

**Freie Universität Berlin**

Department of Political and Social Sciences

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**Role of Governmental Policies in Forest Degradation and Sediment  
Transportation to the Caspian Sea**

**A Dissertation**

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## **Preface**

Deforestation in Iran has been more rapid in the past 50 years than at any time in Iran's history. Forests play a vital role in sustaining water resources and aquatic ecosystems. Forest disturbance, both natural (e.g. wildfire, insects, disease, windstorms, drought) and human (e.g. timber harvesting, land conversion) caused, can have a profound effect on hydrologic, geomorphic and ecologic processes. With climate change, natural disturbances are becoming more frequent and catastrophic. This, together with growing human disturbance, will undoubtedly affect water resources and consequently have significant implications for land managers and policy makers. Intensive cultivation and mismanagement have caused environmental problems and soil degradation. Soils which developed under natural forests in north Iran have been degraded by land-use changes. Forests protect water quality by slowing runoff, stabilizing soils and filtering pollutants. Conversion of forest land to other uses interrupts these natural processes and increases the potential for water quality impairment. Since soil erosion and sediment redistribution have implications for both soil and water resources, and scientists have established that the movements of soil, sediment and water are intrinsically linked, it is critical to implement integrated resource protection strategies. Erosion, transport and sedimentation processes gain increasingly importance in socio-economic and ecological respect. In this research land use, land cover maps were prepared, using satellite imagery and aerial photos during the last 50 years. The rate of land use changes was compared with rate of sedimentation. Parallel with this work forest policy in Iran during different development plans using policy cycle method was analyzed and actors were recognized. Then the policies in development plans before and after Islamic revolution compared with prepared maps, results showed that government development plans didn't apply according to the program and forest degradation and consequently sedimentation was increased in study area during the time.

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## List of Abbreviations

AEOI	Atomic Energy Organization of Iran
AFC	advocacy coalition framework
AHP	Analytical Hierarchy Process
CBD	Conservation of Biological Diversity
CBO	Congressional Budget Office
CEP	Caspian Environment Program
CITES	international conventions including Biodiversity
CPPNF	Comprehensive Plan for Preserving Northern Forests
COED	Organization for Economic Co-operation and Development
CPPNF	Comprehensive Plan for Preserving Northern Forests
CRTC	Caspian Regional Thematic Centers
DOE	Department of the Environment
DWPA	Department of Women and Pastoral Affairs
EPI	Environmental Performance Index (EPI)
FAO	Food and Agriculture Organization
FDC	forest dwellers' cooperatives
FMP	Forest management plans
FOWECA	Forestry Outlook Study for West and Central Asia
FNL	Forest, Nature and Landscape
FRWO	forest rangeland and watershed organization
FTO	Forestry Technical Office
FYDP	Five Year Development Plans
GEF	Global Environmental fund
GIS	geographical information system
HCE	High Council for the Environmental
HTIO	Harvesting and Timber Industries Office
IFF	Intergovernmental Forum on Forests
IPF	International panel of forestry
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature and Natural Resources

LFCC	low forest covers country
MAI	Mean Annual Increment
MCDM	multi criteria decision making
MCC	Money and Credit Council
MOJA	Ministry of Jihad and Agriculture
NAB	Nomadic Affairs Bureau
NWFP	North Western Frontier Province
NAP	National Action Program
NCSD	National Committee on Sustainable Development
NCAP	National Caspian Action Plans
NRO	Natural resource offices
NGO	Non-governmental organizations
EIA	Environmental impacts assessment
OPRC	Operational Procurement Review Committee
PAA	policy arrangement approach
PCU	Project Coordination Unit
PPO	Plantations and Parks Office
RIFR	Research Institute for Forest and Rangelands
SAP	Strategic Action Program
SFM	Sustainable forest Management
SMCE	spatial multi criteria evaluation
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
VA	voluntary agreements
WWII	world war 2
WIPO	The World Intellectual Property Organization

## 1. Introduction

However, several current processes are contributing to an alarming deterioration of Iran's natural environment. Iran faces threatening prospects of diminishing basic natural resources – most critically, its soil and water resources. Soil loss is caused primarily by the salination, sedimentation and erosion of the soil, desertification, deforestation, poor land-use management, and overgrazing. With an average annual precipitation of 250 mm, Iran faces serious water shortage, which is becoming more severe with rapid population growth. The agriculture sector consumes over 80% of the water share, drinking, industrial and environment sectors count for less than 20% of the freshwater consumption. Moreover, water allocation in rural areas is not based on actual demand, therefore often resulting in further waste of water. Inappropriate agricultural practices such as low efficiency irrigation methods, land-use conversion and livestock policies further aggravate environmental deterioration in rural areas. Moreover, illegal extraction of sand and gravel from river beds for use as construction material is causing enormous damage to river beds and provoking landslides. (UNESCO,2010)

