

[Review]

Role of political power in forest administration policy of Iran

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ABSTRACT

The area of natural forest in Iran is approximately 12.4 million hectares, comprising 7.5% of the total area of Iran. Forest management in the country was changed to the legislature after order of the Forest Nationalization Law in 1963. With civilization development, pressure on forests was significantly increased. In the early 20th century a system of development planning began as a series of seven-year cycles, focusing on accelerating economic growth by improving capital-intensive industries and replacing religious and social traditions with rapid modernization. There are some essential challenges ahead of the common assets administration of the Hyrcanian forests which have many conflicts between including executive associations and regulations. So that, forest policy has been structurally shifted in policy sector, from private administration to governmental management. This paper has provided a literature review discussing the forest policy administration in Iran and its essential structural shifts during the last century as well as data collection from relevant governmental and private organizations.

Keywords: Iranian forests, Forest policy, Political power, Climate change adaptation.

INTRODUCTION

In global scale, forest management has been structurally shifted in policy sector from sustainable management in the seventies through livelihoods forestry in the nineties and to carbon forestry in recent years (Shivaramakrishnan, 2000; Yufanyi Movuh & Krott, 2011; Krott *et al.* 2013). In the meantime, forests of Iran have experienced a variety of intrusions. In May 1908, oil discovery in this country was the most remarkable economic outcome, impacting urbanization and deforestation rate (Aflaki, 2007). Although oil has provided a protecting buffer for forests, it has also caused urbanization and initiated some unwanted development plans which destroyed forests (Amirarsalani & Dragovich, 2011). The positive consequences of oil exploration included a noticeable boost on economic growth, health and education (Nassirpour 1985). Hyrcanian forests comprise the main sources of commercial timber, so one

of their generally noticeable utilizations is for timber extraction (World Bank 2012). In the 20th century, an organized modern forest management system was established for the first time with relevant laws and regulations in Iran. It began with establishment of the Bureau of Roads and Railroads and Forests, which later was renamed to the Bureau of Roads and Mines and Forests in 1916. Iranian government decided to survey and map the Hyrcanian forests, So, the Ministry of Public Benefits, Trade and Agriculture was established in 1917 by amalgamating several offices including the Bureau of Roads and Mines and Forests (FRWO 1988). An office in the north of Iran was enacted and foreign commissioners were trained to assess forests, to evaluate organizing national and private forest lands, as well as to identify both unspoiled and degraded forests (FRWO 1991). In 2002, the Northern office eventually turned into the current Forest, Rangeland and Watershed Organization (FRWO). The first

administration for forest policy - making was initiated in the early 1910s (Yachkaschi, *et al.* 2009). After that, a few number of environmental laws and natural resources regulations were determined in the late 1920s (Ayati, 2003). The first law for forest was enacted in 1943 followed by the Ghanoun-e-Hefazat va Bahrebardari az Jangalha in 1959 (FRWO 1996). In fact, formalizing forest management of Iran was a remarkable step for conserving remnant forests of this country. Unfortunately, the country was not able to apply up-to-date executive changes in laws and regulation. Thus, this situation is similar to many developing countries; e.g. India, UAE, and Iran (Shamekhi, 2011). During the eight-year war between Iran and Iraq (1980 to 1988), no significant changes were made to forest resource policies (Yachkaschi *et al.* 2009). In 1988, the Iranian Parliament passed an enactment by which "a seven-member board would be in charge for investigating the objections of farmers holding informal deeds, government institutions, and the owners of orchards and other installations located in forested lands outside the formal urban boundaries". Following the Law in 1992 on the Preservation of Iranian Natural Resources and Forests, Department of Environment (DOE) was legally empowered to hold portions of State-owned forest resources as environmentally protected areas where no timber harvest is permitted. In 2004, to involve local people in the prevention of further desertification in arid and semi-arid regions, the government stated that "the ecologically ready arid areas for plantation will be conditionally leased to the people who provided a feasible afforestation plan". Most forest territories of Iran are currently State-possessed, aside from a couple manors on private area (Yachkaschi, *et al.* 2009). The State part in forest administration has been characterized as "adjusting the utilization of woods assets for the whole country as potential stakeholders". State possession has served to control timberland use in the Caspian forests, where timber could be concentrated as per

endorsed forest management plans (FMPs). The State most huge commitment to forests has been in averting further woods corruption coming about because of such exercises as: (a) far reaching change of timberland area to other area employments, (b) deforestation or forest debasement including loss of biodiversity and (c) illegal logging. FRWO has implemented activities to prevent illegal logging in Caspian forests, and (directly or indirectly) prepared FMPs for Northern Iran. The plans are then implemented either by FRWO or by cooperatives or private entities (concessions) (Hess & Buys 2007).

There are numbers of driving factors in increasing misappropriation of Forest Lands and Resources (FLRs).

Population growth

From census operated in 1922, the population of Iran was reported to be approximately 7 million. This number reached to 19 million in 1957 (SCI, 1994), meanwhile at the moment it is estimated over 70 million (SCI 2014). Concerning to population pressures is ubiquitous in literature on deforestation, soil degradation, loss of biodiversity, threats to future peace and stability, food scarcities, global warming and underdevelopment. Many scholars focus on overpopulation when they analyze resource use (FAO 2007).

Development and technology enhancement

As an important milestone, in Amir-Kabir era, the formation of Darol-fonoun was notable. It was the first technical school of its kind, initiated great social and economic changes throughout Iran (Smith, 2000). Generally, the modern industrial civilization has created a form of life style, which through consumerism and conspicuous consumption, made the plundering of forest and nature a lucrative enterprise for the industrial capitalism (Ahmed 2002).

Traditional animal husbandry using understory vegetation

According to FRWO reports, 5.7 million livestock units are now settled in or close to the

Caspian forests. Of these, FRWO has plans to relocate up to 4.3 million units, while 600 000 units have already been relocated. Relocation of residents and livestock has faced many challenges, including the unsuitability of the new residential environments assigned to former forest dwellers, and that the villagers have sold most of the non-forest lands assigned to them, for house building. In spite of the large government credits issued for relocation, serious socio-economic issues have arisen, including cultural problems for the former forest dwellers settled in towns. Relocated livestock has not been organized (Shamekhi 2011). An extensive variety of perspectives were gathered, including those of woods groups, cooperatives, government woodland use organizations, commonplace normal asset workplaces (NROs), research establishments and scholastic characteristic of asset resources. Normal asset partners, including agents of the information sources, went to an acceptance workshop held by the study group (Yachkaschi *et al.* 2009).

