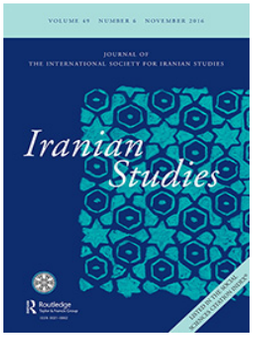

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Houman Jowkar, Stéphane Ostrowski, Morad Tahbaz and Peter Zahler

The Conservation of Biodiversity in Iran: Threats, Challenges and Hopes

Because of its diverse geological formations, climates, and soils, Iran is home to outstanding biodiversity. National conservation started in Iran over fifty years ago and today nearly 10 percent of the country is protected. However, biodiversity in Iran is threatened, with about 100 species of vertebrate fauna vulnerable or endangered. Increased population and human activity, climate change, drought, desertification, agriculture, poaching, and economic sanctions have helped create this crisis. Many of these causes can be mitigated through better planning, sustainable policies, and increased civil society and local engagement. Promoting awareness about the impacts of human practices will also be important for the long-term sustainability of Iran's ecosystems. Iranian conservation NGOs have already taken an active role in preserving biodiversity.

Why Biodiversity?

For a long time biodiversity was thought to possess unquestionable intrinsic scientific value but only marginal relevance for the development of human societies. This misunderstanding has contributed and continues to contribute to the rapid and irreversible loss of biodiversity around the world. We now know that biodiversity is crucial to the healthy development of any society.[1] In addition to its aesthetic value and role in cultural heritage, biodiversity offers direct-use values to human societies and supports human life more generally. Direct-use contributions, like the use of natural products for pharmaceutical development, or natural resource extraction through fisheries and the timber industry, are among the most obviously important roles that biodiversity plays.

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In Iran the Wildlife Conservation Society has been working as an advisory organization to the Asiatic Cheetah Conservation Project since 2000. This commitment would not have been possible without the sustained and welcoming support of the Department of Environment of the Islamic Republic of Iran and administrative authorizations from the Office of Foreign Assets Control of the Department of the Treasury of the United States of America. At the United Nations Development Program, country resident representatives and Mr. Mehdi Kamyab have been dedicated and efficient promoters of this collaboration since the beginning of the project. Finally, WCS work in Iran would not be possible without the sustained and generous support of the Flora Family Foundation and Dr. Amir Farman-Farma. This paper is dedicated to Mr. Eskandar Firouz.

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Biodiversity, by supporting their stability, functionality, and sustainability, is also responsible for the health of ecosystems.[2] These healthy ecosystems can in turn deliver a wide range of balanced services crucial to humanity, including the primary conversion of sunlight to energy, recycling of organic waste, protection of water quality, moderation of climate extremes and flood effects, mitigation of the effects of pollutants, pollination of crops, and improved human and animal health.[3] Biodiversity has also been shown to positively affect human health, improving immunoregulatory capabilities through exposure to a diversity of antigens and supporting the health and diversity of humans' microbiota.[4]

The Unique and Outstanding Biodiversity of Iran

Iran is the seventeenth largest country in the world. With a terrestrial surface area of 1,648,195 km^2, the country covers an area equivalent to the combined surface areas of France, Germany, Spain, and the United Kingdom. It is a land of diverse geological formations, climates, and soils, and it is home to ancient civilizations, as well as being the origin of many agricultural genetic resources.[5]

From a biodiversity perspective, the country is located in the Palearctic realm at the crossroads of four biogeographical regions: the Euro-Siberian, the Irano-Touranian, the Nubo-Sindian, and the Saharo-Arabian regions.[6] The variety of landscapes resulting both from this unique intersection of biogeographies and from the physical and evolutionary processes operating across ecosystems and organisms has produced a diverse selection of flora and fauna, including approximately 6,500 vascular plant species and more than 1,000 species of mainland vertebrates.[7] The north and west of the country, with many unique indigenous species of plants and vertebrates, are part of the Irano-Anatolian Biodiversity Hotspot, one of only thirty-five such areas recognized on earth.[8] Compared to a similarly sized region of Europe, Iran hosts 50 percent more endemic species of vascular plants and vertebrates than France, Germany, Spain, and the United Kingdom combined. Moreover, recent molecular biology investigations have revealed that the biodiversity of Iran has likely been significantly underestimated.[9]