The Caspian Sea is the world's largest lake in terms of both area and volume. Being the largest lake in the world, it has some important characteristics pertaining to sustainable development. Biodiversity in the region is significant; Water resources, substrate minerals and petroleum and gas reservoirs are concentrated around the coasts of the Caspian Sea. Considerable quantities of sediment materials have been released into the sea and hydrological cycles have caused some irreversible damage to the life-cycle/environment through the increase of human activity. Rivers, in particular, have accelerated the rate of pollution because they receive various sources of pollutants from industrial, agricultural and suspended materials, which are then transported to the sea. These pollutants have a drastic effect on coastal land form, the habitat, and the environmental value of the Caspian Sea, in turn, threatening sustainable use and development. Considering that the Caspian Sea is an integrated ecosystem, disregarding such vital issues could be detrimental to additional environmental values and benefits that the Caspian Sea has to offer. (Caspian Science Network, 2003).

Identifying and tackling these problems serves to shift the focus to developing a

long-term conservation strategy for sustainable use in the Caspian Sea region. Such objectives, however, can only be met by integrating local policies of bordering countries in the region by implementing coherent and effective management strategies and programs.

Flooding has increased during recent decades in Iran. The number of floods recorded in the 1980s and 1990s is more than five times the number recorded in the 1950s and 1960s. Poor land use management and Deforestation can contribute to increases in the frequency and intensity of floods. Clearly identifying causes of floods is very complex and allocating a damage cost to the responsibility of manmade activities in flood occurrence is difficult. However, it is believed that the dramatic increase in the number of floods over the last three decades is closely related to increased deforestation, which took place over the same time period. Assuming that four fifths of the increase in floods is related to manmade activities would result in annual damage costs estimated at about US\$150 million (equivalent to IRR 1,190 billion or 0.13 percent of GDP).

### **1.1 Deforestation and forest degradation**

With 8,200 plant species, of which 1,900 are endemic, Iran is considered a unique country in terms of its plant diversity and genetic reserves. Climate diversity makes the country's forests heterogeneous, providing a wide range of benefits. Despite these benefits, Iran's forests have been severely degraded during the last half century. Forest clearing for agriculture, firewood and charcoal production reduced drastically the forest area. Overgrazing and over hunting are believed to be responsible for decreasing forest quality. According to data for the Forest, Range and Watershed Organization, cost of natural resource degradation is predominantly from land and forest degradation. Cropland salinity as well as rangeland, wetland and forest degradation and increased occurrences of floods due to soil erosion all have significant economic impacts. With regard to waste and coastal zone Degradation, time and data limitations have prevented an in-depth estimate of these two sectors. Potential damage from suboptimal disposal of hazardous waste has not been included in the analysis. The assessment of coastal zone degradation is limited to fishery losses along the Caspian Sea. These two sectors would clearly benefit from a more thorough analysis in the future. The loss of vegetation on the sloped areas commonly results in soil erosion and an overall reduction in vegetation coverage,

as well as in changes to the vegetation composition. Thorny shrubs, dwarf-shrubs and thorn-cushions increasingly dominate plant communities as species that can better withstand grazing and pruning gain a selection advantage (Frey & Probst 1986).

Erosion and sedimentation, particularly from dry land agriculture, are a major source of water-quality problems. Sedimentation provides a vehicle for the transport of agricultural chemical residues into the canals, streams, rivers and eventually the Caspian Sea. Through general observation from the different regions, it became apparent that the environmental impact of soil erosion and related nutrient transport is considerably high and that fish communities of rivers, and specially the Caspian Sea are certainly affected by chemical contamination originated from the region's farmlands. Poor land use management and deforestation can contribute to the frequency and intensity of floods. An exceptionally rainy period can result in more flooding due to changes in land use. Iran's forests have been severely degraded over the last decades. Forest clearing for agriculture, firewood and charcoal production reduced forest area from 19.5 million hectares to 12.4 million hectares over the last 57 years. Vegetative cover is one of the major factors influencing the degree of soil erosion and floods.