Fuelwood collection and charcoal production

Forest dwellers use wood extricated from the timberland for fuel (particularly in winter). To control this, fines were presented for timberland occupants who surpass their yearly wood assignments from the State. Notwithstanding, the fundamental issue of determining woodland tenants' monetary issues (e.g., fuel supply) is by all accounts more essential (Karami 2007).

Conversion of forest lands

Although the administration has tried to clear up its responsibility for normal assets, clashes keep on emerging when distinctive government associations possess backwoods lands for their own particular purposes. Illustrations are the arranged development of a petrochemical takes a shot at around 200 ha of corrupted wood lands, and the late transformation of 7 ha of forests territory into a city waste landfill in eastern Mazandaran Province (individual interchanges with Mazandaran commonplace NRO and DOE).

In spite of the fact that land-use transformation of forests area ought to be entirely constrained, or even precluded, the customary (and still casual) privileges of backwoods occupants ought to likewise be all the more completely considered. Most land-use changes (especially in low-elevation territories) to plantations, ranches and paddy fields – which have brought about huge soil disintegration, substantial surges and environmental change in late decades – are at any rate mostly established in neediness (Yachkaschi *et al.* 2009).

Illegal logging

Owing to expanded interest for wood, unlawful logging has been a wellspring of salary for some nearby – and a couple non-neighborhoods – jobs in late decades. By official information, 2 million m³ of mechanical timber was lawfully extricated from the Hyrcanian forests in 2001, alongside an equivalent measure of illicit timber. In light of this issue, the government has presented a strict checking framework, chiefly through woodland insurance watches, and a system to guide wood imports into the nation. Be that as it may, the impressive decrease in legitimate wood harvests in the last couple of years (down to 900 000m³/year) appears to have expanded illicit logging. It in this way appears making stable pay hotspots for forest inhabitants (through NWFP use, forestry frameworks, and so forth.) and enhancing their financial conditions would be more gainful to country group improvement – and subsequently SFM – than group movement arrangements are. Such changes would likewise balance out the State responsibility for timberlands, accordingly reducing their transformation to other area use (Karami 2007).

This paper aims to illustrate forest land administration policy in Iran and Impact of regional political powers on forest management shifts in the country during the last century.

There is a solid verbal confrontation occurring among researchers about including power relations in forest policy analysis (Arts & van Tatenhove 2004; Hassanagas 2004; Krott 2005;

Giessen and Krott 2009; Krott *et al.* 2013). A few authors comprehend power as the capacity of a performer to impact different performers to accomplish a political result. They consider the performer as an article, which is incorporated into the strategy definition and usage process, where the plan and execution are considered as a consequence of performers' intercession. These performers can be people or associations (Krott *et al.* 2013).

MATERIALS AND METHODS

Iran covers approximately 164 million ha in central Asia. Most of the country is mountainous with a central plateau comprising steppes, semi-steppes and saline deserts. The phytogeographical regions that concern the flora of Iran are the following; the Irano-Turanian, the Saharo-Sindian regions and the Euxino-Hyrcanian Province of the Euro-Siberian Region (Sagheb Talebi, *et al.* 2014) which is illustrated in Fig.1. In the Northern Alborz Mountains and the Southern Caspian Sea area of northern Iran, original temperate forest cover constitutes a valuable natural heritage, featuring rich biodiversity and genetic variation (Yachkaschi *et al.* 2009). The case study is based on investigation of forest management information accumulated by official organizations. As most forest resources in Iran are State-owned, forest tenure data were collected from government management sections. The management units of FRWO provided most of the data, with additional inputs from the Department of Environment (DOE), forest use/management companies in the private and cooperative sectors, and environmental non-governmental organizations (NGOs).

An extensive variety of perspectives were gathered, including those of forest communities, cooperatives, government forest use companies, provincial natural resource offices (NROs), research institutes and academic natural resource faculties. Natural resource stakeholders, including representatives of the data sources, attended a validation workshop held by the study team.

Constitutional revolution of Iran

The Constitutional Revolution (1905-1907) permanently changed how the state would relate to the many ethno-national identities in the country. By formation of the first parliament and ministries in the country, the controversial subject of legislation and governmental administration of Iranian FLRs was gradually propounded (Shamekhi 2011). As the initial step, forests were literally targeted for legislation (Aflaki 2007). After revolution, most of FLRs were gradually shifted to agriculture fields meeting government policies (Shamekhi 2011). Therefore, many parts of the country (especially Hyrcanian forests) were subjected to different changes, specifically land use (Malekzadeh, 2004). Notably, before the revolution, main usage of forests was allocated to cattle grazing and, wood extraction mostly was not subject to attention (Shamekhi 2011). In contrast, at the moment policies were regulated by the government and enacted by Parliament. Forest management according to these policies was implemented by the relevant bodies, such as state companies, cooperatives, private sectors and forestry plan administrators (FPAs).

Constitutional amendment of Iran

In the early part of the 20th century, Iran had a centralized government, and in 1947 a system of development planning began as a series of seven-year cycles, focusing on accelerating economic growth by improving capital-intensive industries and replacing religious and social traditions with rapid modernization (Amirarsalani & Dragovich 2013). All six of Quinquennial Development Plans (QDP) preceding the modifications were aimed at economic development, and were fuelled mostly by the increase in petroleum industries. The constitutional amendment was an expansive arrangement of changes in Iran propelled in 1963 by Mohamad-reza Shah (Bayar 1994).