Recently, in an attempt to create new tools that will enable governments to craft better environmental policy, the World Bank, through the Global Environment Facility (GEF) has promoted a new indicator to better gauge the potential of each country to generate global environmental benefits in a particular focal area.[10] Under this scheme Iran had the highest GEF benefit index for biodiversity across western Asia and the Middle East. From a regional perspective this relatively high index supports the idea that a conserved biodiversity could have a higher positive economic impact in Iran compared to other countries in the region. An increased self-interest in biological resources should support economic and social benefits for the country.

History of Biodiversity Protection in Iran

The Game Council of Iran was established in the 1950s in order to protect the country's wildlife. In 1956 the first Conservation Act was passed and in 1967 the Game

Council became the Fish and Game Department of Iran, tasked with protecting newly established wildlife parks and protected areas. In 1972 the Fish and Game Department was restructured into the Department of Environment (DoE).[11] Today, the biodiversity heritage of Iran is largely under the custody of the DoE, which manages more than 250 protected areas, encompassing nearly 150,000 km^2 or about 10 percent of the national land surface as of 2014.[12] The DoE was the principal architect of conservation, environmental legislation, and implementation in Iran at the time of the revolution (1978-79), setting a world standard for conservation and land protection. By the 1970s, just twenty years after the creation of the Game Council of Iran, the country had already classified nearly 70 percent of currently protected land.[13] In 1975, with national parks—the highest level of protection—covering 0.66 percent of its land mass, Iran was approaching the level of the USA (0.77 percent of land mass in national parks) and was recognized as a world leader in national park protection efforts. Unfortunately this trend has suffered significant setbacks over the last forty years.[14] During the fifteen years immediately following the revolution, land protection was neglected in favor of other political priorities, including the devastating war with Iraq. Land users, especially farmers, also began invading protected areas, which were regarded as part of an illegitimate land confiscation process implemented by the previous regime.[15] Following the reemergence of environmental protection as a political priority in the mid-1990s, the country ratified the Convention on Biological Diversity (CBD) in 1996 and new protected areas were created, indicating an increased effort by the government to protect land with a view toward achieving the long-term conservation of biodiversity.[16] The DoE was re-empowered to implement protection schemes. However, since the mid-2000s environmental protection has again suffered from a lack of political interest, this time as the government has struggled to meet the expanding economic requirements of a population exceeding 70 million people.

Since 2013 the new leadership of the DoE has reiterated the need to revive Iran's biodiversity conservation through additional protection efforts. While this statement of interest raises hopes for the future, the challenges remain enormous. Although Iran's coverage of protected areas is significant (around 10 percent), it is still below the world average of 15.5 percent and short of the Aichi targets adopted by the UN Convention on Biological Diversity to protect 17 percent of the world's terrestrial and inland water areas by 2020.

Threats to Biodiversity in Iran

Biodiversity in Iran is under serious threat. By the early 1960s large, emblematic carnivore species like the Caspian tiger (*Panthera tigris virgata*) and the Asiatic lion (*Panthera leo persica*) had already been hunted into extinction.[17] The Asiatic cheetah (*Acinonyx jubatus venaticus*), one of just two large cat species remaining in Iran along with the Persian leopard (*Panthera pardus saxicolor*), is considered critically endangered according to the globally recognized Red List of Threatened Species, admi-

nistered by the International Union for the Conservation of Nature (IUCN).[18] It has lost almost its entire historic habitat in the Middle East, Central Asia, and South Asia, persisting only as a small and fragmented population of 40-70 individuals in Iran, mainly in the Dasht-e Kavir central desert region.[19] More generally, according to the IUCN Red List, about one hundred species of vertebrate fauna in Iran are considered vulnerable or already endangered.

