Challenges to the future development of Iran's protected areas system

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Since the1950s, there has been a continuous increase in the number and coverage of protected areas (PAs) in Iran, and in total 253 PAs have been declared that cover 10.12% of the country's area. This paper reviews literature addressing Iran's PAs, examines what is known about them, highlights the challenges and lessons learned, and identifies areas where more research is needed. The PA system in Iran is criticized because of (1) shortages of manpower, equipment, and financial resources; (2) *de jure* PAs that are often implemented as *de facto* reserves; (3) lack of national biodiversity indicators and objective monitoring processes; and (4) limited public participation and conflict between people over PAs. To improve, Iran's PAs system needs to be realistically supported by policies and planning instruments. In addition, the implementation of active management to restore habitat, increase education and awareness, shift practices towards the guidelines of international organizations, build capacity, and improve management and co-management by local communities needs to occur.

Key Words: Iran; Protected Areas; Management; Governance; Biodiversity

Introduction

Protected Areas (PAs) span the globe. A PA is defined as “a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values” (Dudley 2008). Almost all countries have set aside at least a part of their territory for the purpose of nature conservation (Nolte et al. 2010). More than 161,991 PAs have been reported (PPW 2011), and this number is still increasing.

Nature conservation is among the top priorities of most members of the international community in the 21st century. The 2002 World Summit on Sustainable Development called for a distinctive global network of PAs by 2010 (UN 2002). In 2004 the Convention on Biological Diversity (CBD) compelled member states to effectively conserve at least 10% of each ecological region by 2010 (UNEP 2004). The Fifth World Parks Congress recommended focusing on the development of a comprehensive PA system (IUCN 2005). The Nagoya summit on biodiversity in 2010 proposed an increase of PAs to at least 17% by 2020 (UNEP 2010).

The Earth's biodiversity and other natural resources provide enormous amounts of both monetary and non-monetary benefits to humankind, and PAs are the cornerstone of most national strategies to protect biodiversity and natural resources (Groombridge 1992; Howard et al. 2000; Hockings 2003; Leverington et al. 2010; Hockings et al. 2005). These sites, as obvious locations for conserving biodiversity (Braatz 1992), host

key habitats for an array of species and associated ecosystems and play a key role in the sustainable utilization and attainment of natural resources.

PAs have significantly lower rates of clearing, as compared to areas outside their boundaries and as compared to before their designation, even in weak institutional settings (Nagendra 2008; Leverington et al. 2010; Chomitz 2007). Nonetheless, there is growing evidence of critical breakdowns in many PAs systems and global biodiversity, especially in African and Asian regions (Nagendra 2008; Leverington et al. 2010; Stolton and Dudley 1999; Hockings et al. 2002; Dudley et al. 2004; Fischer 2008; Butchart et al. 2010; UN 2011). Accordingly, many PAs are presently being degraded and destroyed (Liu et al. 2001; Hockings 2003; Dudley et al. 2004). Overpopulation and overconsumption, socioeconomic problems and policy failures, weak government structure, policy, and legislation, low morale, and inadequate funds are underlying causes of biodiversity loss (Eldredge 2002; Braatz 1992). Habitat loss and fragmentation, invasive species, overexploitation, pollution, and global climate change are direct causes of biodiversity loss (Eldredge 2002).

In most developing countries, PAs are under pressure from anthropogenic activities and lack proper management and maintenance. In many cases, poaching and biodiversity loss continue; forests are harvested and clear-cut, air is polluted, soils are eroded, watersheds are degraded, more and more fertile land is lost to desertification, and vital ecosystem processes are disturbed (Bennett 1998, 2003; UN 2002).

The establishment of PAs is perhaps the longest-standing, most widely practiced, and best-funded approach to maintaining environmental services (Chomitz 2007; Yakhkashi 2002). Their establishment has sometimes involved displacement of, and loss of assets by, indigenous people (Ghimire and Pimbert 1997; Geisler and Sousa 2001; Smardona and Faust 2006). People depend on PAs. The effects of PAs on the livelihoods of local people are poorly documented, but they are often negative when people are excluded from PAs that they formerly relied on for natural products (Chomitz 2007). Conflicts between management of PAs and local communities are increasing in many countries (Munasinghe and McNeely 1994). Nowadays, indigenous peoples and issues are becoming increasingly common at international conservation events (Brockington et al. 2008; Fuller 2004) and there is a trend towards permitting multiple uses for PAs. Subsequently, the mission of PAs has expanded from biodiversity conservation to improving human welfare (Naughton et al. 2005). Most new PAs are beyond the agricultural frontier, where it is easier to accommodate local residents, and there is less competition from commercial interests (Chomitz 2007). There has also been a trend to educate, increase awareness and income, and to actively engage local people in co-management and sustainable use of PAs (IBRD 2011; Munasinghe and McNeely 1994; Braatz 1992), to protect the diversity of species and communities (Muller et al. 2011).

Against this background, this paper reviews the literature on biodiversity in Iran, designation, policy, management and implementation issues in Iran's PAs system. The

paper surveys what is known about Iran's PAs, to identify areas where more research is needed. Finally, it discusses the key characteristics of Iran's PAs system and challenges to its development and, in describing the observed effects and lessons learned from Iran's experience, sets out how these challenges may be addressed.

Biodiversity in Iran

Iran is a large country of diverse climates, terrains, flora, and fauna (Collins 2001). Rainfall in Iran is only one-third of the global average and evaporation is 20% greater than the global average (Sabzpress 2011). Despite the fact that 85% of the country is semi-arid or arid (Misra 2009), Iran is well known as one of the world's major centers of biodiversity and natural heritage, because of the junction of four major plant geographical regions (Irano-Turanian, Hyrcanian, Zagrosian, and Khalijo-Ommanian; see e.g., IFNRCBD 2010; Sagheb et al. 2003; Croitoru and Sarraf 2010; NBSAP 2000; Darvishsefat 2006; Ziaie 2008; Zehzad et al. 2002; Firouz 1976 & 2005; GoIRI 1995; Groombridge and Jenkins 2002; IRI 2005; Rabiee 2002; Firouz et al. 1970; Tavakoli 1987; IUCN 1992; Harrington 1977). Nonetheless, Iran faces serious challenges in sustainable development with major environmental issues in its territory, coastal, and wetland sections (See IFNRCBD 2010; Madanipour 2011; Croitoru and Sarraf 2010; ShafiePour and Ardestani 2007; GoIRI 1995; Ebtekar 2009; Seddigh et al. 2010; Pak and Majd 2011; Pak and Farajzadeh 2007; IUCN 1992; Coadt 1980). Similar environmental problems are happening around the world, especially in developing

countries, and cause biodiversity loss (See Braatz, 1992; Sekercioglu and others, 2011; Say and Yucel, 2006).

While humans have been an important factor in the modification of the region of Iran during the last 7,000 to 8,000 years (Dewan and Famouri 1964), during past decades, major eco-regions of Iran have been affected through the implementation of different development plans, which in many cases led to an overexploitation of biological resources (IFNRCBD 2010; Makhdoum 2008). Such problems raise doubts as to whether any sustainable management system can be adopted.