The amendment introduced novel economic concepts such as profit-sharing for workers and

initiated massive government-financed heavy industry projects, as well as the nationalization of forests and pastureland. Most important, however, were the land reform programs which saw the traditional landed elites of Iran lose much of their influence and power. Nearly 90% of Iranian share-croppers became landowners as a result (Abrahamian 2008). The constitutional amendment consisted of 19 elements that were introduced over a period of 15 years (Araghi 1989). One of the most important achievements of the constitutional amendment was land reform. The government bought the land from the feudal land lords at what was considered to be a fair price and sold it to the peasants at 30% below the market value, with the loan being payable over 25 years at very low interest rates. In short, it is widely claimed that land reform and subsequent policies resulted in rural-urban migration (in particular arid and semi-arid areas), and made the country dependent on food imports (Majd 1991). The economic success of land reform is indicated by the high growth rate of agriculture which was among

the highest recorded for a developing country (Majd 1991). Another notable element of the constitutional amendment was the Forest Nationalization Law (FNL). In fact, after a long period of diversified forest ownership and tenure (e.g., feudalism and forms of private ownership), forest ownership in Iran was transferred to the government following enactment of this law. The FNL introduced many measures, not only to protect the national resources and stop the destruction of forests and pasturelands, but also to further develop and cultivate them. During the third Quinquennial Development Plans (QDP) of Iran over 9 million trees were planted in 26 regions, creating 70,000 acres (280 km²) of "green belts" around cities and on the borders of the major highways. It was a major step in preserving the remaining forests (Ehlers 2001). According to notes 1 and 2 of FNL Article 2, "all the forests released to the individuals prior to the enactment will be considered as private properties which could be utilized only with the State permission. The government can also buy the above-mentioned lands".

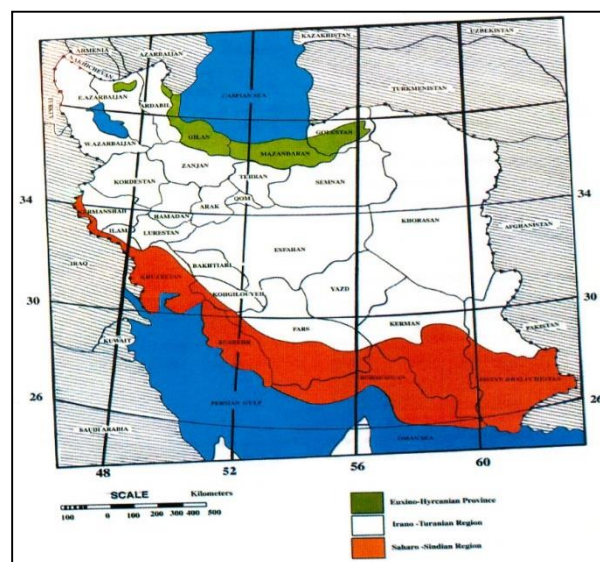


Fig 1. Three phytogeographical regions of Iran (adopted from Sagheb Talebi, *et al.* 2014) Note: the Euxino-Hyrcanian Province is green, the Irano-Turanian is white and the Saharo-Sindian Region is red.

Forest administrations and authoritative context in Iran

The National Environmental Protection Act (1974) established the DOE, which is one of the oldest

environmental authorities in Iran. The Act is the major law regarding environmental conservation in Iran; under the Act various carefully selected sites representing every

different major habitat in Iran have been put under protection (FRWO, 1988).

Article 45 of the National Constitution Public which indicates that property and assets - such as uncultivated or abandoned land, mineral deposits, seas, lakes, rivers and other public waterways, mountains, valleys, marshlands, natural forests, open pasture land, legacies without heirs, property of undetermined ownership, and public property recovered' from usurpers - shall be at the disposal of the Islamic government to be utilized in accordance with public interest. Detailed procedures for the utilization of each of the foregoing will be specified by law.

Article 48 of the National Constitution Public which determines that there must be no discrimination among the various provinces with respect to exploitation of natural resources, utilization of public revenues, and distribution of economic activities among the country different provinces and regions, so that every region has access to the necessary capital and facilities in accordance with its needs and potential for growth.

Article 50 of the National Constitution is the highest-ranking legal reference addressing environmental conservation in Iran. It states that 'The preservation of the environment, in which the present as well as the future generations have a right to flourish social existence, is regarded as a public duty in the Islamic Republic of Iran. Economic and other activities that inevitably involve pollution of the environment or cause irreparable damage to it are therefore forbidden.' (FRWO 1988).

National Biodiversity Strategy and Action Plan (NBSAP) (2006). The NBSAP focuses on linking research, uses and policies. It has four components: the promotion of public awareness and participation; the formation of biodiversity information systems; the sustainable use of biodiversity resources; and the integrated conservation of biodiversity (adapted from FRWO bulletin)

Cabinet Enactment of July 2001: the comprehensive plan for preserving northern forests (the Hyrcanian forests). This Plan described the facilities, credits and

qualifications required for plantation development. The plan stated the following: policy-making with regard to any land use that might incur land conversion or decline in forest area are under the responsibility of FRWO and the Supreme Council of Environmental Protection; FRWO, DOE and the private sector are responsible for preparing resource utilizing plans, protecting resources, organizing forest dwellers, relocating livestock outside forest boundaries, surveying and acquiring forest area deeds; FMP implementation is the responsibility of the State, cooperative and private sectors; FMPs must include increased local participation (Petroleum Intelligence Weekly 2003).

The Optimization Plan of Monitoring, Conservation and Exploration of Natural Forests of Iran enacted in 2013. The program includes ten principles, seven major criteria and eighty indicators of sustainable management. The protection of the environment has been addressed in this plan.

The Twenty Year Vision Initiative of Iran, incorporating the fourth and fifth QDPs, anticipates that by 2025 Iran will be the fastest progressing nation of the Middle East and South Asia in terms of the economy, science and technology; it will be fully advanced in terms of health, social welfare, judicial security, equal opportunities, equitable income distribution, a favorable living environment; it will be far from poverty, crime and corruption (Ministry of Economy and Financial Affairs 2010). *Conventions:* Iran is a member of the Convention on Biological Diversity (CBD), the Ramsar convention (which was hosted by Iran), the United Nations Convention to Combat Desertification (UNCCD), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), United Nations Framework Convention on Climate Change (UNFCCC), the World Heritage Convention (WHC) and the World Conservation Union (IUCN) (adapted from FRWO bulletin).