Recent biodiversity loss in Iran is largely related to tremendous human population growth, and to the resulting increase in human activities. Over the past fifty years the population of Iran has tripled from about 25 million in 1965 to 76-78 million in 2013. The urbanization associated with this population growth has meant an increase in the number of cities in Iran from 373 in 1976 to more than 1,000 in 2008, including seventy-six cities with more than 100,000 inhabitants, and, as of 2013, eight cities exceeding 1 million inhabitants. Anthropogenic water and air pollution has also multiplied in proportion to this population increase, affecting the integrity of natural ecosystems. Moreover, it was estimated in 2008 that nearly 30,000 tons of trash were produced every day in Iran, with approximately 84 percent sent to landfills, 10 percent disposed of through composting, and only 6 percent recycled.[20]

Wildlife has paid a heavy price for this human population explosion. The expansion of the road system between fast-growing urban centers has caused significant numbers of animal deaths. A study on road kills over a 55-km stretch of the "Asian Road" passing through Golestan National Park documented that between 2005 and 2010, at least 331 wild boars (*Sus scrofa*), seven brown bears (*Ursus arctos*), three Persian leopards, and many other mammal species suffered casualties.[21] Automobile accidents are a major cause of death for the critically endangered Asiatic cheetah.[22] This road system as well as an expanding railway network threaten to fragment landscapes and impede the movement of animals, especially larger ungulates for which movement is critical to finding food and water in this arid region.[23]

Outside urban areas, biodiversity has also suffered from increased desertification and the erosion of rangelands. Iran is particularly vulnerable to these processes as about 80 percent of the country is characterized as arid or semi-arid. The annual rate of soil erosion in the country stands at 25 tons per hectare, or 4.3 times more than the mean annual soil erosion rate in the world, resulting in more frequent sand storms and larger areas of low productivity.[24] Immediate causes of this land erosion and aridification include overgrazing of marginal rangelands, over-plowing of marginal farmlands, over- and mis-utilization of water resources, fuel wood gathering, and now the growing specter of climate change.[25]

Recent studies using precipitation and temperature results collected by synoptic meteorological stations across Iran have shown that the western, northeastern, and to a lesser extent central parts of the country, including West Azerbaijan, Kurdistan, North Khorasan, Razavi Khorasan, and Yazd provinces, experienced significant climatic aridification between 1976 and 2005.[26] According to the predictions of the Intergovernmental Panel on Climate Change for 2100, based on the assumption of continued rising greenhouse gas emissions throughout the twenty-first century, Iran

could be exposed to temperature increases up to 1.5-4.5°C in the worst case scenario.[27] Along with this temperature increase, the panel predicts that much of Iran will experience significant aridification in the next 30 years. The Zagros Mountain Range, which represents the heart of the Irano-Anatolian Biodiversity Hotspot, is particularly vulnerable.

Overgrazing, particularly of marginal arid rangelands where fragile assemblages of plant and animal communities thrive, represents a considerable threat to the maintenance of a functional food chain within these ecosystems. As of 2008, Iran had the fifth largest sheep population in the world, with about 52 million animals.[28] The country had the highest average density of domestic sheep of any arid rangeland country in the world, ahead of Sudan and Australia. The sheep and goat population of Iran has doubled in the last forty years, and when accounting for all species, the country supports a livestock population of almost 124 million.[29] At the national level, stocking rates are believed to be more than double the sustainable carrying capacity of the country's rangeland, and in some provinces livestock populations reach as much as five times the carrying capacity.[30] Protected areas located in arid and sub-arid rangelands are at particular risk from livestock overgrazing, which can substantially negatively affect these fragile ecosystems. As a simple example of how overstocking may initiate a cascade of interrelated effects at different levels of an ecosystem food chain, depleted plant resources due to livestock overgrazing may expose wild herbivores to malnutrition and push them to migrate; this in turn may expose their predators to starvation, which could then lead to increased human-carnivore conflict, and the retaliatory killing of carnivores over livestock losses.