The PAs ecosystems in Iran are of high biological and socioeconomic importance. A review of the distribution of PAs in Iran indicates that these sites represent almost all of the biodiversity of Iran (Makhdoum 2008; GIRI et al. 2004). According to Iran's Fourth National Report to the Convention of Biological Diversity (IFNRCBD 2010), the assessment of biodiversity trends in Iran is very difficult because national biodiversity indicators are not fully developed, and monitoring of their impact has generally been poor. However, PAs are facing increasing threats. It is obvious, however, that the biodiversity of Iran in different ecosystems and at different levels is decreasing (see IFNRCBD 2010; NBSAP 2000; Makhdoum 2008; Farhadinia and Hemami 2010; Ahmadzadeha et al. 2008; Esfandabad et al. 2010; Ziaie 2008).

The greatest threats to biodiversity have occurred since 1950, particularly in the past three decades. Endemic-rich grasslands, coastal areas, forests, wetlands, and rivers are disappearing, and overgrazing and rampant erosion degrade steppes and rangelands.

In most areas, especially in forests, overexploitation, overgrazing, and overhunting are major factors of degradation (Kolahi 2005a&b; Croitoru and Sarraf 2010; Aminzadeh and Ghorashi 2007). Mismanagement, unchecked urbanization, pollution, dam construction, deforestation, draining of wetlands, poaching, and excessive irrigation are often done without consideration of environmental impacts and are the most widespread threats to biodiversity. Transformation and destruction of ecosystems occur across Iran (Firouz 1972, 1976). Fifty-six species are on the verge of extinction (UNCTI 2003) and 90 species are threatened (Vie et al. 2009). Some estimates showed that during the Iran-Iraq war, 80% of all wildlife was lost due to lack of management in wildlife refuges, and 50% of PAs were seriously affected (GoIRI 1995). This depletion of already critically endangered and threatened species is a major environmental issue.

There have not been any official statistical reports about wildlife by the DoE for the past 14 years. Anecdotal records suggest that numbers of wildlife have decreased by approximately 90%, as compared to three decades ago (ENP 2011). About 1000 (58%) of Iran's 1728 native plants are on the IUCN red list (KhabarOnline 2010b). Some estimates suggest that up to 2,604 of Iran's species may be considered endangered. More than 25% of 10,363 known fauna and flora species in Iran are in critical condition and at risk of extinction (Darvish 2006). The speed of degradation of Iran's biodiversity is at least 166% greater than the global average. Kahrom (Prof. of Tehran University; interview 22 Sep. 2011) estimated that 15 leopards are killed in Iran each year by people, representing half of all leopard births. Kahrom further stated that the Persian onager, an

indicator species in Iran, totals only about 400 individuals and there are only about 70 panthers in the country. There are frequent reports of killing of bears, leopards, and other large mammals. In addition, all 252 of Iran's wetlands are drying and many wetland bird species are declining. Iran is located between 10 countries, all of which are environment destroyers (Sabzpress 2011). Many experts report that Iran's environmental alarm lights are red.

Designation of PAs

The global system of PAs has grown dramatically over the last half century (UN 2011), especially in developing countries, where biodiversity is greatest (Naughton et al. 2005). Only 12.5% of the Earth's land area is protected for conservation (WDI 2011). The choice of land uses for the other 87.5% is therefore critical. The percentages of terrestrial PAs are 14.9% in East Asia and the Pacific, 7.4% in Europe & Central Asia, 20.8% in Latin America and the Caribbean, 4% in the Middle East and North Africa, 6.1% in South Asia, and 11.7% in Sub-Saharan Africa (WDI 2011).

According to historical documents and evidence, the first protected forest area in the world was established in Iran by Xerxes (Khashayar Shah, a Persian king) around 500 B.C. (Yakhkeshi 2002). Based on the new definitions of PAs, however, Iran has seen tremendous growth in the number and area of PAs since the 1950s (Fig. 1; Mirkarimi 2007; DoE-GIS 2011; PPW 2011). In total, 253 PAs, which cover 10.12% of the country's area, have been progressively selected (DoE-GIS 2011; Table1). The

number and biodiversity of PAs in Iran is better than in many other nations and regions (see WDI 2011; IUCN 1992; Firouz 1969, 1971a, 1971b, 1974, 1976, 2005; Firouz et al. 1970). For example, it has a higher percentage of PAs than other Middle Eastern and North African countries, and some other nearby countries such as Turkey and India (WDI 2011).

There are four broad categories of PAs in Iran: 'National Park', 'National Natural Monument', 'Wildlife Refuge', and 'Protected Area' (Table 1 and Fig. 2). Some PAs are also named as Ramsar sites or biosphere reserves. Because of their environmental characteristics and high biodiversity, National Parks have the greatest variety of management zones compared with other types of Iranian PAs. In addition, they have the greatest variety of natural attractions and opportunities for visitors, and the most developed tourist facilities.

The size of Iran's designated areas varies greatly, ranging from about 100 square meters, such as Sarve Zarbine Sangan National Natural Monument, to over 1.5 million hectares for the Naibandane-Tabas Wildlife Refuge. Of these sites, 11.5% are less than 1000 hectares and are not large enough to provide a suitable habitat for large mammals. Much biodiversity can be found outside these areas (See GIRI et al. 2004). This problem is not unique to Iran; the majority of the world's PAs are small (Eldredge 2002; Sekercioglu et al. 2011).

In the absence of an overarching, national systematic planning strategy, there is a mix of unintended and intended uses for designated PAs in Iran, and this is a major

scientific concern. A similar problem exists in Canada due to lack of efficiency in the location of PA resources and confusion of roles among agencies (Dearden 2008). Government in Iran often perceives the development of PAs as a symbol of administrative achievement. In other words, it has often been more concerned with the numbers and total area of PAs than with their effectiveness. Therefore, important decisions such as the implementation and configuration of PAs are regularly driven by the interests of the directors rather than by strategic objectives.

PAs have long been the only way to conserve ecological regions from other forms of land use (EEA 2010). The new generation of PAs constitutes an increasingly important mechanism for promoting the sustainable use and conservation of landscape biodiversity (EEA 2010; Madjnoonian 2000). There are still some additional representative landscapes in Iran where new sites should be set aside in order to complete the network of PAs (Hunnam 2004; Madjnoonian 2000; IUCN 1976). However, more emphasis on rapidly introducing or establishing PAs should not lead to the neglect or more inefficient management of existing PAs (EEA 2010).

Iranian Policy on PAs

The Department of the Environment (DoE) has been the top policy and decision-making governmental organization for the protection and management of PAs in Iran since 1972 (IRI 2005). The management system is governed under a three-tier structure operating at the national, local (provincial/municipal), and site levels (Fig. 3;

DoE-Webpage 2011) with most management of PAs centered at DoE provincial offices.

Prior to three decades ago, there were positive activities and management initiatives with regard to PAs (see Firouz and Harrington 1976; and IUCN 1992). Wildlife were surveyed and their population status evaluated, and endangered species were well protected (Firouz, 1969, 1976; IUCN 1986). Some reports also showed positive conservation activity from 1997-2007 (Ebtekar 2009). But, nowadays, programs remain weak. Wildlife populations and their new generations in Iran have survived the ravages of human activities and mismanagement but they are threatened with extinction in every kind of PAs and urgent conservation actions are needed immediately (see IFNRCBD 2010; Makhdoum 2008; Farhadinia and Hemami 2010; Ahmadzadeha et al. 2008; Esfandabad et al. 2010; Ziaie 2008).