QDPs in connection to forest policy

In an alternate period of real changes in the public arena, the Islamic Revolution, which

occurred in the late 1970s, was promptly taken after by the Iran-Iraq war. The war kept going until the end of the 1980s and ingested national holdings while obliterating framework (Esfahani & Pesaran 2009). While the Iran-Iraq war negatively affected forests along the Western borders of the country, the rangelands along the Eastern areas were infiltrated by Afghan refugees who contributed to vegetation destruction in their search for firewood and shelter (UNDP/GEF, 2003).

The QDPs started in 1991 gave careful consideration to the preservation of nature as public assets. Insurance of nature's domain was highlighted as one of the most imperative parts in each of these arrangements and apportioned huge budgetary backing.

The Second QDP (1995-1999) expressed that all financial and social exercises must be performed inside the imperatives of natural and biodiversity protection and administration.

The Third QDP (2000-2004) tended to issues such as sustainable exploitation of natural resources, environmental liability and redress, support of green industries, and environmental impact assessment (DOE 2000).

The Fourth QDP (2005-2009) set stress on environmental conservation as a tool for attaining sustainable development (Amirarsalani & Dragovich 2013).

In light of the limitations of the previous development plans, the Fifth QDP for the period of 2010-15 focuses on socio-economic development through decentralization, encouraging private sector activities and the growth of cooperatives in construction, agriculture, animal husbandry, trade and services that enhance the economic development of the state and cooperatives.

The plan is part of Vision 2025 (National Outlook of 2025), a strategy for long-term sustainable development.

Forest plantation in Iran

Planting of tree species in order to product wood and fruit has been started from arising of civilization in Iran. Generally, plantations have been established to meet local needs.

Formulation of FMPs or these areas have been commenced since 2003. In Hyrcanian forest, the policy targets to forest promotion.

Thus, some highlands of this region were allocated to afforestation each year (Yachkashi 2006). By development of civilization in Iran, trees were aimed to be planted for different purposes.

The first afforestation was carried out in coasts of Persian Gulf during the World War I (1914 - 1918) (Ayorlo 2003).

After foundation of the Afforestation Office in 1948, planting of various woody species was begun in different parts of country (Moslehi 1964; Hedayati 2001). The first considerable afforestation of coniferous species was carried out in 1960. Before Islamic Revolution of Iran (1920-1979), the total area of afforested lands in northern and other parts of the country was reported to be 29400 ha and 13300 ha, respectively. After the Revolution, afforestation activities were stopped for a four-year period. During the QDPs, the total area of afforested lands was changed (Fig. 2). The activities of private landowners (of plantations) were liable to government policies, and private landowners were excluded from policy - making processes. This factor discourages private forest plantation in Iran, which now covers only 310568 ha according to official data of FRWO. As a result of losing ownership and usufruct rights, the FPAs lost interest and sense of responsibility towards sustaining and protecting forests and rangelands, used since without restraint to face growing demands that came with population growth (Carle *et al.* 2003). Formulation of FMPs or these areas have been commenced since 2003. In Hyrcanian forests, the policy targets to forest promotion. Thus, some highlands of this region are allocated to afforestation each year (Yachkashi 2006). At the moment, the annual rate of forest plantations establishment is 63000 ha, the majority being implemented under governmental investment.

Deforestation in Iran

Deforestation is the conversion of forested areas to non-forest land through cutting,

clearing, and removal of forest or related ecosystems into less bio-diverse ecosystems such as pasture, cropland, or plantations, urban use, logged area, or wasteland (Kricher 1997; Sten 1995). Forest degradation and deforestation are closely related together, as both can cause each other.

Therefore, in many cases, there is a common cause, immediate or final, for both variables (Kaplan *et al.* 2009; Amirarsalani & Dragovich 2013).

The destruction of forests began from the formation of early civilizations (Lahiry 2002). FAO made a global assessment of 179 countries in 1990 and found that forest land constituted slightly over 3,400 million ha or %27 of the land area.

Forests of the developed regions represented 42% of the total global forest area compared to 58% of the underdeveloped regions (FAO 1995). In Iran, the presentation of forestry management policies in the twentieth century concurred with a time of serious consumption in woods. This over-utilization resulted from

tree cutting for road construction, the establishment of sawmills and match factories, and in particular, the growing demand for charcoal and fuel wood for a rapidly increasing population (Amirarsalani & Dragovich 2013). Iran, in the same way as other different nations, has encountered vast scale deforestation. General estimation of the disturbance cost from deforestation in Iran was equivalent to 0.8% of the country annual GDP in 2002 (World Bank 2005) and 1.4% of GDP in 2010 (World Bank 2012). Desert areas in Iran are expanding by the rate of approximately 3 meters per second (Aflaki 2007).

There is undoubtedly deforestation in Iran started in ancient times (Kaplan *et al.* 2009).

The annual rate of decrease in forested areas in Iran has been lower than the overall rate (Table 2), actually amid the periods when the country had encountered the most exceedingly awful deforestation (1850-1980).

Obviously, deforestation in this decay matched with gigantic and phenomenal demographic, social and monetary movements.

Table 2. Annual rate of deforestation in Iran.

World/country	Period ^a	Total forest lost (m ³ ha ⁻¹) ^a	Total years	Average annual decline (m ³ ha ⁻¹) ^b	Average annual decline (%) ^c	Annual decline per capita (ha) ^{b, d}
Iran-1	1850-1980	24.29	130	0.19	0.78	0.01
Iran-2	1980-2000	4.00	20	0.20	1.25	0.07
Iran-3	2000-2010	2.67	10	0.72	1.59	0.17

Notes. This Table is derived from Amirarsalani & Dragovich (2013), but data of the "Iran-3" is provided in current study. For Iran-1, population with an average of 14.35 million, for Iran-2, population with an average of 54.41 million and for Iran-3, population with an average of 70.11 was presumed using different sources; N/A: Not available. Source: ^a Williams, (2006); Arian *et al.* (2007); Kaplan *et al.* (2009); FAO cited by Lipper, (2010); Amirarsalani & Dragovich (2013); FRWO (2013); ^b Mostly calculated by authors; ^c for 'Iran', Average annual decline (%) = (average annual area of forest lost/average forest area) × 100; ^d For tropical forests in the world, a constant population of 300 million (Lipper 2010) was assumed.