In recent years, the increased market demand for meat has created tremendous incentives to maximize profits, which has the potential to damage a long track record of sustainable livestock management in rural areas of Iran. For example, in the Zagros region, where more than half of Iran's livestock population lives, it is debatable whether indigenous communities can still meaningfully apply their ancestral knowledge of sustainable grazing practices in the context of an increased demand for livestock products combined with a fast-developing market economy. Maximizing livestock production in this fragile landscape threatens an invaluable biodiversity hotspot and destroys the crucial services biodiversity has been providing to local societies for thousands of years.

Agriculture is another important economic sector which supports both the food requirements of the growing Iranian population and substantial employment. However, the agricultural sector is responsible for significant land erosion through overgrazing, over-plowing of marginal lands, and adverse effects on water resources. Agriculture represents more than 90 percent of the water usage in Iran, but more than 60 percent of that water is lost before reaching the farms due to inadequate water delivery systems and the multiplication of irrigation networks resulting from the high level of farmland fragmentation.[31] The agricultural sector is of considerable importance to the country, and the kinds of country-scale technical and managerial improvements that would target sustainability in land and resource use and minimize

agricultural impacts on the environment and biodiversity would also have significant positive implications for agriculture and farmers.

Poaching, as well as the illegal capture and occasional poisoning of animal species inside and outside protected areas, poses a very significant threat to protected areas and the most emblematic, iconic, and economically significant Iranian wildlife species.[32] Wild sheep (*Ovis orientalis*), wild goats (*Capra aegagrus*), gazelles (*Gazella* sp.), and wild asses (*Epuus hemionus*) are killed both for meat and for sport. Striped hyenas (*Hyaena hyaena*), wolves (*Canis lupus*), and large cats are killed in retaliation for livestock predation, and brown bears (*Ursus arctos*), and Asiatic black bears (*Ursus thibetanus gedrosianus*) for beehives and orchard destruction and sometimes out of fear or ignorance when encountered, as well as for furs. Houbara bustards (*Chlamydotis undulata macqueenii*) and saker falcons (*Falco cherrug*) are actively trapped to be sold to falconers from the Arab States of the Persian Gulf.[33] Scientists tagging houbara bustards with satellite transmitters in their breeding grounds to the northeast of Iran tend to "lose" these animals soon after they migrate into their wintering grounds in Iran.[34]

Captive-breeding centers for houbara bustards and falcons have been erected in Iran and across western and central Asia, with the goal of providing large stocks of birds to foreign hunters in order to reduce the harvest pressure on wild populations. However, the net conservation benefit of these initiatives has never been independently or transparently evaluated. According to reports from game guards, chronic poaching is present throughout the year and across the country, while bird captures for falconry occur most often in the autumn in northeastern and central Iran. Although few statistics on the magnitude of these threats are available, a number of interesting indicators are worth emphasizing. There are about a million licensed rifles and shotguns in the country and probably an equivalent number of illegal weapons. Licensed hunters are allowed thirty bullets and 120 shotgun cartridges each year.[35] Finally, and tragically, for the last forty years an average of 2-3 DoE game guards per year have died while on duty, many of them killed by poachers.[36]

Support for Biodiversity Conservation in Iran

While many developing middle-income countries suffer from the same threats to natural ecosystems, negative effects on biodiversity may be more complicated to resolve in Iran because of the high overshooting of Iran's ecological footprint. The ecological footprint measures the supply of and demand on nature. On the supply side, biocapacity represents the biologically productive land areas. The ecological footprint of Iran in 2009 stood at a relatively modest 2.7 global hectares per capita, far lower than many high-income countries.[37] However, the overshooting, which is the per capita difference between the ecological footprint and the biocapacity of the country, and which measures the natural capital used compared to the biological capacity to produce or regenerate it, was +231 percent, far greater than in many developed countries, and the highest of all Iran's neighbors with the notable exception of

Iraq (+350 percent). While not a direct measure of population sizes of different species, the ecological footprint provides an indicator of the pressure on ecosystems and biodiversity by measuring the competing level of ecological demand that humans place upon the environment.