Iran's government has issued various policies and regulations that provide for the establishment and management of PAs, e.g., the Protection Bill (1956), the Environmental Protection and Enhancement Act (1974), and the National Biodiversity Strategy and Action Plan (2001) (IFNRCBD 2010; Cheraghi et al. 2008; Darvishsefat et al. 2008; GoIRI 1995). Based on its national provisions, the management of PAs follows a zoning scheme.

The Bureau of Habitats and Protected Areas is obligated to prepare management plans for PAs. The main goals of management plans are conservation of biodiversity resources, optimal utilization of natural resources (landscape planning), development of eco-tourism plans, and providing ecosystem services for human wellbeing (BHPAs

2011). The preparation of these plans is done in three phases: a feasibility study phase, a detailed study phase, and a planning and implementation phase.

A model management plan based on FAO guidelines was prepared for Khojir and Sorkhe-hesar National Parks in 1985 (Makhdoum et al. 1987). However, "Due to the shortage of funds and experts as well as mismanagement at a high level of the department, and the lack of understanding of the concept of national parks and PAs, the practices of management principles, which were painstakingly prepared and proposed, have not been implemented. As a result, 40% of the areas of these two national parks has been occupied and converted to other uses, that is, housing and military barracks" (Makhdoum 2008). That said, that management plan does not represent present operations because of many changes having been implemented.

An attempt to prepare management plans for Iran's PAs was started in 2001. Table 2 shows the kinds of studies for different categories of PAs (BHPAs 2011). Except for one national natural monument, other PAs do not have any completed documentation in the detailed study or the planning and implementation phases. Thus, most PAs operate without any management plans. In most PAs, inventories of primary wildlife resources and specific management plans have not been completed. Plans typically fall short in sustainable management practices, particularly with regard to the involvement of local people and other relevant stakeholders, creating conflicts and challenges at the local, regional, and national levels. The development of management plans is frequently outsourced to private companies that often minimize field

assessments in order to maximize their profits. Furthermore, these companies usually have no direct geographic or political relationship to PAs sites, at the administrative, planning, or executive levels, which creates a disconnect with the local managers who end up implementing the plans. The collection of basic information for the preparation of a management plan takes a long time, and can be complicated by changing factors and by the problem of maintaining funding to the completion of the project. Iran does not currently have any systematic national planning for PAs, and the development of management plans does not follow international guidelines.

A wide range of Iran's policies, laws, and regulations result directly or indirectly in the depletion of biodiversity or work at cross-purposes to conservation. Braatz (1992) describes similar problems in some Asia-Pacific regions. In addition, the Iranian government, practically unopposed, can easily modify existing environmental laws and pass new ones to remove environmental obstacles to the construction of roads, dams, mines, factories, housing projects, and other developments. A similar growing threat that development concerns surpass environmental concerns is occurring in other Asian countries (CICRED 1992). Such construction increasingly occurs in "protected" areas, often at the expense of local people. In addition, lack of coordination between government agencies and conflicting policies hinders biodiversity conservation (Eldredge 2002). Various departments, sometimes without knowledge of each other's plans and without any environmental impact assessments, undertake unnecessary, costly, and ecologically harmful projects. Environmental assessments with regard to

development plans are needed to address and evaluate ecological issues for decision-making (Monavari and Fard 2011). Such activities within and adjacent to PAs have resulted in large scale, often irremediable, changes to their ecosystems. Moreover, enforcement in PAs often remains inadequate or non-existent due to poor management, lack of expertise, limited coordination within and among agencies, and even collusion and corruption. Turkey has also experienced these problems (Sekercioglu et al. 2011).

The DoE at the national, provincial and PAs levels are unable to engage on equal terms with other government sectors and remain weak actors (Hunnam 2004). Technical and financial capacity, and planning and management at all levels of the DoE remain weak. As Croitoru and Sarraf (2010) have reported, setting up an administration or establishing an organization does not necessarily guarantee the success of plans for PAs. Implementation is the most crucial phase. Due to the lack of sufficient qualified research ecologists in the DoE, research is almost non-existent and ecological problems are neglected (Makhdoum 2008).

In a parallel manner to the Department of the Environment (DoE), the Forests, Range and Watershed Organization (FRWO), managed by the Ministry of Jihad-e-Agriculture, has designated several natural forest parks and forest reserves to be managed for human recreation and for the preservation of endangered flora. The Research Institute of Forests and Rangelands (RIFR), under the management of the Ministry of Science, Research and Technologies, and other environmental centers and institutes, independently protect some areas for their objectives. The existence of

different categories of environmental protection under various government ministries and departments complicates the calculation, jurisdiction and status of PAs, which are threatened by various types of use and abuse (Sekercioglu et al. 2011).

Most PAs do not have clearly demarcated boundaries (Kolahi et al. 2011; Salehi 2009) and are in constant threat of invasion by nomads and farmers. Traditional uses and mining of ores are two major threats in Protected Area and Wildlife Refuge categories (Makhdoum 2008; Mirkarimi 2007). Unfortunately, the construction of asphalt roads through PAs sometimes fragments PAs, as in Khojir National Park (KNP) and Golestan National Park, and this conflicts with the conservation of biodiversity. An average of four animals are killed each month in KNP by collisions with vehicles.

Grazing is not allowed in National Parks, but it is allowed on 80% of the land in the Protected Area category (GoIRI 1995). In PAs, grazing is for all practical purposes uncontrolled (Firouz et al. 1970). There are no hard data available on the extent of the problems. However, grazing and poaching affect 80-90% of all PAs (GoIRI 1995).

Iran has both a lack of sufficient environmental laws and a severe lack of implementation of existing laws. The current patchwork legislation is weak and sometimes focused on particular species or types of organisms rather than on habitats. A more critical problem is that enforcement of conservation legislation is weak, and illegal hunting, logging, and land encroachment in PAs is common. For example, in mid-October 2011, two people shot a brown bear with its two cubs in the mountains of Samirom, Esfahan and filmed a movie to celebrate their kill. This demonstrates that PAs

do not adequately protect animals. The maximum fine for hunting a brown bear, based on article 12 of the hunting law, is only 7,200,000 Rials (approximately US$600)! These laws are ineffective. Hunting problems continue to exist due to a lack of sufficient awareness and ongoing cultural issues of indigenous people. When there is little fear of getting caught and the costs of getting caught are less than the benefits of illegally taking wood or wildlife, illegal harvesting will continue. As long as laws are insufficient and poorly enforced, penalties are small and often not implemented, public education and awareness of existing environmental standards and regulations are limited, and poverty and unemployment are not decreasing, environmental degradation will continue and effective management will be limited.