Forest Utilization in Iran

Official intensive exploration of forests in Iran returns to Qajar dynasty. In 1872, Reuter's patent deal was signed between Baron de Reuter and Qajar government. In accordance with this privilege, any developing operations throughout the country such road and railway, dam, water channels, aqueducts and canals for shipping or agriculture, banks and industrial companies, monopoly welfare work, forest utilization for a period of 70 years, use of

customs for twenty-five years and exploitation of mines (except gold and silver) was committed to Reuters in return for the installment of two hundred thousand English pounds and addition 5% (Clay 2006). In 1876, in return for 0.5 Million Rials, benefits of forest harvesting in Guilan Province was exchanged to the Russians for two years. In 1913, the forests of Astara region (Guilan Province) were leased to a Greek logging contractor. Meanwhile, the forests of Talesh area (Guilan

territory) were rented to French and Swedish logging contractors.

After expiration of contract, the Swedish company gained logging authorization of the Boxwood (*Buxus hyrcana*) in Mazandaran Province for three years; logs were transported to Russia. Gradually, foreign contractors were replaced by local contractors. Since 1921 with construction and development of the national railway and urgent need for traverse, activities of local contractors were extraordinarily extended. Due to lack of forest roads in northern forests of Iran, most harvesting activities were concentrated around the national roads and low land regions; subsequently, notable areas of plain forests particularly in Mazandaran Province were destructed. The history of logging in Hyrcanian forests can be divided into following three stages:

i) Wood for fundamental needs (1848-1878) by the time, forest was targeted for basic needs (e.g. building construction, heating and etc.) (Aflaki 2007).

ii) Logging for commercial export (1879-1925) one of the most important tree species was Boxwood transported to Russia and different parts of Europe. At that time, the prevailing attitude on Iranian forests was to extract more volume of timber with no forest development (i.e. afforestation and reforestation) in perspective. Inappropriate tree harvesting methods were employed and clear-cutting system was operated in vast areas of Mazandaran and Guilan provinces which led to tremendous damage to the Hyrcanian forests and profoundly destruction of some elite woody species (e.g. Boxwood).

Totally, despite the adverse contracts, more wood export, the more valuable it became. Gradually, foreign companies were deprived and it was a notable beginning in intellectual independency and enhancing technical knowledge of forest science in Iran (adapted from FRWO bulletin).

iii) Official logging after enactment of FMPs (since 1959 to date) A law of 1959 stipulates that this must follow approved FMPs, which are

arranged by FRWO's technical office or by private advisors under FRWO's administration, as indicated by Terms of Reference (TOR).

Throughout the previous 20 years, generally FMPs have been arranged by private counseling organizations, but FRWO holds the overall responsibility, providing TORs, supervision and control, and approving the forest management booklets (FRWO, 2013). Growingly, many FMP executive companies were structured. Logically, many traditional harvesting methods were shifted to industrial procedure. The entry of forest harvesting machines and construction of forest roads and networks and regulating different management and trade units in forest sector providing various timber products are some instances of this stage.

Table (3) shows the proportion of the workforce employed in the forest sector in Iran. Based on Table (3), it is obvious that the formal forest sector employs relatively few people in Iran. Meanwhile, the contribution of the sector to GDP is quite low as well. Fig. (3) Shows the total volume of domestic wood production of commercial forests of Iran from 1979 to the date.

It is evident that the total amount of domestic wood production in 1990s was high. In the early 1990s, the QDPs initiated including development of roads, dams, businesses, extension of oil and gas refineries and systems, advancement of correspondence frameworks to urban and rustic regions, and misuse of mineral assets.

The total demand of wood in Iranian market is illustrated in Fig. 4. It was assumed that total demand of wood is based on equation (1):

$$Y_d = X_i + X_e + X_p \quad (1)$$

Where Y_d is total demand of wood, X_i is amount of imported wood, X_e is amount of exported wood and X_p is total production of domestic wood.

The amount of exported wood is included in equation (1), because it is eventually considered as a partial demand in the wood market of Iran.

Table 3. Contribution of the formal forest sector to employment and GDP, 2013.

Country	Employment				Gross value added					
	Roundwood production	Wood processing	Pulp and paper	Total for the forest sector	Roundwood production	Wood processing	Pulp and paper	Total for the forest sector		
	(1000)	(1000)	(1000)	(1000)	(US\$ million)	(US\$ million)	(US\$ million)	(US\$ million)	(% of total labor force)	(% contribution to GDP)
Iran	6	10	19	35	0.1	429	295	473	1197	0.2

Notes. This table is derived from (State of the World's forests FAO, 2014).

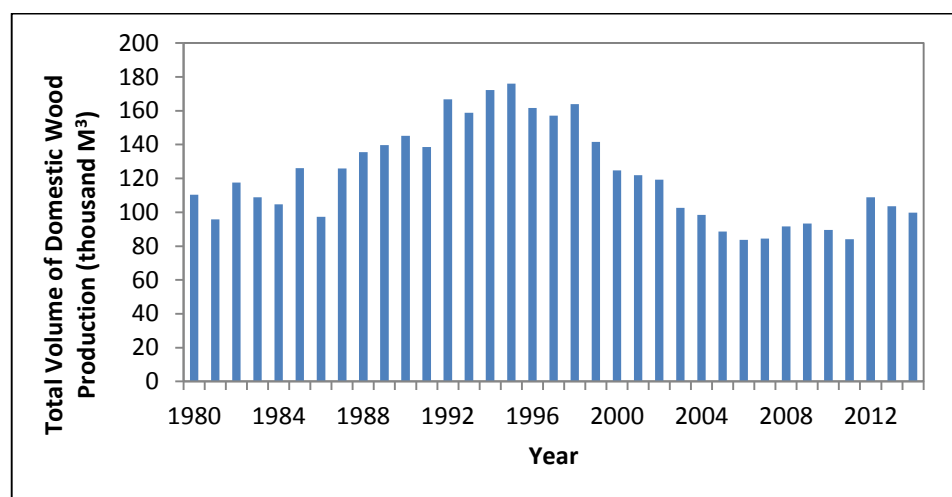


Fig 3. The total volume of domestic wood production of commercial forests of Iran

Note: The data is provided in current study. Source FRWO (2014).

