviv University's (TAU) Nature Campus and Garden for Zoological Research.[8]

- The Steinhardt National Collections of Natural History building is currently under construction on TAU Campus, and will greatly promote biodiversity research and education.[9]

- Numerous zoos house native Israeli plant and animal species.[10] In some cases, these zoos re-introduce captive-born endangered species back into their native habitats.


Photo: A.Gotlieb

- SPNI operates several bird-watching centers that are situated throughout the country, where the public can view the ringing process of migratory birds and learn about birds and nature conservation. The government is funding the initiative of SPNI and TAU to create a nationwide network, establishing four more centers and upgrading three existing ones.

- Jewish National Fund (JNF) forests are a popular local tourism attraction. They contain hiking trails, camping areas and recreational facilities. Many of the forests are located adjacent to nature reserves and serve to lower visitor pressure on nature reserves themselves.[11]
- Private eco-tourism organizations promote awareness of the importance of sustainability as part of the international Global Sustainable Tourism Criteria (GSTC) initiative.[12]

1.2. The educational system:

- Over the years, the Education Division of the MoEP, environmental education centers and teachers throughout Israel have worked side-by-side with the Education Ministry to develop formal environmental education curricula that include issues concerning biodiversity conservation. These curricula are based on both formal and informal environmental education principles for all levels – from kindergarten to university.
- The MoEP's municipal environmental units throughout the country assist the formal education system in planning and preparing environmental curricula (in conjunction with local teachers), conduct in-service teacher training programs, and support the introduction of innovative educational approaches.
- The MoEP has supported the TAU in establishing an educational database on the topic of biodiversity in Israel.[13]
- TAU's Nature Campus offers outreach educational programs to students of all ages to teach them about Israel's environment and biodiversity.[14]
- The MoEP, in cooperation with the NPA, Green Network, and the Technion - Israel Institute of Technology, have initiated the Green Schools program. As of 2011, more than 500 schools have been accredited as Green Schools, according to the formal accreditation requirements. [15,16,17]
- The NPA has established 15 education centers which are visited by approximately 200,000 school children annually.
- SPNI's flagship eco-education programs promote awareness throughout the community.[18, 19] Students participating in SPNI's Children Make a Difference are obliged to adopt environmental thinking

and green management in cooperation with the community and the neighborhood.

1.3. Innovations for Agriculture

The Ministry of Agriculture and Rural development (MoAG) has initiated an innovative program that supports agricultural communities in advancing conservation-oriented agricultural practices.[20] [See case study in the section discussing Ecologically-Friendly Agriculture, Aquaculture, and Forestry.]


Photo: A.Gotlieb

1.4. Commercial, Business and Industrial Awareness and Action

- A successful workshop led by SPNI helps senior government officials and businessmen to incorporate conservation of biodiversity into their respective activities and responsibilities. [See Case Study below.]
- The National Plan for Green Growth led by the MoEP and the Ministry of Industry, Commerce and Employment helps reduce environmental impact of development and therefore reduces impact on biodiversity.

1.5. Planning and Development

- The MoEP and the NPA are enforcing the preservation of ecological corridors in Israel's construction and development plans. [See Case Study in the section entitled: "Reducing Fragmentation"]
- The SPNI monitors development presented to planning commissioners, and provides data and alternative plans to decision makers.[21]
- Israel now requires environmental impact assessments (EIAs) to be carried out for all major development projects and investments, with the explicit requirement to account for the impact of development plans on biodiversity.

Case Study: Biodiversity Protection Workshops: An Instrument of Change in the Public and Private Sectors

The Society for the Protection of Nature in Israel, Israel's largest NGO, has a unique method of inspiring appreciation of biodiversity, and of facilitating its protection. With contributions from TAU, and the MoEP, SPNI has begun providing workshops for senior decision makers in government ministries, and for private businesses, to instill in them the importance of conserving Israel's biodiversity, and to provide training so that they can effectively integrate biodiversity protection in their decision-making processes. The goal of the workshops is to mainstream biodiversity conservation in the public and private sectors, and to instill the biodiversity conservation ethic as a central social, environmental, and cultural value.