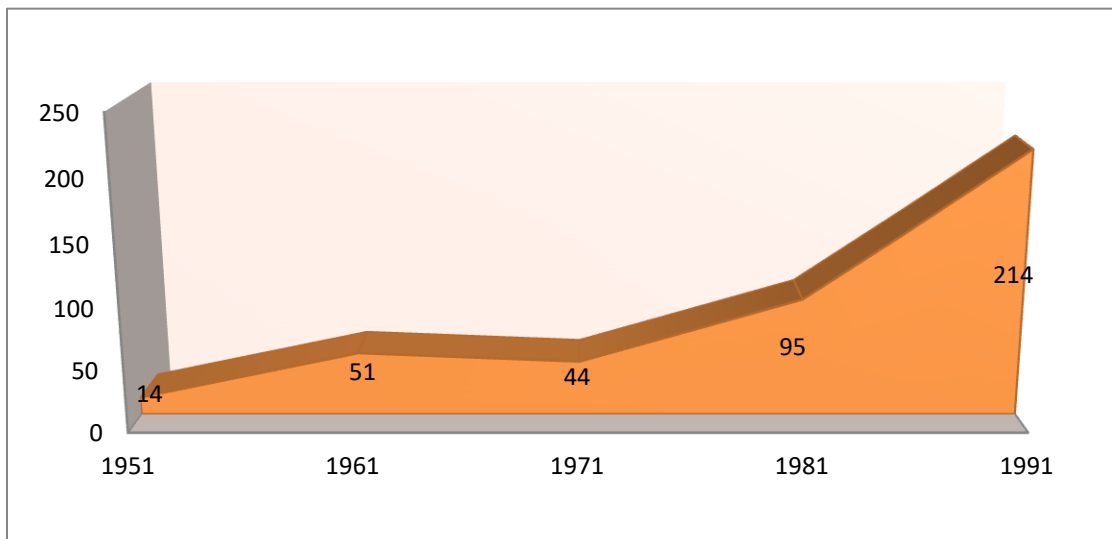


Fig. 1.1. Number of flood in North of Iran

Source: *Forest Rangeland and watershed organization of Iran (FRWO)*

Forest policy in Iran aims at forest conservation through management, afforestation and community forestry. During the last decades, considerable attention was given

to implementing afforestation, silviculture, road construction, and wood transport projects. However, forest policy has largely failed to conserve the country's forests: overexploitation of industrial wood by logging companies and of forests by rural communities (for fuel wood and grazing) has contributed to forest destruction (NBSAP, 2001). Deforestation and forest degradation has occurred especially in the Caspian and Zagros forests, accounting for more than 55 percent of total forest area.

Actually, the situation is more complex: besides being scarce, most forests and their benefits are publicly owned. Therefore, forest users, most of whom are poor, have little incentive to conserve forests. Rather, they prefer short-term benefits such as clear-cutting for wood, overgrazing and conversion to agriculture. The institutional and regulatory framework is quite weak, thus enforcement measures to limit illegal activities are rarely applied. This overexploitation usually results in a high rate of forest degradation and depletion.

The Caspian Sea is under threat due to increase in the coastline population and increase in the utilization of the resources, presence of invasive and alien species, different types of pollutions entering the sea, lack of effective integrated management systems, low awareness and insufficient involvement of local communities in conservation of biodiversity. The rise of sea level in the past decade has reduced the area of coastal ecosystems and increased hazards to human settlements. Degradation of coastal ecosystems will have negative impacts on the tourism industry. In many parts of Iran, the level of exploitation of wetlands is high. Flood plain wetlands, river banks and lake shores are utilized for the cultivation of cereals, rice or vegetables, while the rivers and lakes themselves support intensive freshwater fisheries. The wetlands provide vital sources of water for domestic and industrial consumption, and constitute natural water storage reservoirs which can be utilized for irrigation purposes.

## **1.2 Sedimentation process**

Sediments are material of varying size of mineral and organic origin. Erosion is the process of carrying away or displacement of sediment by the action of wind, water, gravity, or ice (Smith & Smith 1998). Natural sources of sediments transported to the sea include erosion of bedrock, soil and decomposition of plants and animals

(UNEP & Gems Water Program 2006). Natural sediment mobilization is an important process in the development and maintenance of coastal habitats, including wetlands, lagoons, estuaries, sea-grass beds, coral reefs, mangroves, dunes and sand barriers (UNEP/GPA 2006a). However, anthropogenic activities or those which are carried out by man, often change the processes of erosion and sedimentation as well as modifying the flow of rivers and the amount of sediments it can carry. Most land-based activities that occur in sectors such as agriculture, forestry, urbanization, and mining contribute to these changes. Another significant cause of changes in sedimentation and erosion patterns is through hydrological modifications that may occur from construction of reservoirs, dams and causeways, dredging of water bodies and development of large-scale irrigation schemes (UNEP/GPA 2006b).