Some of the parameters that contribute to Iran's ecological footprint and that decrease its biocapacity, such as weather and population size, are very difficult to control. However, agricultural practices and ecosystem management—which do lie within human control—have the potential to be considerably improved and to support Iran's biocapacity. The government could conspicuously signal a willingness to commit to higher biodiversity support by resurrecting the Supreme Council of Environmental Protection, easing administrative pathways to allow for the creation of environmental nongovernmental organizations (NGOs), building awareness of the value of biodiversity through educational curricula, and developing regulations. It could also move towards the implementation of international conventions already ratified by Iran, including conventions addressing biodiversity conservation, wildlife trade control, the conservation of migratory species, and the conservation of wetlands.

The capacity of the DoE to achieve its mandate could also be enhanced through a significant increase in the manpower available to protected areas, which currently stands at fewer than one ranger per 100 km^2 of protected land.[38] In order to effectively implement its mandate, the DoE must also have the resources to increase the salaries of protected area staff, equipment and vehicles to enforce environmental regulations, and more effective monitoring and enforcement systems and practices. Low government wages for DoE staff have caused productivity declines and created incentives and opportunities for the misuse of public resources. Underpaid staff have developed a wide range of coping strategies to supplement their incomes, including the use, abuse, and even destruction of the natural resources they are mandated to protect.

The DoE, as the main governmental body in charge of biodiversity protection, should revise its management practices in protected areas in order to gain legitimacy and sustainability in its biodiversity protection mandate. Today, in an overwhelming majority of Iran's protected areas, management practices are limited to the control and enforcement of regulations in restricted areas by government staff. However, based on the premise that local populations have a greater interest in the sustainable use of natural resources around them than distant government entities, participatory management of protected areas offers an opportunity to improve the management of biodiversity in protected areas with the assistance of local people and to build in them the sense of ownership needed to improve the protection of most valuable species. Unfortunately most protected areas have not attempted to implement participatory management schemes alongside local populations. As a result, local communities largely consider DoE authority to be coercive and see protected areas as obstructing their well-being and livelihoods. At the same time, DoE authorities and personnel do not adequately appreciate the merits of working with communities. Although participatory management projects and associated income substitution strategies could be problematic in protected areas with surrounding low population densities, they could be

tested in areas with higher population densities and significant potential for tourism or sustainable hunting.

In Iran, ecosystem management remains largely under government control and only marginally involves actors from civil society. Direct civil society engagement would help move towards greater efficiency and legitimacy in biodiversity conservation. It will be particularly important to engage rural communities that already depend on the natural resources of protected areas—for example, for livestock grazing—as well as communities adjacent to protected areas which might benefit from the development of eco-tourism, both of which would enjoy immediate benefits from the services provided by the ecosystems targeted for protection. For example, potential solutions to the overstocking problem in several protected areas and other high-biodiversity areas include community-driven decisions to endorse more sustainable grazing practices on how much livestock can be grazed in each particular area, for how long, and by whom; an increased destocking effort through sales associated with alternative livelihood resources; strict enforcement of no-grazing regulations in protected areas; and restrictions imposed by the government on the use of pastures by non-residents.