Forest cover changes in Iran

Forest area is an important indicator of the relative essentialness of forests in a country or district, can typify these functions (Xisheng *et al.* 2014). An undeniably number of studies have been dedicated to investigating land use/cover changes (LUCC) and their related effects on the nature's domain (Islam and Weil 2000; Burnside *et al.* 2003; Ramdani & Hino 2013). The recovery of landscape functions in these new ecosystems is currently debated, as recent studies have shown that the impact of land use transition on ecosystems depends on the existing land cover prior to the transition and on the land covers type established during the transition (Farley 2010; Hall *et al.* 2012). In the study of Gholamalifard *et al.* (2012) on land cover changes of forests and coastal areas of Northern Iran between 1988 to 2010 it was revealed that 33487 ha of forests was reduced, while 21367 ha of agricultural lands were expanded. Development of urban areas was increased to 14925.69 ha (Table 4).

Between 1960 and 1980, consumption of natural gas increased slowly, but in the decade after 1980 there was a sharp, six-fold acceleration in the use of natural gas (Fig. 4). Estimated forest cover had fallen rapidly over the decade to 1980, associated with a marked rise in population growth. After 1980, the substitution of fossil fuels for forests led to a levelling off in the rate of decline in forested areas. If oil had not been discovered in Iran, considerably more forest would have disappeared in the process of supplying fuelwood for a growing population. Taking 300 m³ per acre (approximately 4,050 m²) as an average density for hardwood forests (Williams 2006), we applied similar rates of wood consumption to Iran. Using a spreadsheet and considering population numbers from the 1850s onwards, we employed a presumed Brazil per capita coefficient of 0.32 for the period of 1850-1930 and a USA per capita coefficient of 1.24 for the period of 1931 onwards. This combination of values for per capita wood consumption in

Brazil and the United States produced a forest cover figure close to the substantiated figure in 1980, giving an estimated 20 million hectares of forest, which was a more conservative result than the 18 million hectares mentioned by Bahrainy (2003) for 1980.

The procedure adopted thus provided acceptable estimates. Even in this conservative scenario, the authors' calculation suggests that Iran could have lost all forests by 2000 if oil had not been discovered and used as an energy source (Fig. 5).

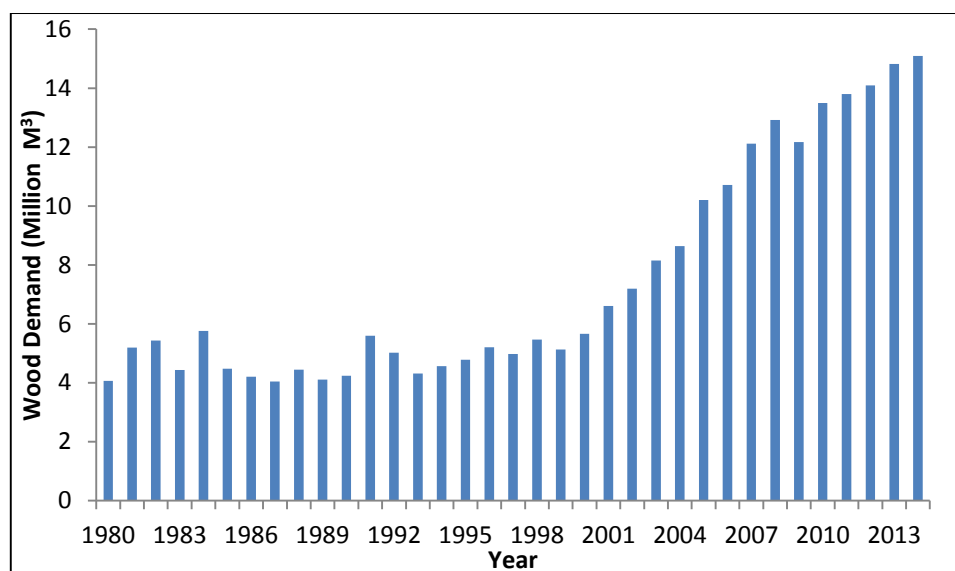


Fig 4. Total demand of wood in Iranian market.

Note. The data is provided in the present study. Source FRWO (2014).

Table 4. Land cover changes of Northern Iran.

Land Type Year	Area (ha)				
	Forest	Agriculture	Urban	Wetland	Open Area
1988-2001	263540.4	320920.1	11110.5	935.6	14673.6
2001-2006	255878.4	374413.5	13316.4	792.2	13480.2
2006-2010	257165.6	350228.3	14925.6	692.3	12720.1

Iran's forest ecosystem goods and services

Forest ecosystem goods and services, and the natural capital stocks that produce them, make significant direct and indirect contributions to national economies and human welfare. There have been many attempts to value these contributions. Literature that definitely links health concerns directly to the adaptations of forests to climate change does not appear to be

available. Some inferences and predictions could however be made from the work of Few (2007) on the health aspects of natural climate disasters, or the discussions of Molyneux (2003) on how a lower biodiversity leads to an increase in the 'generalist' vectors commonly associated with diseases. Tables 5 and 6 illustrate the valuation of forests goods and ecosystem services of Iran, respectively.

Table 5. The valuation of forests ecosystem goods of Iran (FRWO, 2013).

Indicator	Unit	Amount	Value (US\$ billion)
Tree volume of Northern parts of the country	M ³ ha ⁻¹	397	29775 * 10 ⁴
Tree volume of other parts of the country	M ³ ha ⁻¹	249	1245 * 10 ⁴
Edible wild plants	Ton	143000	7015 * 10 ⁴
Medical plants	Ton	357500	17875 * 10 ⁴

Note. The values are provided in "US\$" considering official currency converting of "1 US\$ equals 29,600 Rial" announced by Central Bank of Islamic Republic of Iran in 2013.