Iran has strengthened communities through training for some services (IBRD 2011), but local people are extensively experiencing structural upheavals (Hunnam 2004). Most of them have felt the need for a change from undesirable activities towards desirable ones, particularly in animal husbandry and agriculture (Hunnam 2004; Bovarnick and Gupta 2003). Nonetheless, Iran's rural development is not very significant and the active participation of people in this development has been weak (HashemiDaran 2004). An assessment revealed wide interprovincial disparities, consistent rural-urban differentials and unequal income distribution among populations (UNCTI 2003). However, there is typically little consultation with local people in the establishment and management of PAs (Kudat et al. 1999). In other words, the policy choice of establishing large areas for Iran's PAs has often ignored local social contexts

and effects on conservation. Local people are unsure of the geographical borders of PAs (Hunnam 2004), unaware of the value of PAs, or simply dislike them. Similar problems exist in Turkey (Sekercioglu et al. 2011) and in many Asia-Pacific regions (Braatz 1992).

In many developing countries, the agency of local communities is relatively low (Bardhan 2002) and they have limited control over public decision making (Ribot 2002). Conflicts between PAs management and local economic development are intensifying in many countries (Munasinghe and McNeely 1994). Conflicts involving PAs and local people are a serious conservation problem undermining the integrity of PAs in Iran and many other countries such as Mexico (Smardona and Faust 2006). People routinely use natural products for income, construction, fuel, food and medicine. In the Central Zagros Mountains, because of a lack of alternative livelihood options, up to 50% of the cash income of poor households comes from harvesting wild plant and animal species (Fuller 2004). Locals harvested 90% of their medicinal and nutritional plants from PAs (Hunnam 2004). Approximately 72% of households used the woodland resources to obtain a portion of their cash or kind income (Salehi 2009). Even 35-70% of livestock fodder came from the nearby PAs (Hunnam 2004). So, the establishment of PAs has had a negative impact on people's access to traditional and customary resources and, thus, on their subsistence and livelihood needs. Many indigenous people think the management of PAs is not with and for people, but against people.

Some reports have noted rising public consciousness and sensitivity to environmental issues (Ebtekar 2009; UNCTI 2003), but others have reported little information available on sustainable use and limited knowledge of biodiversity (Hunnam 2004; Calabrese et al. 2008). The environment is not yet thought to be an important problem compared with other socioeconomic issues (Calabrese et al. 2008). Public knowledge and awareness of the ongoing crisis in Iran's ecosystems remains low, hampering the ability of well-intentioned decision-makers to implement positive changes with regard to conservation policies.

The vulnerabilities and deficiencies of the Iranian management system are so entrenched that little is known about the environmental, social and economic resources of PAs. Makhdoum (2008) believed just three percent of the country's PAs are effectively protected by naturalists and PAs rangers, local communities, and some NGOs, and that some PAs rangers have been killed by poachers. A review of Iran's PAs shows that their management is generally poor. Insufficient operational budgets and the lack of trained staff members add to the challenges of implementing effective and sustainable PAs management, and available funding is often not used effectively (Hunnam 2004). In addition, money from fines and entrance fees at PAs is transferred to the Treasury, and not all is returned to the PAs for management and programs. This centralized financial model limits the advantageous effects of conservation to local economies. This problem is not unique to Iran; Turkey, for example, has similar problems (ESSDU 2001; Sekercioglu et al. 2011).

PAs are expensive to establish and operate. However, it is less costly to protect their ecological integrity and manage their goods and services before biodiversity and environmental values are lost, than to restore them later (Munasinghe and McNeely 1994). Natural disasters in Iran have not only negatively impacted nature but have also killed or affected many people and caused substantial financial losses (Chandrappa et al. 2011; UNCTI 2003). The cost of environmental degradation in Iran in 2002 was US$8.4 billion or 7.4% of GDP (WB 2005). The situation is exacerbated by soil erosion, which commonly reaches 10 tons/hectare/year (Hunnam 2004), six times more than the global standard (KhabarOnline 2010a). Iran loses about $500 million a year from the loss of soil nutrients and productivity, (GoIRI 1995).

Iran's government has a policy for the establishment of new PAs and expanding current PAs. While there is a sound environmental policy for the establishment of PAs, a large proportion of PAs do not have sufficient management. Sometimes only small core areas are truly protected (Hunnam 2004). Overall, investment in Iran's PA system has been extremely limited, considering the relatively strict regulations and huge difficulties of enforcement. Many PAs are protected in name only. Local officials are unable or unwilling to stop unsustainable resource use and pressure on such resources is growing (Hunnam 2004). A large number of Iran's PAs are "paper parks", (*sensu* Dudley and Stolton 1999), which, although protected by law, are unprotected, unmanaged, and lacking in infrastructure and on-site staff. Some have been so degraded

and their biological diversity so depleted that they are no longer worth designation as PAs.

Policy Implementation Issues in Iranian PAs

PAs can deliver their environmental and socioeconomic benefits only if they are effectively managed (Hockings 2000). The concern is that many PAs around the world are not achieving their management objectives. To maximize the potential of PAs and increase the effectiveness of management, the strengths and weaknesses of the management process and the threats faced need to be understood through the application of assessment tools (Stolton et al. 2007).

Many countries around the world, including Iran, are signatories to the Convention on Biological Diversity, and thus are obliged to ensure effective management of PAs. Iran still has little detailed information about the state of many of its PAs because there are no monitoring programs (Kolahi et al. 2011). In reality, due to a lack of long-term and systematic management planning, well-trained personnel and monitoring, as well as inadequate financial resources, management capacity and mismanagement, there is usually a large gap between intention and achievement. Without enough information and comparative studies, the DoE is unable to properly assess its effectiveness in the conservation of biodiversity.

Baseline data on type, number and "distribution of species across space are critical to setting priorities effectively and to monitoring populations over time to assess

conservation strategies" (Eldredge 2002). Data on forest cover, rangeland, and biodiversity in Iran is incomplete, outdated, and often inaccessible. Furthermore, the data do not follow modern data collection methods, a fact that limits analysis and interpretation. There are very few data on the number of threatened animal and plant species, and biodiversity information is often based on unreliable estimates that differ considerably.

Discussion and Recommendations

Conservation efforts have led to rapid and continuous growth in the number and area of PAs in Iran. PAs are, at present, the main tool for conserving biodiversity and nature in Iran. However, there have been disastrous reductions and changes in Iran's ecosystems. There are major challenges to be overcome if PAs are to fully realize their potential in biodiversity conservation and ensure the sustainability of Iran's areas. Some of these challenges are common to many countries in early stages of PAs management, but others are unique to the Iranian region. Iran's PAs system is criticized for (1) shortages of manpower, equipment, and financial resources; (2) *de jure* PAs that are often implemented as *de facto* reserves; (3) lack of national biodiversity indicators and objective monitoring processes; (4) information gaps and lack of a suitable PAs information database; and (5) limited public participation and PA-people conflict.

Iranian landscapes have become highly fragmented and homogenized, threatening their biodiversity and affecting ecosystem services. Reducing this loss of

biodiversity will require strong efforts to reduce pressures on biodiversity and improve the size, management and connectivity of the patchwork of PAs into a spatially coherent network. However, this needs to be done with consideration being given to numerous socio-economical and environmental issues, including biodiversity, village development, community participation in PAs, development of agro-pastoral PAs, extractive uses, recreation, wildlife, eco-tourism, pasture improvement and management, multipurpose management, sustainable utilization of natural resources, and economics. There are many global examples that can provide instructive experiences for PAs management (see e.g. www.wpc.org and; ICEM 2003), as well as examples of previously successful management projects in Iran.