### **1.2.1 Why should we be concerned about erosion and sedimentation?**

Sediment is responsible for more stream and river degradation than any other pollutant. Deposits of sediments in ditches, streams, and rivers reduce their capacity to store water resulting in more frequent and severe flooding and increased property damage. Accumulations of sediment may result in severe damage to storm drain systems. Many millions of dollars are spent each year to dredge our state waterways, to remove sediments from storm drain systems, reservoirs, and water treatment plants, and to repair flood damage. Sediment in streams and rivers causes the most damage to aquatic life by severely impacting aquatic animal habitats and degrading water quality. Areas needed for reproduction and food sources are destroyed when fine silts cover the sand and gravel streambed. Decreased clarity of the water prevents sunlight from reaching plants resulting in loss of aquatic plant communities. The result is a reduction in the number and variety of fish and other aquatic life. This impact often can be seen for many miles downstream.

### **1.2.2 The forest policy**

Since forests in Iran cover less than 10% of the total land area (LFCC), the main objective of the national forest policy is to protect forests in natural ecosystem. In the national forest policy and forest protection strategies, priority has been given to rehabilitation and sustainable forest management of environmentally critical areas.



The main objectives of the Forest Policy in the Islamic Republic of Iran are:

- Preparing integrated plans for all natural resources of the country and applying proper exploitation systems based on modern technology suitable for the sustainability of natural resources and increasing timber and fodder production for economic exploitation;
- Establishing wood industry units to create income-generating possibilities for forest dwellers;
- Establishing forest cooperative societies to manage, preserve, rehabilitate, develop and exploit the forest in collaboration with local people and within the conditions and limitations prescribed in the developed plans;
- Procuring technical facilities and required investment to develop road networks;
- Industrializing the traditional animal husbandry systems in the northern forests by creating income-generating possibilities and procuring animal husbandry facilities in marginal areas outside forested lands;
- Procuring the required equipment and inputs to implement the country's natural resources development plans;
- Improving timber production through mechanization and modern technology, and decreasing waste;
- Procuring the required facilities to replace fuel wood by other suitable kinds of fuel;
- Determining rational ways of exploiting forest by-products to supply local needs and export the excess materials;
- Extending agroforestry, the plantation of multiple-use wood species and the plantation of fast-growing tree species to meet timber needs through short and medium rotations;
- Preserving rare forest communities and species as national reserves;
- Promotion of State, private and cooperative investment in developing, rehabilitating and utilizing all touristic areas and landscapes of the country;
- Promoting training and extension programs and awareness raising about the importance of natural resources preservation and rehabilitation.

In the formulation of forestry policies and programs all relevant administrative sectors are involved. The new policy, adopted to promote forest resources, was devel-

oped in partnership with all stakeholders. Several cross-sectoral measures have taken with other organizations such as the Meteorological Organization, the Ministry of Energy, the Department of Environment and the agricultural sector. Forest ecosystems play a special role in both the National Action Program to Combat Desertification and the National Biodiversity Strategy and Action Plan developed by the I.R. of Iran (I.R. of Iran, 2005).

Forest policy in the Islamic Republic of Iran aims at forest conservation through management, afforestation, and community forestry. During the past decades, the state has given considerable attention to implementing afforestation, silviculture, road construction, and wood transport projects. However, forest policy has largely failed to conserve the country's forests. Forest clearing for agriculture, firewood, and charcoal contributed to an estimated reduction of forest area from 19.5 million hectares to 12.4 million hectares during the past 57 years, based on FRWO data.

### **1.3 Research questions**

1. Was land use changes in past half century influenced by government development policy? (Review the time of programs and policies)
2. Which policy instruments are more suitable for conservation of Caspian Forest?
3. Whether Land use changes in selected case study area cause to sediment Accumulation in main river mouth?

#### **1.3.1 Hypothesis**

Development policies of the government are effective for forest land use changes in selected area

Low degree of state intervention in order to forest conservation is not that much effective

In the selected area (Lomir basin) for the study there is a relation between land use changes (conversion of forest area to the other land use) or forest degradation and sedimentation in river mouth.

### **1.4 Theory**

Forest policy analysis began as a sub-discipline of the forest sciences. This meant

that it was foresters, rather than policy scientists, who primarily became involved in forest policy analysis. As a consequence, the role of theory in such analyses remained limited. Also, the analyses tended to be normative and oriented towards policy advice (Gluck, 1992). Two decades ago, however, this situation began to change fundamentally. Policy scientists became more involved in forest issues, probably because “green politics” had become a serious topic within their discipline. Today, readers of forest journals that include policy analyses encounter many policy theories that are fashionable in the “mother discipline” – such as neo-institutionalism or discourse analysis (Arts, 2011).