The workshops include analyses of environmental decision making options from exemplary situations, and the training process is provided by experts. Among the key areas covered in the governmental training session are:

a) Identifying how policy decisions, legislation, and proposals for specific projects can impact biodiversity and ecosystems
b) Providing support in the planning and operation of projects, by expert ecologists
c) Developing and adopting economic instruments for encouraging biodiversity conservation.

Workshops for the private sector identify the value of the ecosystem at all levels: including the provision of services, installations, supplying products, and events. It shows participants how to integrate biodiversity conservation into their businesses while at the same time increasing the value of their company and business opportunities, as well as minimizing risks, and in some cases, even saving costs. Training areas include understanding the impacts of business decisions on the ecosystem, and learning the tools with which to minimize damage and preserve biodiversity.

The tools provided in both the Public Sector (governmental) and Private Sector (business) workshops have been widely tested and effectively used internationally. They are conveyed in a practical training format in these workshops so that participants can actively contribute towards biodiversity conservation.

2. Reduce the direct pressures on biodiversity and promote sustainable use

<Contributions toward Aichi Targets 5-10 that make up Strategic Goal B>

Among the key threats to Israel's biodiversity are overexploitation, pollution and habitat alteration and fragmentation. Agricultural, forestry, and aquaculture practices can contribute substantially to all of these major threats if they are not carefully regulated and managed.

2.1. Agriculture

An extensive range of activities are a part of the national agricultural practices that support Israel's biodiversity. These include: [22]

2.1.1. Water Conservation and Innovative Sources

- International state of the art leadership in water conservation practices (including computerized drip irrigation directly to plant root systems, and the use of crops that require less water or can tolerate slightly saline water.
- Nationwide use of treated domestic wastewater for irrigation (comprising approximately 40% of all irrigation needs in Israel)
- Nationwide use of brackish water resources for irrigation (comprising approximately 15% of all irrigation needs in Israel)

2.1.2. Environmental Sustainability, Responsibility, and Conservation

- Conservation of biodiversity and agro-biodiversity through the gene bank activities
- The reform of the livestock sector, and integrated pest management (IPM) programs have reduced environmental pressures from excess applications of nutrients and pesticides. Considerable attention has been given to biological pest management, for example in a project that uses barn owls and kestrels as biological pest control agents. [12]
- The MoEP is involved in several agro-environmental schemes aimed at providing farmers with incentives to deliver


Photo: A.Gotlieb

biodiversity-related ecosystem services:

- MoAG has initiated a two-year pilot project under way that pays farmers through an auction system to maintain farmland for biodiversity conservation .
- A similar scheme related to grazing is mainly implemented in areas for which there is no alternative agricultural use. From 2004, this scheme provides a per-hectare grazing payment, taking into account livestock density relative to land vegetation cover, with the regions of Israel divided into four categories according to pasture richness. Herd owners must follow appropriate production practices and environmental criteria. Preliminary research suggests that such managed grazing regimes have helped support floral diversity. [12]
- Logistic and financial support is provided to farming communities for region-wide innovative farming practices that support ecosystem and biodiversity conservation (see Case Study below).
- There are programs supporting farmers who have suffered losses of yields in fish ponds due to fishing by migratory birds. Agriculture is also subject to other forms of damage and losses from wildlife, such as damage to irrigation equipment by mammals and birds and losses to field crops and orchards due to small rodents and birds. In addition to support for some losses, farm advisory, bio-control, IPM and other approaches are used to address these wildlife-agriculture conflicts.

2.1.3. Upcoming Plans

MoAG is preparing a strategic plan for sustainable agricultural development in which special attention is given to actively engaging in the conservation of Israel's biodiversity. The plan includes economic incentives to use of agricultural practices that conserve biodiversity. The plan's targets include the promotion of agro-ecological programs through: [22]


Photo: A.Gotlieb

- Regional agricultural planning
- Decreased pesticide use
- Protection of wildlife from invasive species
- Promotion of agro-tourism practices, based largely on local biodiversity
- Promotion of organic agriculture and sustainable resource use

2.2. Fishing, Mariculture and Aquaculture


Photo: Ilan Malester

The bulk of Israel's fish production comes from aquaculture and mariculture. Changes and innovations in the private sector aim at minimizing environmental disturbances of aquaculture and mariculture practices.