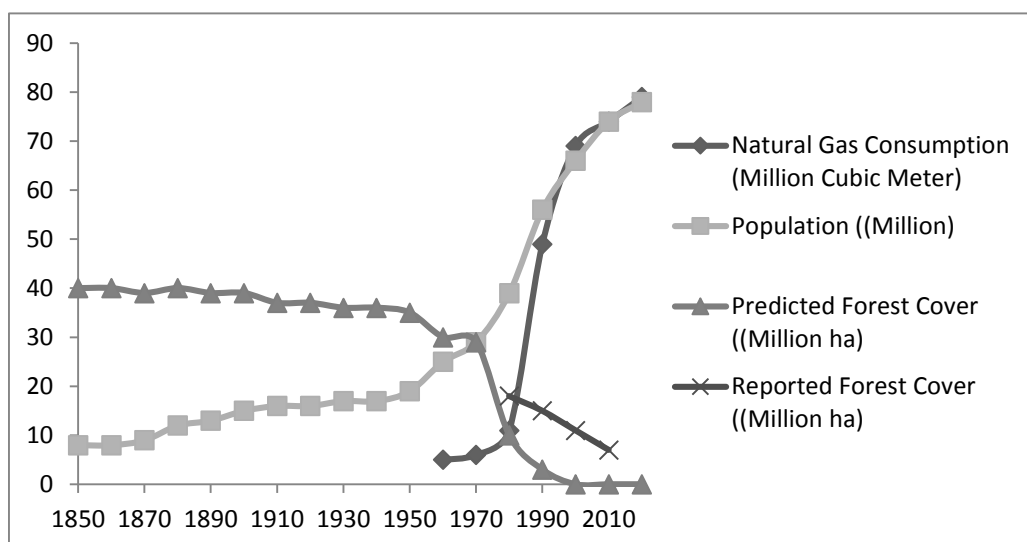


Fig 5. Interaction between population increase and the decrease of forest cover between 1850 and 2010 in Iran.

Note. The predicted forest cover line is predicted forest cover if oil had not been discovered. Source: for population: Nashat (1981); Fanni (2006); Hakimian (2006); for reported forest cover as the only available data: Bahrainy (2003); Amirnejad *et al.* (2006); Kaplan *et al.* (2009); and for natural gas consumption (million barrels of oil equivalent): Hessari (2005).

Table 6. The valuation of forest ecosystem services of Iran (FRWO 2013).

Indicator	Unit	Amount	Value (US\$ billion)
Carbon sequestration	Million ton	795	254202 * 10 ⁴
Pollination	Ton	23008	263201 * 10 ⁴
Flood control	Million ton	253	1336 * 10 ²
Hydrological flow regulating function	Billion M ³	82	18811 * 10 ³
Soil erosion control	Ton	1128000	6032 * 10 ²
Soil production	Million ton	53	213434 * 10 ²
Ecotourism	Million	27	16016 * 10 ³

Note. The values are provided in "US\$" considering official currency converting of "1 US\$ equals 29,600 Rial" announced by Central Bank of Islamic Republic of Iran in 2013.

Adaptation of forests of Iran to climate change

The possible impacts of climate change on forests and the forest sector are considerable, and many impacts have already been observed (Zheng *et al.* 2006). As forest conditions change, there is an inherent need to change management and policy measures to minimize negative impacts and to exploit the benefits derived from climate change (Eastaugh 2008). Several aspects of contemporary forest management and policy can be viewed as adaptations to climate (Spittlehouse 2005). However, local forestry practices are often based on an implicit assumption that local climate conditions will not change (Guariguata *et al.* 2007). Policy programs and instruments concerning the adaptation of forests to the predicted impacts of climate change aim at

enabling forest managers to take appropriate actions in time to ensure sustainable forest management (SFM) under the changed conditions of global warming. The information presented in the following indicates existing trends in management and policies for promoting the adaptation of forests and the forest sector to climate change. The information is based on post-2004 national communications (NCs) and National Adaptation Programs of Action (NAPAs) produced for the UNFCCC (United Nations Framework Convention on Climate Change) (Roberts 2008). Hyrcanian forests of Iran may be situated in the class of "Temperate Domain", thus the management techniques outlined in the NCs concern mainly the formation of more stable forests in the face of climate change. Close to nature forest management and a move away from

monocultures toward mixed forest types, in terms of both species and age classes, are advocated. In addition, natural or imitated natural regeneration is indicated as a method of maintaining genetic diversity, and subsequently reducing vulnerability. For management against extreme disturbances, improvements in fire detection and suppression techniques are recommended, as well as methods for combating pests and diseases. It is reported that through stricter quarantine and sanitary management, the impact of insects and diseases can be minimized.

The adaptation policy options identified in the NCs are largely concerned with increasing the resilience of forests to climate change, through forest expansion, SFM and forest protection, although these are often secondary impacts of the policy, with mitigation being the primary objective.

The policies that were introduced concerning adaptation of forests and the forest sector are often reactive and form parts of national forest program (NFPs) or rural development programs.

Regulatory instruments: Strengthening national forest laws or equivalent processes aiming at SFM, and subsequently adaptation, is commonly referred to throughout the NCs. This includes the protection of forests and forest genetics as well as the setting of performance guidelines for forest management. Also reported is in-situ conservation and protective legislation against deforestation.

Economic instruments: Economic instruments, such as grants, subsidies and compensatory payments are used to promote afforestation, changes in species composition and recovery from extreme disturbances. Voluntary forest certification systems such as the Forest Stewardship Council (FSC) and Program for the Endorsement of Forest Certification schemes (PEFC) are also used for providing financial incentives for SFM, and subsequently adaptation. *Informational instruments:* NFPs are a common mechanism for promoting the adaptation of forests to climate change. They

provide foresight to the future climatic conditions and planned as well as reactive adaptation. Furthermore, dissemination of information concerning the likely impacts of climate change, the economic and financial implications of adaptation measures, as well as guidelines for adaptation and assessing climate-change impacts and adaptation options, are portrayed as invaluable instruments when dealing with climate change. National monitoring and research programs targeting the impacts of climate change support the national strategies.