#### **1.4. 1 Theories in forest policy studies**

Several relevant questions emerge from the analysis of the use of theories in forest policy science. Which theory – or theories – should be chosen when undertaking a forest policy study? A simple answer to this question is that the choice of theory may often come before the choice of a case study. Policy analysts who are interested in critical theory likely have deep core beliefs about interpretative theory being superior to (post)positivism or whether science contributes to equality and social justice. People who may be interested in public choice theory or ACF<sup>1</sup>, likely have a different core view on these matters, probably in line with analytical theory. The selection of these theories by the respective authors appears to be guided by personal preferences or interests, socialization, tradition and researchers' previous knowledge. The personal preference for any of these theories is likely not accidental, as it might be the result of what (Sotirov & Memmler 2011) call “deep core beliefs.” Policy analysts who are interested in critical theory likely have deep core beliefs about interpretative theory being superior to (post)positivism or whether science contributes to equality and social justice. People who may be interested in public choice theory or ACF, likely have a different core view on these matters, probably in line with analytical theory. In the case of the papers by (Buizer & Van Herzele 2010) or de (Jong & Ruiz 2011) the choice of theory, while certainly a reflection of personal ideological inclination or beliefs, was influenced by the policy case that was being researched. (Buizer & Van Herzele 2010) observe the policy process related to greening and foresting cityscapes. They conclude that Habermasian deliberative discourse theory is appropriate for analyzing this case, at least

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<sup>1</sup> Advocacy Coalition Framework

partially. They also observe that while this theory provides an understanding of the case, it does not reveal adequately how initiatives to change are hampered by deeply institutionalized, converging discourses. These discourses inhibit foresters or spatial planners from going beyond familiar ways of understanding a situation. A similar argument can be given for several other papers in this special issue. (Arnouts et al. 2011) use of policy arrangement approach does appear to have been pre-selected before they tackled their forest policy case in the Netherlands. This is partly a consequence of their proposition to develop the analytical framework related to modes and shifts in governance. We may assume, however, that the selection of PAA was also inspired by the case that they analyzed themselves, as the theory does fit the specific empirical analysis. The same holds true for the (Böcher 2011) study, which concludes that a useful framework to explain the choice of policy instruments needs different theories (institutional rational choice theory) rather than the conventionally used theories (naïve instrumentalism, public choice) to explain or predict instrument choice. Hence, his theory choice was also guided by the policy case that was reviewed. An intriguing question remains as to what extent it would have been possible for any of the cases presented in this special issue, or in forest policy studies in general, to choose other theories than the one(s) chosen. If a different theory had been chosen, how much that would have made a difference in terms of empirical analysis and conclusions? This reflection is somewhat speculative, but it does provide some insight into how specific forest policy case studies that are based on a particular theory can be interpreted differently in the light of possible alternative theory choices. We can suppose that several of the papers in this volume could have chosen other theories to underpin the cases that they analyzed. The most obvious alternative choice in the (Arnouts et al. 2011) paper would have been advocacy coalition framework, or possibly other network theories, to analyze the nature policy case in the Netherlands. An ACF analysis would have identified the policy coalitions and the various core and policy belief systems that guide their pursuit of policy objectives. It would less likely have focused on the decision-making procedures, which in the Arnouts et al. paper led to proposing the concept of “governance continuum,” or identified the “governance shifts.” It would have identified how the different policy coalitions organize their strategies, or how they link to policy entrepreneurs, for instance. If the PAA choice was made before the governance continuum was conceptualized, this choice clearly influenced the outcome and shaped the innovative contributions of the study. The case

presented by (Buizer and Van Herzele 2010) could also have been analyzed using alternative theories, such as a critical political ecology perspective which might have generated similar conclusions, or ACF, which, like in the case of (Arnouts et al. 2011), could have resulted in a different view on the case being studied and ultimately led to a different interpretation. (Winkel 2011) concludes that forest policy studies in tropical forest regions are dominated by political ecology, which is largely absent from US and European forest policy studies analyses. The reasons for the dominance of political ecology inspired studies in the tropics is, according to Winkel, the desire by largely northern researchers to reveal patterns of dominance by the state and powerful elites at the expense of indigenous groups or other forest dwellers. Winkel recommends more tropical/non-tropical comparative efforts that use elements of Foucault's discourse theory, or specifically political ecology theory. The same could be said for ACF theory, for instance, which is commonly used in the US, but rarely in tropical forest settings. ACF is not applicable in non-plural political systems, such as clientelistic states, where only one official coalition is allowed, and opponents are either marginalized or coopted. Clientelism was common until recently in tropical countries like Indonesia or Zimbabwe. In many countries, including Indonesia, but also notably in Bolivia (de Jong and Ruiz, 2011) these situations have changed; now multiple opposing interest and advocating coalitions strive to influence the forest policy agenda. While these proposals to explore alternative options of theory use in forest policy studies appear attractive, it should be mentioned that the selection of a particular theory does influence the outcomes of the study and may even conflict with the initial objectives of the forest policy research. (Buizer & Van Herzele 2010) wanted to analyze the degree of local participation in centrally formulated plans and found that a combination of Foucauldian discourse theory and Habermasian normative theory suited that purpose, whereas using only the latter would, in their view, not provide sufficient basis to enhance insights into the role and power of competing and converging discourses. (Arnouts et al. 2011) were interested in reviewing governance changes over a period of 20 or so years, and the PAA appeared to be the most appropriate framework to analyze that case. Tropical forest policy researchers, who apply political ecology in their analyses, are interested in demonstrating patterns of dominance and resulting expropriation or similar processes that do not meet standards of justice, and political ecology, or some related approach is an appropriate theoretical basis to do this.