In Iran, with the notable exception of a few private initiatives, nongovernmental organizations are the only groups that are creating civil society networks through collaboration with a broad constituency of local partners and stakeholders. Through this kind of network, NGOs can share information and coordinate conservation efforts with provincial DoE authorities. Because of their existing networks, NGOs must play a crucial role in ecosystem protection. The existence and active deployment of NGO resources in areas of high biodiversity will help guarantee that civil society remains aware and active in dealing with threats to their most valued ecosystems.

Iran faces an urgent need to develop both a country-scale spatial land use planning system which dedicates sufficient land to protect as much as possible of the country's unique biodiversity, and protected area management plans that include and involve local communities. Despite half a century of efforts to improve wildlife and landscape protection, Iran still lacks management plans for the majority of protected areas that would include research, education, and recreational uses in addition to protection. Such management plans would require civil society involvement or at the very least consultation. This sort of approach would help resolve conflictual relationships between local communities and the DoE, as well as helping to develop innovative and viable revenue-generating mechanisms aimed at increasing positive attitudes towards protected areas specifically and biodiversity conservation in general.

Although biodiversity in Iran suffers from numerous serious threats, and many natural ecosystems continue to be exposed to increased levels of degradation, current efforts indicate that the future of Iranian biodiversity may be a positive one. Among many factors, the projected leveling off of population growth in the foreseeable future should slow pressure on biodiversity. The population of Iran has already experienced a remarkable drop in the crude birth rate, from an average of 44 births/1,000 people in the mid-1980s to the current 17-18 births/1,000 people, which is actually lower than the world average of 20 births/1,000 people. Although more than half of the population is under thirty-five, the birth rate has remained low.[39]

This trend depends on the interaction of factors including higher education levels, economic development, urbanization, efficient family planning policies, contraception, and decreased infant mortality among others. The total fertility rate, or the average number of children born to a woman over her lifetime, has also dropped from an average of 6.5 in the mid-1980s to 1.8 in 2013, below the replacement rate. Studies project that Iran's rate of population growth will continue to slow until it stabilizes between 100 and 110 million people by 2050.[40] This period of decreased demographic growth, combined with higher levels of economic development, has often been associated in developed countries with increased public interest in environmental issues.

Education brings stability and sustainability to development efforts. By promoting increased understanding of the impact of human practices, education is the most important factor in encouraging new, balanced practices and behaviors that promote biodiversity conservation and sustainable human development. Eighty-five percent of the Iranian adult population is now literate, well ahead of the average of 62 percent in the region. As per UNESCO Institute for Statistics, this rate reaches 98 percent among young adults aged between fifteen and twenty-four, notably without any gender discrepancy.[41] The percentage of Iran's population with university degrees has increased faster than in any other Middle Eastern country, from only 0.77 percent of the adult population aged 25 or older in 1970 to 12.85 percent in 2010. As a consequence the percentage of the labor force with a university degree reached 20 percent by 2008. [42] This increased educational level will be crucial for the emergence of sound environmental approaches, first in urban areas and then throughout the country. One of Iran's biggest exports is its students. In 2012, before the currency rate crisis, there were some 90,000 Iranian college students abroad, including 7,000 in the United States.[43] Although the number of Iranian college students in the US has not regained the record high of 52,000 students it reached in 1980, the number has increased steadily since 2000.[44] As foreign studies continue to grow, Iran must also implement policies to moderate the brain drain which often accompanies foreign study, and to instead redirect this group of young trained professionals toward investing their capacities in resolving environmental problems in their homeland.

Iranians have a genuine interest in biodiversity conservation because they have a traditional and customary passion for their environment. The population has enthusiastically embraced outdoor recreation and eco-tourism. On "Sizdah Bedar," the thirteenth day of the Nowruz (Persian New Year) festival, celebrated for at least 2,500 years, Iranians worldwide go outdoors and celebrate the friendship between people and nature. This tradition shows how deeply Iranians are attached to nature and how fondly they have regarded the natural beauty of their environment throughout history. This passion for environment, wildlife, and iconic species should be nurtured as a means to expand public interest in conservation and ultimately to help build a national biodiversity conservation movement.