DISCUSSION AND CONCLUSION

Iran has a long history of utilizing natural resources, stretching back for about 10000 years (Gholamalifard *et al.* 2012). World per capita share of forests is about 1.1 ha while is less than 0.5 ha in Iran (Abdullahpour & Asadi 2001) indicating the prevalence of desert and semi-desert conditions in Iran. Only a limited area (27.6%) of this vast land is covered with forests (Sagheb Talebi *et al.* 2014) which may be due to two significant factors : first, the natural limiting factor that arises from situation of Iran on the globe and second, the human factor that adds to this limitation by conscious or unconscious actions (Abdullahpour & Asadi 2001). The conditions concerning the destruction of forests in Northern Iran would be more clearly understood if we consider that every second 300 m² is added to the area of Iranian deserts. On the other hand, an area about 310,000 ha of forests is destroyed annually (FRWO 2013). The environmental and social consequences of deforestation are innumerable. At the moment, during the Fifth QDP the project of Tehran-North road, for instance, is one of the most controversial environmental issues in Iran. Its main aim is to link Tehran to the northern part of the country with a motorway (Aflaki 2007; Iran daily paper 2007). In addition to forest destruction, this project has caused land degradation and other environmental problems such as disposing construction debris into rangelands, altering the Chalus River canal, as well as wastewater flowing into adjacent rivers (Iran daily paper

2007). Illegal tree cutting is still common in many timberlands with an expected collecting of 2 million m³ for every year (Arian *et al.* 2007). Improper enforcement of FMPs as an alternate ecologically issue has many executive conflicts between associations and regulations (e.g. Ministry of Industries and Mines, Ministry of Agriculture Jihad, FRWO, DOE and etc.). Recent internal migration patterns (rural to urban and urban to urban) as a consequence of population growth, fast industrialization and urbanization have likewise expanded the estimation of area and structures, luring the unlawful occupation of national grounds over the Hyrcanian forests. Not shockingly, some home - builders have obliterated FLRs to build houses and organizations. Despite the fact that there are no national facts accessible for transportation of Northern forests to urban area land-uses (Aflaki 2007). Expansion of agriculture is also exerting more pressures on the Northern forests which, with the exception of small patches of natural habitats, have been converted into agricultural use, mainly for rice culturing, tea plantations, as well as citrus and kiwi orchards (Amirarsalani & Dragovich 2013; Ramezani *et al.* 2008). Fire has additionally helped the debasement and annihilation of forests. Based on the data from FRWO, in recent years from 2009 to 2016, over 11000 fires have taken place which caused more than 125000 ha loss of forests and rangelands in the country (DOE 2016). One of the essential challenges ahead of the common assets administration of the Hyrcanian forests in the previous decade was the vicinity of over 5797000 animal husbandry farms which work in 33107 units inside 3401 cultivated lands at the woodlands of this region (Riyazi 2000; Khadem 2001; Shadi Talab 2001). To perform this national program, different techniques have been employed, for instance, purchasing the cattle, shifting lands in harmony with the size of pasture delivered, initiating industrial animal husbandries and employment of the animal keeper and their household members. Generally, it seems the plan is not effectively done. In accordance with the reconstruction of socio-economic structures

of the local communities inhabiting in FRLs in the northern parts of Iran and in order to have a successful implementation of national project along with facilities given to the permanent residents of these areas to organize their livelihood from animal husbandry and for the purpose of decreasing their dependence on marginal forest sources of the villages in the depth of forest, it is necessary to identify the potentials for developing employment in coordination with the respective bodies (Alipour-Nakhi, *et al.* 2009). Oil has permitted forest administration strategies to turn out to be more powerful by diminishing the vitality created weights on forest utilization. As a major consumer of forest resources, firewood and charcoal production has become an increasingly less significant cause of deforestation, giving conservation and reforestation programs a much greater chance of success. Furthermore, over 1 million domesticated animals have been replaced outside the forested regions. Alongside the decrease in fuel wood request, genuine arrangement and execution endeavors towards building up and keeping up woods estates in different parts of the country are sure signs for the eventual fate of over-misused ranger service assets in Iran. As conclusion, providing greater participation of local people may improve forest management. A land - use planning and development system with its own council is also required in order to ensure proper planning and sustainability via decentralization and the equitable distribution of resources and opportunities. Another requirement was that, in order to improve decision - making and inter-sectorial coordination in rural areas and to reduce inequalities between cities and rural areas, the government should: (i) create an inter-sectorial structure for integrated management of rural and nomadic areas; (ii) improve rural development indicators; (iii) support the development of small and medium - sized industrial enterprises in rural areas; (iv) support micro-financing systems in local areas and establish a small-loan banking system that

supports rural development (DOE 2016). For the case of adaptation of forests to climate change, Mapping of areas and forest types which are sensitive to climate change and carrying out risk assessments are also reported as steps to promote adaptation.

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نقش قدرت سیاسی در اداره امور جنگل در ایران

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چکیده

مساحت جنگل‌های ایران حدود ۱۲/۴ میلیون هکتار معادل ۷/۵ درصد مساحت کشور می‌باشد. پس از ملی شدن جنگل‌ها و مراتع در سال ۱۳۴۱، تمامی عرصه و اعیان جنگل‌ها در اختیار دولت قرار گرفت و قانون اساسی جمهوری اسلامی ایران نیز بر آن صحنه گذاشت. با توسعه شهرنشینی، فشار بر جنگل‌ها بطور چشمگیری افزایش یافت. برنامه‌های پنجساله توسعه اقتصادی، اجتماعی و فرهنگی جمهوری اسلامی ایران، در سال ۱۳۶۸ با تأکید بر حفاظت از دارایی‌های طبیعی عمومی ایران شروع شد. یکی از اهداف مهم، ایجاد رشد اقتصادی در جهت افزایش تولید سرانه، اشتغال مولد و کاهش وابستگی اقتصادی با تأکید بر خود کفایی بخش کشاورزی و منابع طبیعی بود. پیشنهاد تغییر روند بهره‌برداری چوب از جنگل‌های شمال کشور در پیروی از سیاست‌های نظام جمهوری اسلامی در جهت تحول مدیریت منابع طبیعی، به عنوان یکی از تحولات اساسی در ساختار و مدیریت حوزه منابع طبیعی و نوعی تغییر خط‌مشی مهم در اداره جنگل‌ها محسوب می‌شود. در این تحقیق، ابتدا به مطالعه منابعی که در مورد سابقه مدیریت جنگل و تغییرات اساسی آن در قرن حاضر است پرداخته شده و سپس آمار و اطلاعات از نهادهای دولتی و خصوصی جمع‌آوری و تحلیل شده است.

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