Since the 1980s, a scientific and political debate concerning the use of alternative instruments in environmental policy has escalated (Howlett, 2011; Deke, 2008; Busch & Jörgens, 2007; Eliadis et al., 2005; Harrington et al., 2004; Salamon, 2002). Politicians require policy instruments that influence collective action as a means of realizing political objectives (Böcher & Töller, 2007: 305). The literature distinguishes among four main types of policy instruments based on the mechanisms they employ to influence and coordinate collective action. These types include (i) informational (or persuasive), (ii) cooperative, (iii) economic, and (iv) regulatory policy instruments (Böcher & Töller, 2007; Böcher & Töller, 2003; Howlett & Ramesh, 1995). Informational instruments attempt to influence collective action by providing information to citizens and other actors (e.g. eco-labels meant to influence consumers' behavior). Cooperative instruments use the coordination mechanism of negotiations, which can take place either between private actors or between private actors and the state, to establish voluntary measures that lead to voluntary agreements (VA). An example of a voluntary instrument is forest certification, which is a market-driven, voluntary, private regulatory scheme that does not require state involvement (Cashore et al., 2005). Governance through more traditional regulatory instruments utilizes the principle of hierarchy by applying “command-and-control” principles to influence actors' behavior. Governments have used regulatory instruments since the onset of environmental policy making in industrialized countries in the 1970s. Economic instruments use the market-based coordination mechanism of prices to influence actors' behavior. The state imposes economic incentives as price signals to promote behavioral changes. Eco-taxes increase the costs of environmentally detrimental behavior, such as automobile use, whereas subsidies stimulate environmentally friendly technologies, such as renewable energies (Böcher, 2010). The amount of state intervention that policies necessitate also differentiates environmental policy instruments (Howlett & Ramesh, 1995, 82). Regulatory instruments require the largest amount of direct state control. In contrast, the state only sets economic incentives when it uses economic instruments, freeing actors in society to react flexibly to these incentives. We observe a smaller degree of direct state control in such circumstances. Cooperative instruments do not entail much direct control or priority setting on the part of the state, and informational instruments provide the smallest amount of state intervention by only using persuasive measures. Fig..1 Shows different instrument types and examples of instruments from natural resource policy. Early examples of

environmental policy (established at the beginning of the 1970s) mostly relied on regulatory instruments, and environmental policy in many countries continues to rely on such direct control (Holzinger & Knill, 2004). In Germany, environmental policy has relied predominantly on regulatory instruments for nearly four decades. Nevertheless, since the 1980s, a perception that governments require “better” alternatives to the prevailing systems of command and control has created an important debate both in scientific circles and in political practice. As a result, a wider range of “alternative” instruments and combinations of instruments has supplemented regulatory instruments in environmental policy regimes (Böcher & Töller, 2003).