From the above generalizations, we make the following recommendations in four areas:

(1) Active management:

The scale of change that is currently happening to the environments in Iran indicate that the PAs system is insufficient. The rise in "active management" in PAs is going to be increasingly necessary. Iran's experience demonstrates that determining an appropriate balance between conservation and development is difficult and requires careful consideration of both scientific and socioeconomic interests. As Hunnam (2004) noted, the DoE has limited capacity for biodiversity conservation and sustainable utilization of resources. "It is unable to influence society and unable to influence the economic

sectors, such as forestry, rangelands, agriculture, water and tourism. As a result, in the baseline, it will focus its efforts on managing the core of its PAs, with some success in the initial years, but leading to a fragmentation and islandization of biodiversity" (Hunnam 2004). The DoE must be better supported legally, politically and financially. PAs would be better managed through a centralized organization such as a new Ministry of Environment and Natural Resources that would combine the DoE, FRWO, and related organizations, centers, and institutes to address sustainable management following international guidelines.

Many causes of biodiversity loss can be traced to national policies and programs (Hunnam 2004). Development and the environment are in conflict in Iran's PAs. The present level of legal measures in environmental codes is insufficient. Planning lags behind change, and change brings the destruction of much of the country's rich biodiversity heritage. To date, most projects in Iran do not correctly prepare or implement Environmental Management Plans (EMPs). In addition, only 32% of biodiversity indices are assessed in the process of Environmental Impact Assessment (Monavari and Rahimi 2010). Environmental issues frequently are inadequately addressed during development project designs and in the supervision reports, concept reviews, and appraisal reports (IBRD 2006). The recent National Five-Year development plan included economic, social and political targets but no environmental assessments. An Environmental Management Plant (EMP) should be required for every project with a focus on mitigating the possible adverse effects of a project and ensuring

maintenance of environmental quality (Seddigh et al. 2010). An EMP also can guarantee that conservation of natural resources and PAs are integrated into development action.

New models, experience and capability in PAs management is needed to realize the benefits of PAs. The recent Conservation of Biodiversity project in the Central Zagros Landscape Conservation Zone supported by the Global Environment Fund (GEF) (Hunnam 2011) aims to provide experience in how best to manage and monitor biodiversity conservation and sustainable resource use. The objective of that project is to build capacity and develop experience that could be used to establish sustainable, decentralized, participatory systems to support sustainable PAs, and forest and natural resource management more broadly.

Some reports have showed that non-governmental organizations (NGOs) have been useful for improving environmental governance in Iran (Doyle and McEachern 2008; Ebtekar 2009; UNCTI 2003). Others have emphasized the importance of participatory planning and management, developing new environmental laws, having better educated lawmakers, and incrementally decentralizing power and budgetary decision-making to provincial levels (Hunnam 2004; Ebtekar 2009; Doyle and McEachern 2008). DoE participation with other government agencies to solve some environmental problems showed good results (Calabrese et al. 2008).

The existing management structure for PAs needs major reorganization to solve the problems of PAs. A key lesson learnt by the United Nations Development Program

(UNDP) in Iran is the need to combine action at three levels: the village, province, and nation (Hunnam 2004). The data from Iran suggest that transfers from central government to the provinces prioritize lagging areas (IBRD 2011). Local agencies need to be empowered not only politically and legally but also financially.

The lack of well-trained staff, including field staff, mid-level managers, and top-level conservation planners and administrators is one of the most critical problems facing conservation agencies in many Asian countries (Braatz 1992). The results of Kolahi et al. (2011), Bruner et al. (2001) and Dudley et al. (2005) suggest that guards are an important part of the transformation from "paper parks" to working parks, but trained staff are also important for working with local residents. To adequately protect all of the PAs in Iran, over 16,000 ecoguards would be required, compared to the 3,000 ecoguards currently employed by the DoE. This means only 2% of the country's areas are effectively protected. In addition, some ecoguards have not been paid for over eight months, and morale is low, so it is not surprising to hear that an ecoguard of Mimand PA had meat of protected wildlife in his refrigerator! It is not possible to effectively cover this large area with such inadequate budgets, manpower, equipment, and poor management. Standardizing the number of executive staff in PAs and increasing the number of experienced ecoguards, permanently employing and supporting them, and including them in planning and management based on IUCN guidelines (See IUCN 1994) could assist the DoE in scientifically managing its network of PAs. The DoE should protect rangers and the hundreds of people all over Iran who put their lives on

the line to conserve nature and bravely campaign to expose environmental and social injustice, by describing the escalating violence that has led to over 111 rangers losing their lives and more than 5,000 people being injured since the DoE was established (BHPAs 2011).

Development and implementation of new comprehensive guidelines and adaptations of existing management guidelines based on international guidelines are necessary to conserve and restore biological resources in Iran's PAs. In addition, a "scientific" and "active" advisory committee would help insure that PAs are managed in accordance with international guidelines.

Most donors and governments believe in the importance of decentralization (Ribot 2002). Iran's government has often been unsuccessful in this. A diversity of institutional arrangements should be used for management of PAs under the leadership of the DoE. While the government management model still predominates; NGOs, corporations, conservation trusts, local communities, and the private sector could take over some of the management responsibility for some Iran's PAs through incentive arrangements. These organisations have more autonomy in finances and decision-making, compared to government bureaucracies, and have proven to be successful models for managing PAs in many parts of the world (ICEM 2003). Because of the need for many studies, research institutions, universities, and students should be encouraged to concentrate their activities on suggested problems at desired sites. Outsourced studies such as this and administrative decentralisation should save costs.

As a beginning, Iran could use this experience in two PAs categories, namely "Wildlife Refuge" and "Protected Area" in an appropriate regulatory framework.

Because they are managed by the government, PAs have to compete with other sectors for public funds. A variety of new and innovative financing mechanisms should be used to cover part of the costs of PAs and reduce their dependence on the public purse and secure sustainable funding. Several mechanisms have been reviewed for securing financing at three levels: local (e.g., user fees, sponsorships, donations); national (e.g., taxes and charges, endowment funds, incentives); and international (bilateral and multilateral donors and lending agencies) (Phillips 2000; Braatz 1992). For instance, Tang-e-Bostanak, a small PA, receives 200,000 visitors/year (Hunnam 2004), and constitutes a financial opportunity for biodiversity conservation through a combination of public and private financing. Developing an economic valuation of Iran's PAs also provides justification for integrating PAs into economic sectors and the national budget.

It is important that the government lead the fight to save endangered species. The government should negotiate with landowners, companies, factories, and other stakeholders inside or related to PAs to move outside PAs and to ensure a commitment to sustainability. To make conservation efforts more systematic and efficient, the current framework of PAs in Iran needs to be better supported by policies and planning instruments that allow integrated, sustainable ecosystem management. The long-term maintenance of biodiversity in PAs depends on the ability to design systems that

incorporate ecological dynamics in diverse habitats (Eldredge 2002). A coherent, cost-effective strategy is needed at the national and regional levels, centered round a well-designed interconnected network of multi-use PAs that involve a participatory approach. The baseline strategy for PAs should involve strengthening the network of PAs and including biodiversity conservation in agriculture, rangelands and forestry (Hunnam 2004). Important isolated PAs should be connected with wildlife corridors via reforestation and habitat restoration. Biodiversity conservation should be integrated into territorial planning to maintain and insure that PAs can contribute to the maintenance of healthy ecosystems in the landscape as a whole. By managing multifunctional natural-historical landscapes and biodiversity sustainably, Iran can secure valuable ecosystems services while preserving its cultural and natural heritages.