Biodiversity loss becomes a particularly dramatic concern when it reaches irreversible thresholds, meaning when species go extinct or become ecologically extinct, suffer-

ing such extreme losses that they cease to play their normal roles in the ecosystem. Though about 80 percent of Iran's total area is composed of arid and semi-arid ecosystems exposed to considerable deterioration through overgrazing,[45] these ecosystems are extraordinarily resilient compared to ecosystems in more humid climates. The main reason for this is that in arid ecosystems plants have evolved the capacity to withstand losses from drought above the ground while investing in long-term survival below ground. Experiments carried out in the Middle East have shown that even hyper-arid areas receiving less than 100 mm of annual precipitation can, after decades of severe overgrazing, regenerate a diverse assemblage of plant and animal life spectacularly fast when the number of livestock grazing the area is reduced below sustainable levels.[46] In Iran, millions of hectares of overgrazed arid rangelands, showing extreme degradation and biodiversity loss at surface level, retain a below-ground potential for rehabilitation.

Since the early days of biodiversity conservation, Iran has maintained good relationships with a variety of international organizations. The IUCN facilitated nature protection in Iran as early as the 1960s. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has continuously supported the nomination of Biosphere Reserves, starting forty-five years ago. The United Nations Development Program (UNDP) has been present in Iran since 1966 and through Global Environment Facility grants and core funding supports the efforts of the DoE in pivotal biodiversity conservation projects such as the Asiatic Cheetah Conservation Project and the Multi-Use Forest Management Framework for the Hyrcanian Forest Landscape. A National Action Plan for Conservation and Biodiversity was drawn up with support from UNDP/GEF as an enabling activity through the National Biodiversity Strategy and Action Plan and has been running since December 1998 with the assistance of GEF and technical support from the IUCN. The continuous presence and efforts of these organizations has helped push the government towards biodiversity conservation, foster international collaborations, and promote policy-level improvements. Despite international sanctions and isolation, it has also offered necessary platforms for environmental discussion and interaction between Iran and the rest of the world.

Conclusion

The challenges to the successful protection and management of biodiversity in Iran are numerous. Young conservationists and scholars face the daunting task of adapting the edifice of conservation initiated by their predecessors in the 1960s and early 1970s to a fast-growing population, increased human activities, and the new challenges of global threats, including air pollution, invasive species, and climate change. Although biodiversity preservation in Iran remains outstanding compared to most of its neighbors, the country's reputation will not last long if policies are not quickly and innovatively adapted to meet these emerging obstacles. Locally, there is a crucial need for the DoE to mainstream its conservation activities through the involvement of civil partners and local communities. Nationally, biodiversity protection should rely on more efficient

law enforcement structures and measures, and the DoE should be empowered to modernize biodiversity protection schemes. Efforts should gradually be made to raise the public profile of the environmental agenda, with new policies enabling the direct involvement of the Iranian people in biodiversity protection efforts. Since 2013, the new leadership of the DoE has emphasized on multiple occasions that Iranian conservation NGOs will play an essential role in implementing conservation efforts in the country, especially by strengthening the capacity of local stakeholders to participate effectively in conservation efforts. Although relatively few in number and largely centralized in Tehran, existing NGOs have already taken an active role in preserving biodiversity, and represent great hope for the future.

Biodiversity has also been indirectly threatened by the political and economic sanctions imposed on Iran until early 2016, which deprived the country of technologies that could reduce environmental damage and limit its access to innovative conservation methods and ecological education opportunities. But it is essential that the younger generations not hide behind this state of affairs to justify inaction on conservation. Instead, young environmental activists should be inspired by the efforts of a handful of dedicated government officials, NGOs, academics, environmental experts, and collaborating international organizations to improve biodiversity conservation, and should embrace their collective responsibility as custodians of a world heritage.

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