Achievements include:

- In 2008, all of the mariculture facilities in the Red Sea (in the Gulf of Eilat) were closed and completely removed as a precautionary measure to protect the nearby coral reef ecosystem that has suffered extensive decline in size and diversity over the past decades.
- Currently, a new legislation is being promoted by the MoEP and the MoAG, in collaboration with the Water Authority and several NGOs to improve water quality flowing out of aquaculture systems and into local streams .
- Attempts are made in the private sector to develop fish farms that minimize overall water use and minimize nutrient or chemical contamination of the natural aquatic systems, with some promising recent progress. [23, 24]
- In the area of fisheries, Israel's marine fish catch comes principally from the Mediterranean Sea. Fishing is overseen by MoAG. Total production from the marine environment is small and steadily declining, partly due to the relative impoverishment of fish stocks in the eastern Mediterranean. In 2000, MoAG concluded that the capture fishing industry in the Mediterranean had reached exploitation limits for most species. Some important initiatives have been taken to protect marine organisms. They include: [12]

    - ❖ A cap on the size of the fishing fleets
    - ❖ Mesh size restrictions
    - ❖ Gear modifications
    - ❖ Prohibition of scuba diving in some areas
    - ❖ Relocation of inshore fishing efforts to deep sea areas
    - ❖ Seasonal fishing restrictions or temporary outright fishing bans (e.g. a ban on fishing in Lake Kinneret in the period 2010-12(
    - ❖ Doubling the minimum depth allowed for fishing with trawlers
    - ❖ Online monitoring of trawlers

However, the implementation of these policy measures is still insufficient in practice, and requires more stringent adherence. Several governmental and non-governmental bodies are currently trying to find new ways to improve the situation.

2.3. Forestry and Afforestation

Israel is one of the few countries in the world that has more trees today than it did 100 years ago.

- In total, between 1990 and 2010 Israel gained 16.7% of its forest cover or around 22,000 ha. This is due to its renowned afforestation program. Israel's forests host several terrestrial endemic species, and they contain 5 million metric tons of carbon in living forest biomass.


Photo: A.Gotlieb

- The 1926 Forestry Ordinance remains the basis for current formal afforestation policy in Israel. Although the act is still in force, afforestation policy is largely implemented under the guidelines included in the 1995 National Master Plan for Forests and Afforestation (#22), under which about 1,620 km2 of forest and open spaces is protected .
- Forest management in Israel is carried out by the Jewish National Fund (JNF) that currently manages about 1,000 km2, largely in areas with a semi-arid climate and rocky, hilly terrain.
- Afforested areas are used for tourism, pastureland and wood supply, and other general ecosystem services, as well as contributing to the water budget and stream restoration .
- Early afforestation efforts in Israel have been criticized for not creating functional ecosystems that support endemic species and conserve biodiversity. Israel's afforestation program has gradually changed its orientation towards increased consideration of biodiversity in the following ways:
    - ❖ In the past decade there has been a shift in the direction of ecologically oriented forest management, with a growing emphasis on fostering woodland biodiversity. Conifer-dominated forestry has changed to mixed woodland management, allowing the

regeneration of wild tree and shrub species, their penetration into carefully managed areas, and increasing biodiversity in these areas .

- Approximately 55% of afforestation areas are to remain as open space, with natural woodlands contributing to soil fertility and in many cases serving as sanctuaries for protected wildlife.

Case Study: Whole Communities Move to Ecologically-Friendly Agricultural Practices

In 2011 MoAG, with the assistance of NPA, launched an innovative five-year pilot project that is designed to financially and logistically support region-wide environmentally-friendly (rather than farmer-specific) agricultural practices. The goal of this project is to encourage environmentally-friendly agricultural development among local groups of farmers as well as the whole community in which they live. These communities are encouraged to find environmentally friendly alternatives to the standard intensive monoculture systems.