With active management and legal, political and financial support from upper levels of government, management, staff, budget, resources, efficiency and systematic planning of PAs as well as national biodiversity planning could be improved. This would allow "paper PAs" to become real working PAs that succeed in biodiversity conservation.

(2) Management of local communities and comanagement:

In general, rural communities in Iran are highly dependent on wild and domesticated plant and animal species (Fuller 2004). There are opportunities for increased productivity from ecoagriculture, livestock, forestry, agroforestry, ecotourism and

fisheries. Native species are a source of alternative food products during periods of drought and domestic crop failure or scarcity (Fuller 2004). More than half of all species occur on agricultural lands outside PAs, so the cooperation of farmers is essential for conservation of biodiversity (WB 2007). An alternative livelihood program and local participation should be included in PAs management plans, with an emphasis on activities that do not compromise biodiversity (Fuller 2004). Without the availability of legal activities that result in tangible monetary benefits for local people, illegal activities and overuse of protected resources will continue, and community conflicts will increase (Kudat et al. 1999; Fuller 2004).

Sustainable PAs depend on national and regional sustainable development (ICEM 2003). Greater attention should be paid to the broader policy context of biodiversity loss, poverty, unsustainable land use, and the establishment of a management body that represents all the stakeholders equitably. Lane (2001) believed that developing cooperative relationships with local stakeholders and sharing the burden of management responsibilities is a potential new paradigm in natural resource planning. However, co-management should not compromise the core goal of conservation (ICEM 2003; Locke and Dearden 2005).

The lessons from the eight pilot villages in Iran demonstrated that biodiversity and development objectives can be met at the local level, with appropriate government support, by giving responsibility to communities through participatory planning and decision-making (Hunnam 2004). A new paradigm of human-centered conservation is

becoming a standard approach in many countries (Phillips 2003) as a tool for social planning and income generation (Locke and Dearden 2005). Community-Based Management Plans for PAs or Integrated Conservation and Development Plans are needed for local co-management. These initiatives need to consider the capacity of PAs to alleviate poverty. New PAs should often have less strict protection (World Conservation Union categories I–III) and allow multiple uses (categories IV–VI). According to the IUCN (1994), categories IV–VI are managed not only for biodiversity but also for "a sustainable flow of natural products and services to meet community needs". One of Iran's PAs categories, namely the "Protected Area" category, for instance, is valued as an area where sustainable resource use and rural development practices can be tested in partnership with a wide range of stakeholders. This indicates a gradual operational shift towards human-centered PAs.

Public participation, awareness and transparency in decision-making are of great importance in conflict resolution and sustainable management in PAs. They are also essential for encouraging the involvement of NGOs and the private sector. Many studies have set out some of the reasons that lead people to act responsibly towards the environment (see Cottrell and Graefe 1997; Keiser et al. 1999; Tuna 2004). The lack of participation in environmental protection in Iran is partially due to the belief that it should be the government's duty, more than an individual's responsibility (Calabrese et al. 2008). The level of dependency of local people on natural resources is high (Hunnam

2004; Dankelman and Davidson 1988; Calabrese et al. 2008), so it should be possible to transform attitudes to more sustainable use with a relatively small awareness effort.

State-centered modes of governance must give way to co-management and conflict management involving local people (Molle and Mamanpoush 2011), with structured participation structures for communication (Baskent et al.2008). The procedures, mechanisms, and appropriate communication tools for active participation of all stakeholders, especially local communities and women (Braatz 1992; CGD 2008), should be included in the planning and implementation stages of management plans. In addition, long-term participatory techniques should be used where possible, and applied at all stages and levels of management plans (Fuller 2003). More effective communication is clearly needed between scientists, conservationists, the public, and decision-makers with regard to PAs management.

The government must try to improve incomes and welfare, particularly in the rural sector, by other management actions such as small business development strategies enabling local participants to pursue development opportunities that are complementary to environmental protection (see Bovarnick and Gupta 2003 and Munasinghe and McNeely 1994). It has been reported that, "Stimulating and stabilizing rural development would improve standards of living, demographic equilibrium and help alleviate poverty" (IRI-UNDP 2010). Examples include environmentally-friendly agriculture, employment in PAs, ecotourism, wild products, agroforestry and handicrafts. Successes along these lines have been seen with ecotourism in Nepal,

medicinal plants in Kerala, India, low-cost loans in Thailand, socio-economic programs in Jordan (Bovarnick and Gupta 2003), and cooperation with Bolivian community groups (Eldredge 2002). These actions have noticeably changed local behavior and increased incentives for sustainable use of natural resources.

(3) Education, planning and monitoring:

A combination of interacting factors including education, age, gender, political ideologies, place of residence, income, poverty, inequality, class, occupation or industrial sector, market failures, inefficient policies, and political problems constitute significant challenges for environmental protection (see Parizanganeh et al. 2011; Calabrese et al. 2008; Hallegatte et al. 2011). Education is the primary way of providing opportunities for development to all people (Munasinghe and McNeely 1994). Stirling (1996) emphasized the point that, "If real sustainability is to become increasingly meaningful and mainstream, rather than devalued and marginalized, education in all forms and in all sectors has a vital role to play". In recent years, Iran has achieved notable successes in education and great strides are being made toward the achievement of universal education (UNCTI 2003; Demiry 2010; CGD 2008; MPO 2004). Basic conservation knowledge is fairly extensive (Braatz 1992), but new planning and management skills are required. Conservation training programs and improving the level of environmental concern among citizens should be strengthened. The DoE's education programs should include movies, classes, pamphlets, etc. A comprehensive

and coordinated strategy for education-related research should be formulated for training property managers, environmental policy makers, planners and ecoguards with regard to new conservation technologies and working with local communities. Thus, PAs managers must have a variety of skills, including people-related skills (Phillips 2003).

Research should play an important role in addressing issues faced by PAs. Executive plans and strategies are needed for sustainable management. Field studies are needed for selected species and ecosystems, in order that policy-makers may better understand the status and trends of biodiversity, and implement conservation and rehabilitation measures for threatened endemic species.

Planning for PAs should be integrated into planning for water, natural resources and tourism. Long-term management plans for each village are needed and PAs should also be reclassified into categories based on IUCN standards.

A system for assessing the effectiveness of PAs management through a Monitoring and Evaluation Plan based on international guidelines is needed (Dearden 2008). Such plans have two objectives: providing a rationale and timetable for data collection, and evaluating success (Pak and Majd 2011). In keeping with the targets in CBD decisions based on UNEP (2004, 2010), the government should put more effort into conservation measures for PAs that are behind schedule. Without a management plan and monitoring system it is difficult to gauge whether progress is being made; in

addition, such initiatives would also help to justify the financial resources spent on managing PAs (Mulonga 2010).