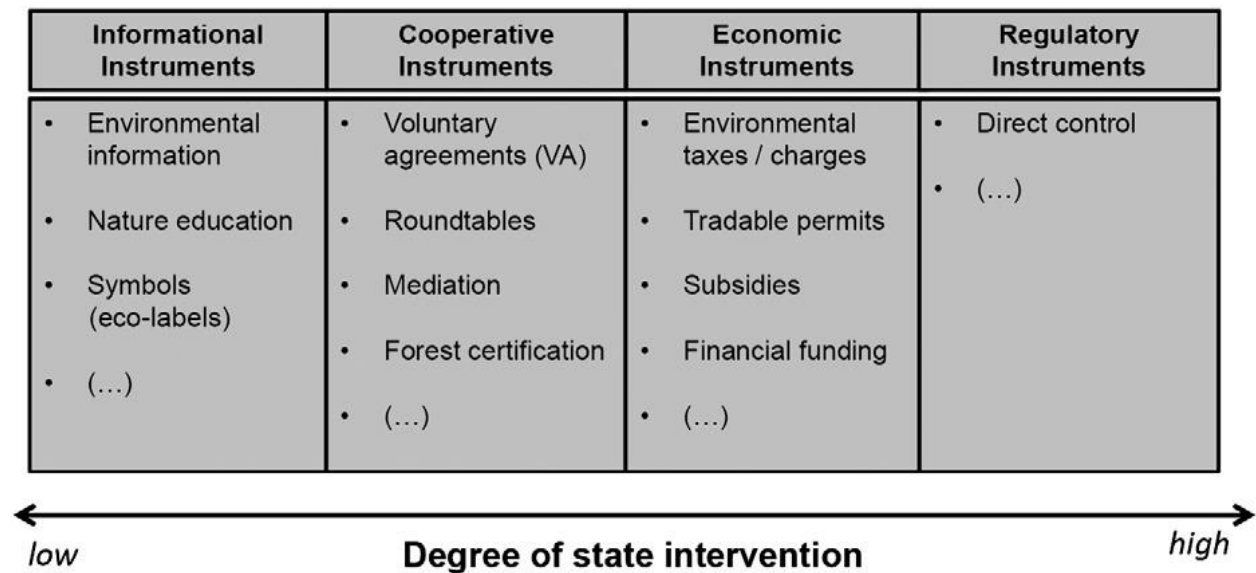


Fig. 1.2. Environmental policy instruments and degree of state intervention  
*Source: (cf. Böcher & Töller, 2007: 306).*

The framework is based meta-theoretically on analytical theory (Krott, 2010) and is in the tradition of neo-institutionalism (Kiser & Ostrom, 1983; Mayntz & Scharpf, 1995). This framework combines important aspects of wider versions of rational choice theory (actors' interests, bounded rationality, power relations) with institutional factors and highlights the importance of underlying discourses, policy ideas, and policy learning for instrument choice (and change) in environmental politics (Böcher & Töller, 2007). The framework differs from others that only emphasize the role of policy learning and public discourses in the choice of alternative policy instruments. It also differs from narrow public choice frameworks that only

identify power and interests as relevant drivers of those policy processes in which political decisions are oriented toward the short term and the static. In contrast to naïve instrumentalism, the framework discards the possibility that politicians will apply the best instrumental solution as the result of a technocratic analysis. Rather, in the policy-making process, we identify elements of political rationality that act as restricting or enabling “filters” and thereby transform policy instruments before governments adopt a special variation of an instrument. This framework has been developed, improved, and applied by the author in cooperation with a German colleague since 2003 (Böcher & Töller, 2003; 2007; Böcher, 2007; 2009) (Fig. 2). According to Böcher and Töller, instrument choice in environmental policy is the result of the interaction of different factors. This interaction initially leads to an extension of the potential range of applicable instruments on the part of public discourses and policy learning. Following this enlargement, a reduction in these alternatives to the actual range of politically feasible instrumental alternatives can take place if, for example, institutional factors impede the choice of one special instrument, or if political conflicts emerge as a result of debates over different instruments in the policy process (Böcher & Töller, 2003; Böcher & Töller, 2007).

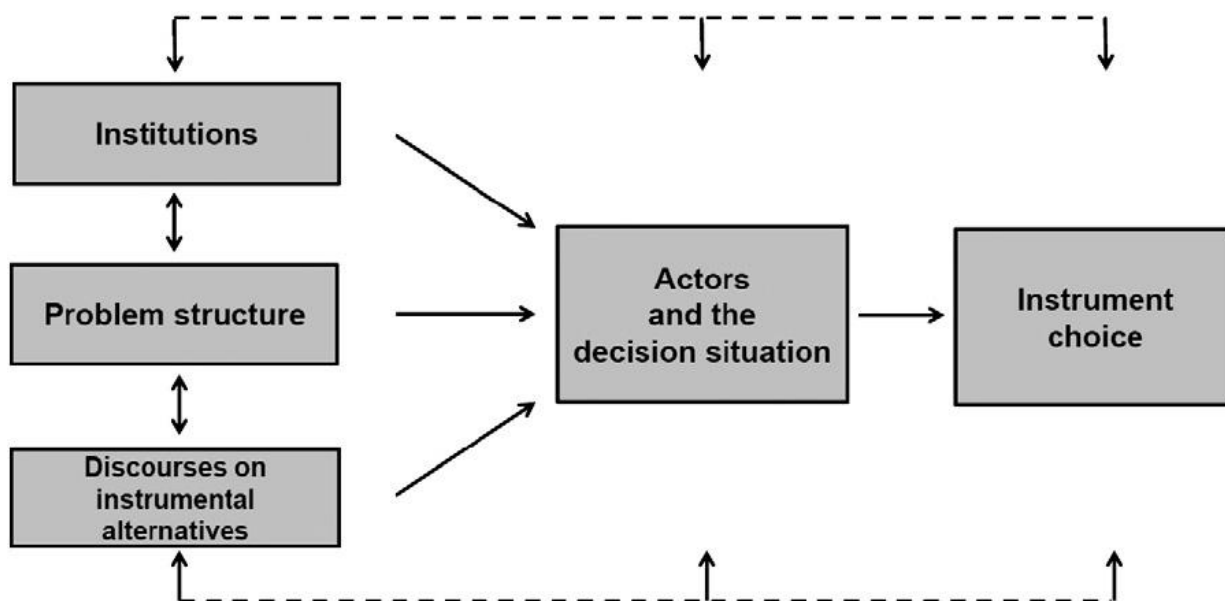


Fig. 1.3. An analytical framework for studying instrument choice

Source: (cf. Böcher & Töller, 2007: 302).