It is important to involve local groups of neighboring farmers, rather than individual geographically dispersed farmers, because efforts made by individual farmers towards environmentally-friendly agricultural practices may not be effective, due to the small geographic scale of their efforts. This is a particularly common problem when neighboring farmers use less friendly practices. The new project addresses this challenge by requiring that all participants in the project be whole communities (led by a community representative) rather than individual farmers. This facilitates the creation of ecologically significant land-areas for change, while encouraging community-wide environmental awareness and pride in the local environmentally-sustainable agricultural practices.
The project is run by inviting farming community leaders from ecologically sensitive regions to submit their proposals for environmentally-friendly agricultural practices. The communities that are accepted into the program receive logistic support from municipal-scale or national-scale environmental management organizations, and financial support from MoAG. Accepted proposals include benefits such as:

- Preservation of wild spaces at the borders of farm plots that will protect particular rare and endangered plant or animal species.
- An almost complete elimination of pesticide use (higher than Organic standards in some cases)
- Preservation (by leaving a strip of uncultivated land) of stream banks, and banks of ponds and other water bodies.
- Tree-planting in uncultivated strips of land (to encourage wildlife, reduce the need for irrigation, and reduce soil erosion).
- Allocation of abandoned fields that have geographical connectivity, to serve as wildlife corridors.
- Protection of ecologically sensitive areas by setting aside ecological corridors at the borders between farm-plots.

The next step for the immediate future is to monitor the effects of each of these special community-endeavors, to determine the extent of benefits in each case prior to, and throughout the period of change. Success will promote an expansion of the project to additional participating communities.

3. To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

<Contributions toward Aichi Targets 11-13 that make up Strategic Goal C>


Photo: Hillel Glazman

The first nature reserve in Israel was established in 1964 on 320 hectares of wetland. Half a century later, Israel has over 300 declared nature reserves and national parks, and over 300 more in various stages of the planning and declaration process.

The parks and reserves are highly valued and frequently visited by Israelis and international visitors. They promote nature conservation while improving education and providing the public with cultural and spiritual services.

3.1. Safeguarding Ecosystems

- Israel has already exceeded the target value of conserved land area. Currently, the collective size of Israel's parks and nature reserves covers approximately 21% of the State's total area, and the number and size of areas set aside for nature in Israel keep growing.
- The representation of Israel's diversity of habitats and ecosystems in declared parks and nature reserves is expanding.
- Israel's Mediterranean coastal and marine ecosystems have been neglected for years, with only 7 small nature reserves declared to date. However, a new (2011) NPA policy plan is promoting the declaration of 7 nature reserves and 5 parks to include a variety of habitats, some stretching from the coastline to the edge of the Israeli Territorial waters. These suggested protected areas cover ~20% of Israel's aquatic area in the Mediterranean.

3.2. Reducing Fragmentation

- NPA introduced the concept of Ecological Corridors in Israel over a decade ago, and ever since then, they are working to spread awareness and ensure the protection of corridors in critical locations nationwide with the support of the MoEP.

- Guidelines for Overpasses and Underpasses Have Been Created by the NPA, the MoEP, and the Israel National Road Company, and there is frequent use in new wildlife overpasses.
- National Planning - Israel's national overarching Master Plan (#35) document for all upcoming development nationwide includes the need to preserve the remaining undeveloped areas in Israel wherever possible, and to maintain connectivity among these areas. Although the sizes, locations, and quality of the areas are not explicitly defined, this is the first step towards a national policy on preservation of ecological corridors.
- Municipalities Show Leadership in Planning Ecological Corridors in collaboration with different organizations. Some municipalities, including Jerusalem, Sha'ar Hanegev, Hof Ashkelon and others, have explicitly allocated space for ecological corridors (with explicit restrictions regarding permitted activities) in their municipal development plans. [25, 26]

Monitoring programs that are conducted at each of these locations have shown heavy usage of these overpasses by wildlife. Photos: Dotan Rotem, NPA

Ecological Corridors

Fragmentation of natural habitats (due to expanding human development) is a major threat to biodiversity.[27] One of the most important methods of counteracting this fragmentation process is to ensure that pathways (ecological corridors) exist that facilitate the movement of organisms among the nature reserves, parks, and remaining open landscape.[26] The Convention on Biological Diversity's (CBD) Program calls for the integration of protected areas into the wider landscape by taking into account ecological connectivity.[27] Thus, it is essential to create and preserve ecological corridors: large, continuous, carefully designed spaces, connecting protected areas, for the movement of plants, animals, and ecological processes.