(4) Other actions for enhancing protection:

To protect the biodiversity of PAs, all necessary facilities and equipment should be procured.

Environmental codes should be developed and enforced to protect unique and fragile PAs and other natural resources. These codes should be strict and free of misinterpretation and misuse. More specifically, the laws related to the environment and PAs should be updated and amended for sustainable development. In addition, the DoE, various management levels, NGOs and local communities should be empowered to enforce these environmental codes. Significant monetary fines should be used to enforce code violations, and the revenue from fines should be used for the improvement and protection of local PAs. The capacity of the DoE (at national, provincial and local levels) should be strengthened to work with and influence other ministries, the media, and the private sector. The DoE should be helped in fulfilling its mandate by the Government, the Legislature and the Judicature.

Knowledge of the distribution and status of biodiversity in space and time is necessary to evaluate threats to biodiversity (Eldredge 2002). Unfortunately, there is little in the way of official environmental data or assessments (UNCTI 2003). Although the DoE once launched an environmental statistics database (Ebtekar 2009), it currently

lacks reliable data and statistics. The DoE needs to organize a databank and enhance its statistical capacity. Inventories of natural and environmental values should be prepared, updated, and made publicly available.

The government should convert paper PAs to true PAs, and identify and advocate for expanded PAs to include important corridors or valuable sites that have not been previously protected. This will require resources to hire and train rangers and guards, mark park boundaries and build guard posts. Road construction must be prohibited inside PAs and in fragmented sites that provide ecological habitat and wildlife corridors (Bennett 1998, 2003).

Sensitive locations inside PAs should be identified and protected. New technologies, such as closed-circuit cameras, should be widely used to protect these locations. Aerial patrols by helicopter could ameliorate shortages of manpower, and help better protect large PAs. Environmentally-friendly techniques, such as using horses instead of vehicles, solar power for electricity, and revegetating with native plants are worth considering.

Conclusion

Considering Iran's long history of environmental protection and government management of nature, this review of the condition of Iran's PAs management over the past decades highlights the many challenges that lie ahead for the conservation of biodiversity and ecosystems. In general, the decline of many species and ecosystems

has increased markedly during the past few years. Conservation efforts in Iran's PAs system have been characterized by little information about the ecological merits of PAs, local socio-economic problems, centralized control, a lack of trained-stuff, insufficient budgets and stakeholder investment, shortages of manpower, equipment and vehicles, low management effectiveness, lack of systematic planning, an emphasis on *de jure* PAs, a lack of national biodiversity indicators and objective evaluations, major conflicts between conservation objectives and socioeconomic and political interests, limited public participation and conflicts between PAs management and local people. These challenges are causing planning and management of PAs to come to a standstill.

The number and scale of threats to Iran's PAs create an extremely difficult task for protection. As a result, Iran's ecological regions are facing rapid environmental changes driven by mismanagement, increasing competition for land from housing development, transportation and energy infrastructure, factories, agriculture, pollution, overexploitation, wetland draining, unchecked development, overgrazing, illegal logging, poaching, mining, and increasingly frequent drought, as well as insufficient staff and human resources, and budget constraints.

Substantial steps should be taken to secure effective conservation of PAs. More basic technical work and ecological field surveys are needed to better document Iran's biodiversity. Iran's experience demonstrates the need for realistic policies and planning instruments that encourage integrated and sustainable ecosystem management, active management to restore habitat, increased education and awareness, a shift to

international organization guidelines and the development of appropriate linkages between strictly conserved and sustainable use underpinning the management of local communities and co-management. Capacity building should focus on management and financial planning, community interactions, participatory approaches, village-driven development, and resource mobilization.The DoE must recognize indigenous peoples and other local communities as important stakeholders in a real co-management process to protect their rights and interests. Local level projects should build community capacity for biodiversity management, develop awareness concerning the production of natural materials, promote ecotourism, strengthen the capacity of local NGOs, and implement participatory approaches to support community empowerment. Using participatory methodology, business-oriented management plans should be prepared for each PA, including a clear demonstration of how local communities can participate in, and benefit from, PAs. These challenges must be addressed if Iran's PAs are to achieve their goal of protecting native biodiversity.

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Figure Captions:

Fig. 1 Growth in the total number and area of PAs in Iran as of Nov. 2011

Fig. 2 Types and Location of Protected areas of Iran (Different colors show different types of protected areas; DoE-GIS 2011)

Fig. 3 Administrative structure of PAs in Iran

Table 1: PAs Categories of Iran by November 2011 (DoE-GIS 2011)

Categories	Number	Area (ha)	% to the whole PAs	% to the country
National Parks	26	1960537	11.76	1.19
National Natural Monument	35	38697	0.23	0.02
Wildlife Refuge	42	5567643	33.39	3.38
Protected Area	150	9109857	54.63	5.53
Total	253	16676734	100	10.12

Table 2: Research Phases in different types of protected areas

Type of Protected Areas		Feasibility Studies			Detailed studies			Planning	
		No	Incomplete	Completed	No	Incomplete	Completed	No	Completed
National Park	Number	12	3	14	11	15	0	26	0
	Area (ha)	835437	47944	1125100	782659	1177878	0	1960537	0
Natural Monument	Number	33	0	2	34	0	1	34	1
	Area (ha)	36960	0	1737	38695	0	2.3	38695	2.3
Wildlife Refuge	Number	28	3	14	28	14	0	42	0
	Area (ha)	4073778	203731	1493865	3881458	1686185	0	5567643	0
Protected Area	Number	122	8	28	126	24	0	150	0
	Area (ha)	5534815	530141	3575042	5723018	3386839	0	9109857	0

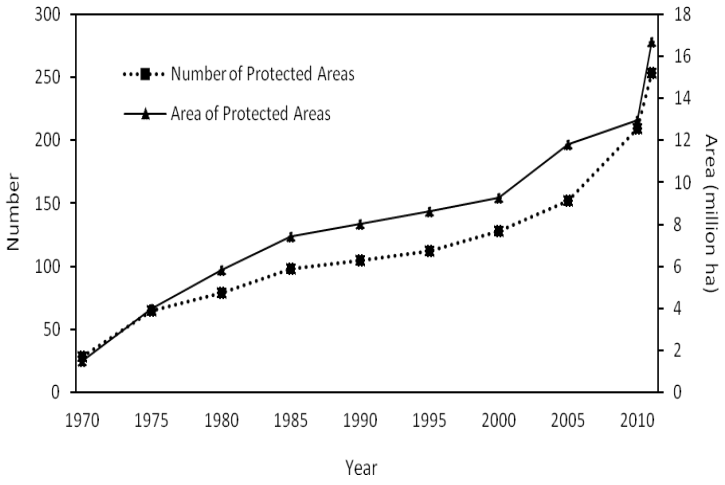
Number of Protected Areas
Area of Protected Areas
Number
Area (million ha)
Year
300
250
200
150
100
50
0
18
16
14
12
10
8
6
4
2
0
1970
1975
1980
1985
1990
1995
2000
2005
2010