In order for these corridors to effectively create 'bridges' between wild spaces, they must be sufficiently secluded from human disturbances, and must be of a sufficient width and environmental quality.

Ecological corridors may in some cases include agricultural areas, or areas for recreation. Ecological corridors also include overpasses and underpasses for wildlife to cross man-made barriers, such as transportation routes (e.g.: large highways; see photo below).

Courtesy: Dotan Rotem, NPA

In the figure above, the red arrows indicate a crucial area requiring the preservation of an ecological corridor between two nature reserves (dark green). An overpass is recommended to cross the man-made barrier created by a main road (yellow dot).

Orange regions indicate JNF Forests, and light green areas indicate existing areas that as yet, meet the quality-requirements for ecological corridors.

3.3. Addressing Threatened Species


Photo: A.Gotlieb

There are many projects that involve collaboration between NPA, different ministries and several governmental and non-governmental organizations including universities, zoos, botanical gardens, the National Gene Bank, SPNI and others. These include:

- Maintaining a reproductive nucleus for a wide range of threatened animal species in NPA facilities, such as Hai Bar Carmel, in zoos and in the wild. These species include birds such as Gryphon vultures, mammals such as Arabian oryx and Otters, fish such as *Nemacheilus dori,* the endemic shrimp species *Typhlocaris galilee* and others.
- Acclimating and releasing animals in suitable habitats.
- Monitoring released individuals and their populations in the wild over time, as well as other species for which there are no reintroduction programs.
- Safekeeping and restoring threatened species' natural habitat (for both plant and animal species).
- Collecting seeds of threatened plant species for safekeeping in the National Gene Bank.
- Reproducing threatened plant species in special areas in nature reserves, national parks and botanical gardens.
- Relocating threatened plant species from areas undergoing development to suitable protected areas.
- Reintroducing threatened plant species into restored habitats.


Photo: A.Gotlieb

3.4. Planning and Management

- The Comprehensive National Master Plan for Building, Development and Conservation is an overarching outline plan affecting biodiversity conservation. It establishes guidelines for the development of conservation worthy areas, including coastal areas. It also gives protection to landscape ensembles and to coastal, river and landscape strips. [12]

- Key sector-specific national plans that contribute to protecting Israel's biodiversity include: the National Master Plan for National Parks, Nature Reserves and Landscape Reserves; the National Master Plan for Forests and Aforestation; the National Master Plan for Coastal Areas; and the National Master Plan for Rivers and Drainage. [12]
- Recently updated guidelines for landscape and environmental planning, published by the Israeli National Road Company, are aimed at addressing fragmentation and barriers caused by infrastructure and development.
- The classification of Israel's landscapes according to sensitivity and value criteria include vulnerability, continuity and functionality and are also based on surveys aimed at identifying landscapes in need of protection.
- Israel now requires environmental impact assessments (EIAs) to be carried out for all major development projects and investments, with the explicit requirement to account for the impact of development plans on biodiversity. Current regulations require EIAs for proposed development in environmentally sensitive areas such as coasts, riverbanks and stream corridors. Most EIAs consider species and habitat diversity, endangered species, and connectivity issues (i.e. with regard to ecological corridors).
- Government, NGOs and local communities are involved in the creation and subsequent management of Israel's UNESCO Biosphere Regions. Two regions have been declared and others are in planning stages (See details in "A Focus on Biosphere Reserves" below). A national plan for locating suitable areas for biosphere regions is currently prepared. Among the major goals of this plan is the conservation of biodiversity and agro-biodiversity, with emphasis on traditional agricultural and pastoral practices, ecosystem conservation, increasing local biodiversity and agro-biodiversity
- Urban nature conservation has been given greater attention in the last few years. It is being embedded in several regional and local plans, with a growing degree of supporting surveys and public involvement. [22]


Photo: A.Gotlieb

A Focus on Biosphere Reserves

Biosphere reserves are national sites that are recognized under UNESCO's Man and Biosphere (MAB) Program to promote sustainable development based on local community efforts and sound science. These are considered to be sites of excellence, where new and optimal practices to manage nature and human activities are tested and demonstrated. They are areas that are set aside (under international accountability) for testing and demonstrating innovative approaches to sustainable development from local to international scales. [28]

Biosphere Reserves provide protection beyond that given by nationally protected areas, and promote sustainable development based on local community efforts and sound science.