Fig. 1

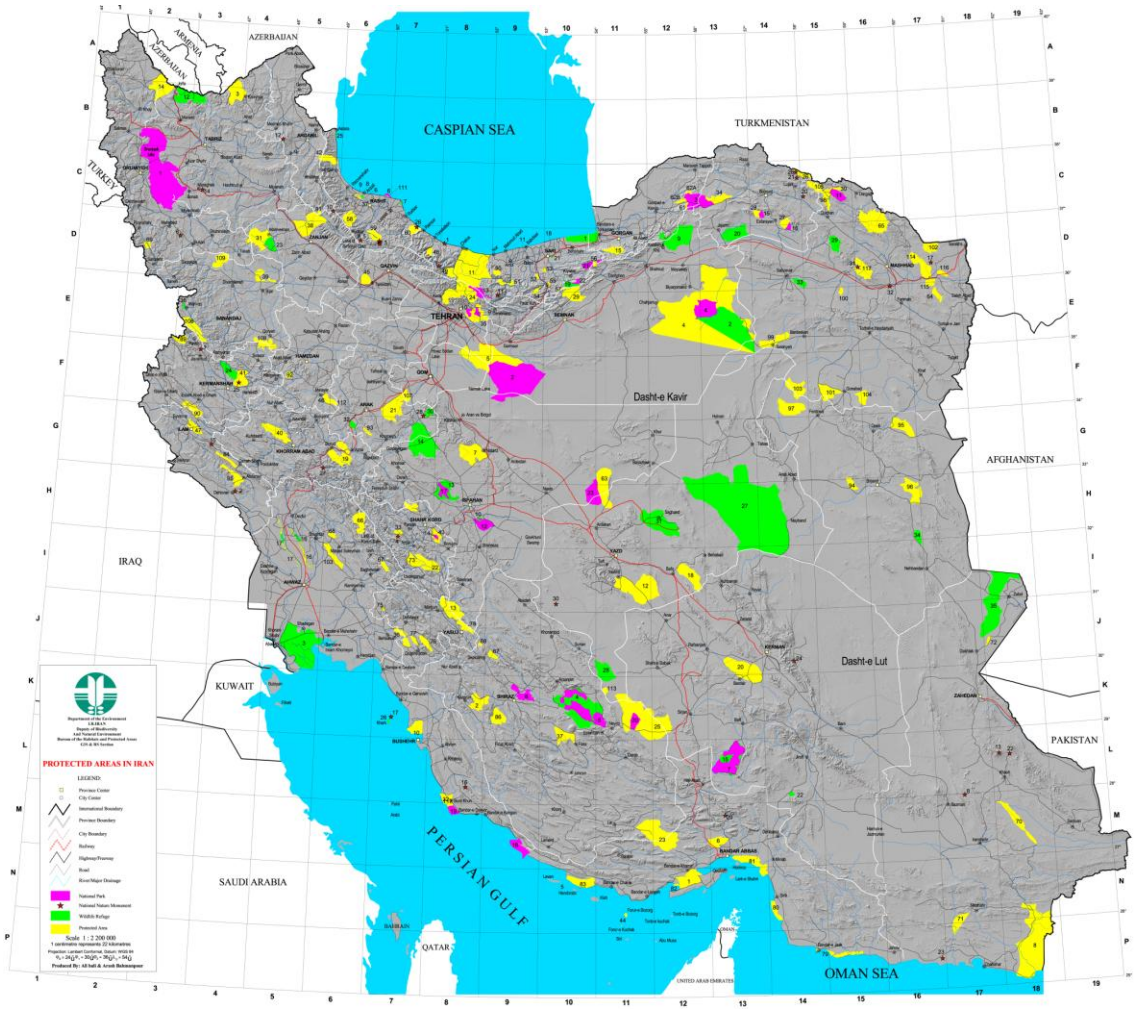
CASPIAN SEA
TURKMENISTAN
AZERBAIJAN
ARMENIA
TURKEY
TEHRAN
Dasht-e Kavir
AFGHANISTAN
IRAQ
KUWAIT
Dasht-e Lut
PAKISTAN
PERSIAN GULF
SAUDI ARABIA
QATAR
OMAN SEA
PROTECTED AREAS IN IRAN

Fig. 2

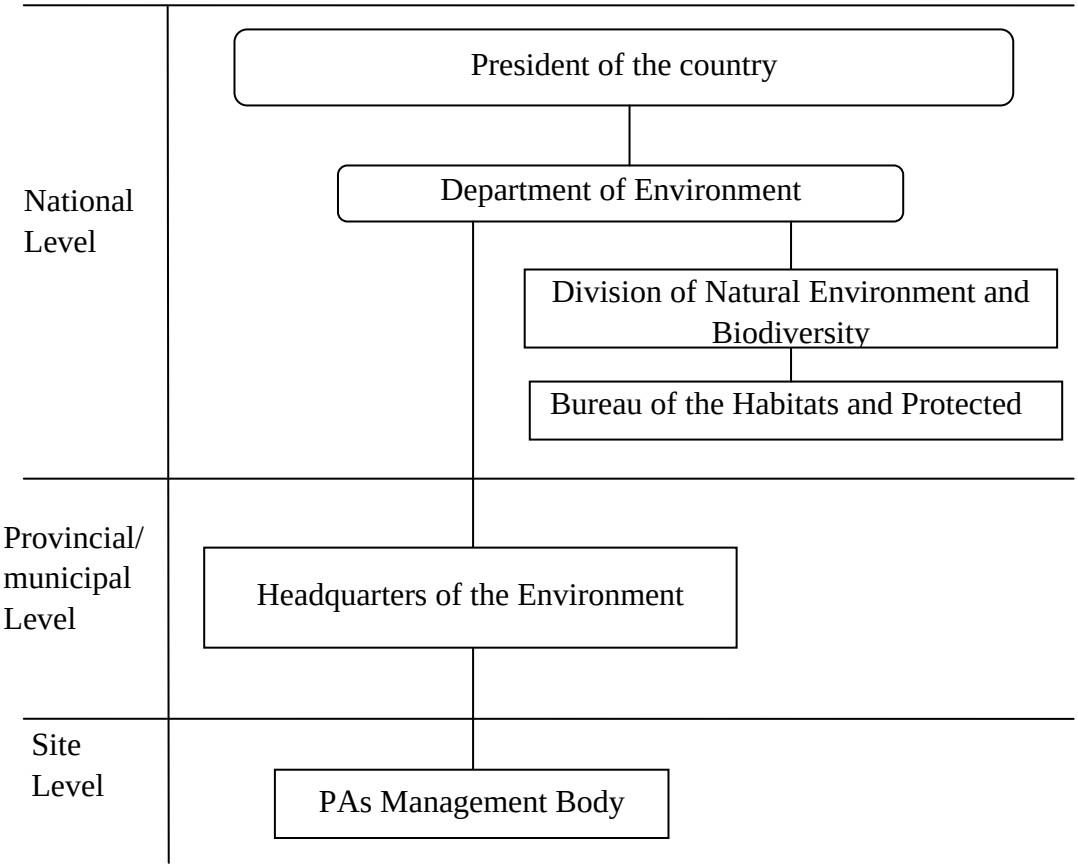
National Level
President of the country
Department of Environment
Division of Natural Environment and Biodiversity
Bureau of the Habitats and Protected
Provincial/ municipal Level
Headquarters of the Environment
Site Level
PAs Management Body

Fig. 3