Government, NGOs and local communities have succeeded in attaining recognition by UNESCO for two biosphere reserves in Israel: The Mount Carmel Biosphere Reserve, and the Ramat Menashe Biosphere Reserve. The Ramat Menashe Biosphere Reserve is very successful at achieving its goals, while the Mount Carmel one requires more efforts to improve its function.

A national plan for locating suitable areas for biosphere regions is currently prepared. Future goals are to declare additional biosphere reserves, such as Mount Meron in northern Israel, and the Judean Mountains area which is a transition zone between the Mediterranean Sea and the desert ecosystem to the east (currently in the planning stages).


Photo: A.Gotlieb

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Photo: A.Gotlieb

(2012) report finds water levels of both Sea of Galilee and major aquifers improved in comparison to previous years due to addition of new desalination plants.

- Afforestation efforts in Israel, led by JNF, contribute to efforts to mitigate climate change.
- The JNF is examining ways to plant trees that are resistant to dry conditions and to introduce genetic strains of plant species that can cope with higher temperatures and water stress. Such actions could help respond to the potential northward expansion of the desert. [22]

5. Enhance implementation through participatory planning, knowledge management and capacity building

<Contributions toward Aichi Targets 17-20 that make up Strategic Goal E>

5.1. National Biodiversity Strategy and Action Plan

Israel published its National Biodiversity Strategic Plan in 2010 and the MoEP is planning an updated action plan that involving the different ministries, governmental bodies and nongovernmental organizations.

5.2. Monitoring, Reporting and Research


Photo: A.Gotlieb

Israel has made significant progress during the last two decades in establishing monitoring mechanisms, as well as information tools and mechanisms. It has set up more narrowly focused monitoring systems and developed more integrated and overarching biodiversity monitoring mechanisms. [12]

- Hamaarag is a consortium of organizations including the MoEP, the NPA, JNF and universities, which is operating within the framework of the Israel Academy of Sciences and Humanities. It is engaged in scientific study, management and policymaking relating to natural and semi-natural ecosystems. Its mission is to support evidence-based open landscape management utilizing the tools of monitoring, long term ecological research and ecosystem assessment. This overarching mission is being achieved by:
    - ❖ Development and implementation of National Biodiversity Monitoring Program
    - ❖ Upgrading and expanding the Israel LTER (long term ecological research) site network

- ❖ Development and implementation of a National Ecosystem Services Program
- ❖ Integration and communication of results, analyses and conclusions, via the State of Nature Report, the official website and other activities to managers, policymakers and the public.

The first State of Nature Report was published in 2010. Several research activities have been promoted at permanent LTER sites throughout Israel. The terrestrial biodiversity monitoring program is already formulated and finalized, and is about to be executed. A marine, coastal and wetlands biodiversity monitoring program is the next step.

- The MoEP has produced an online system of open landscapes sensitivity maps that classify and characterize open landscapes according to sensitivity and value criteria. The criteria include vulnerability, continuity and functionality.
- During the last few years, Israel has also participated in several important EU-led multinational projects for mapping and monitoring habitats, such as the EBONE project, whose main objective is to establish a pan-European biodiversity monitoring mechanism.
- The Hebrew University of Jerusalem (HUJI), in collaboration with the MoEP and the NPA, is developing BioGIS, a spatially referenced, comprehensive, internet-based biodiversity information system for Israel's fauna and flora.
- Numerous research studies have been conducted on the benefits of ecosystem services in Israel, especially in the areas of countryside recreation, valuation of landscapes and charismatic species, and the valuation of irreparable damage to biodiversity.
- Biodiversity related research is conducted in all Israeli universities, with some funding from the MoEP, the MoAG, the Ministry of Science, the NPA, and several private foundations.


Photo: A.Gotlieb

- The Red Book of vertebrates and the Red Books of Plants have been published, portraying the status of threatened plant and animal species in Israel. The Black Book of invasive plant species has been published as well, with implications on measures taken to address them.

6. General Focus Areas for Improvement [12]

Recommendations Made by the OECD in the Environmental Performance Review of Israel

Photos: A.Gotlieb

- Ensure that national biodiversity assessments comprehensively cover all of Israel's ecosystems
- Develop predictions regarding how the main pressures on biodiversity are likely to evolve, and identify the most effective mitigation by alternative policies.
- Establish measurable biodiversity conservation targets.
- Organize the national biodiversity monitoring system to measure progress in achieving these targets and to support future policy development.
- Further strengthen and broaden biodiversity conservation in and around nature reserves, e.g. by establishing buffer zones, ecological corridors and biosphere reserves.
- Identify specific measures to reduce the introduction of invasive alien species from all sources.
- Expand the use of market-based methods of protecting biodiversity. Possible methods include fees, charges, and payments for ecosystem services in key economic sectors, such as housing, infrastructure development, agriculture, fishing and forestry.
- Examine ways to create new market opportunities to further involve the private sector in biodiversity protection, e.g. in the tourism sector.
- Assess how trade-offs between biodiversity and other key policy areas, notably climate change, should be addressed in implementing the National Biodiversity Strategy and the national plan for adaptation to climate change.

Reference List

1. http://old.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Zone&enDispWho=infor_edu&enZone=infor_edu
2. http://old.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Zone&enDispWho=green_campaign&enZone=green_campaign
3. http://english.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Object&enDispWho=News^l5966&enZone=e_news
4. http://old.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Zone&enDispWho=eve_edu&enZone=eve_edu
5. http://www.parks.org.il/Pages/default.aspx
6. http://www.teva.org.il/english/featuredfieldschool
7. http://www.teva.org.il/english/education
8. http://english.tau.ac.il/campus/ecological_campus
9. http://english.tau.ac.il/campus/steinhardt_building
10. http://www.science.co.il/zoos.asp
11. http://www.jpost.com/Opinion/Editorials/Article.aspx?id=283475
12. OECD. 2011. Biodiversity Conservation and Sustainable Use, Environmental Performance Reviews: Israel, pp. 125-147
13. http://www.earthweb.tau.ac.il/?cmd=educators.182
14. http://english.tau.ac.il/campus/ecological_campus
15. http://old.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Object&enDispWho=Articals^l3332&enZone=Green_Educ
16. http://old.sviva.gov.il/Enviroment/Static/Binaries/Articals/30-31_1.pdf
17. http://old.sviva.gov.il/bin/en.jsp?enPage=BlankPage&enDisplay=view&enDispWhat=Zone&enDispWho=rekaa_klalii&enZone=rekaa_klalii
18. http://www.teva.org.il/english/featuredfieldschool
19. http://www.teva.org.il/english/education
20. http://www.moag.gov.il/agri/English/
21. http://biodiversity-group.huji.ac.il/SalitKark/sciencebasedconservationworkshopSPNI.html
22. Ministry of Environmental Protection. The State of Israel. 2009. Fourth Country Report to the United Nations Convention on Biological Diversity
23. http://www.globes.co.il/serveen/globes/docview.asp?did=1000596304&fid=1725
24. http://ccresaquaponics.wordpress.com/tag/grow-fish-anywhere/
25. http://www.haaretz.com/print-edition/news/recognition-growing-for-eco-corridors-1.268529
26. http://old.sviva.gov.il/bin/en.jsp?enPage=e_BlankPage&enDisplay=view&enDispWhat=Zone&enDispWho=corridors&enZone=corridors
27. http://www.unep-wcmc.org/ecological-corridors_402.html
28. http://www.unesco.org/new/en/natural-sciences/environment/ecological-sciences/biosphere-reserves/
29. http://www.haaretz.com/news/national/kishon-river-clean-up-to-begin-12-years-after-navy-divers-contracted-cancer-1.464128
30. http://old.sviva.gov.il/Enviroment/Static/Binaries/index_pirsumim/p0618_1.pdf

WWW.SVIVA.GOV.IL