By using the analytical framework presented here, we can study processes of envi-



ronmental policy instrument choice without overestimating or underestimating factors that support and limit instrument change.

## 1.5 Methodology

### 1.5.1 The policy cycle model

A more consistent and usable framework for natural resources and environmental policy analysis can be derived from the general model of the public policy-making process devised over the past forty years. The essence of this approach is to simplify public policy making by breaking down the policy process into a series of discrete stages. The resulting sequence of stages is referred to as the policy cycle. This simplification has its origin in the earliest works on public policy analysis, but it has received slightly varying treatment by different authors over the past half century. Although the names and order of particular stages or sub stages remain somewhat controversial, there has been slow progress toward the establishment of a common model, or at least a common logic, for elaborating the order of the stages.

The idea of simplifying public policy making by breaking the process into discrete stages was first broached in the work of Harold Laswell. For Lasswell, the policy process begins with intelligence gathering: that is, the collection, processing, and dissemination of information to those who participate in decision making. It then moves on to the promotion of particular option by those involved in the making of decisions. The third stage sees those decision makers actually prescribe a course of action. In the fourth stage, prescribed course of action is invoked, meaning that the set of sanction is developed to penalize those who fail to comply with the prescriptions of the decision makers. The policy is then applied by the courts and the bureaucracy and runs its course until it is terminated or cancelled. Finally, the results of the policy are evaluated against the aims and goals of the original decision makers.

The model was highly influential in the development of the policy sciences. Although not entirely accurate, it did reduce the complexity of studying public policy by allowing each stage to be isolated and examined before putting the whole picture of the process back together. It formed the basis for later models that viewed policy making as a process of applied problem solving, which is, in effect, a five-stage process. It involves: 1) recognition of a problem, 2) proposal of a solution to the problem, 3) choice of solution, 4) putting the solution into effect, and 5) monitoring the effects of the solution upon the problem. This approach introduced the

notion of the policy process as an ongoing cycle, but seems to endlessly recur as one policy succeeds its predecessor with minor or major modifications.

Based on problem-solving logic, it is possible to drive a five stage model of policy cycle which is consisting of: agenda setting, policy formulation, decision making, policy implementation and policy evaluation.

In this model, agenda setting refers to the process by which problems come to the attention of governments. This is the earliest stage in the sequence, when a problem initially emerges. This is characterized by incomplete definition of the problem and existence of various proposals for its solution. These proposals are also often ill-conceived or inappropriate at this point. This stage only ends when a problem is conceptualized or redefined in such a way that a range of feasible solutions becomes imaginable.

Policy formulation refers to the process by which policy options are developed within government. In this second stage, estimations concerning the calculation of the risks, costs, and benefits associated with each solution raised in the earlier stage are made. This process involves both technical evaluation and normative choices. The object of this stage is to narrow the range of plausible choices by excluding the non-viable ones and rank the remaining options in terms of desirability.

Decision making refers to the process by which governments adopt a particular course of action or inaction. The actual decision on a particular course of action to follow is made at this selection stage. This can involve the adoption of one, non, or some combination of the solutions remaining at the end of the formulation stage. Policy implementation refers to the process by which government put policies into effect. This fourth stage involves executing the policy option selected at the decision-making stage. Policy implementation uses the traditional tools of public administration concerned with implementing policy and with ensuring a proper match of policy tool and policy context to successfully execute the chosen policy. Finally, policy evaluation refers to the processes by which the results of policies are monitored by both state and societal actors, leading to the reconceptualization of policy problems and solutions. Here the results of the entire process, especially including the result of the implementation phase, are monitored in order to attempt to determine if the policy option chosen has successfully addressed the initial problem, if the management of the implementation process was effective, and if the

evaluation process itself has been conducted according to appropriate criteria. The adjustments of policy that can result from evaluation may be broad or narrow. That is they can involve minor tinkering with the implementation effort, they might lead back to a reconsideration and redefinition of the problem that the policy was supposed to address, or they can involve a reassessment of some option rejected at an earlier stage of the policy process.

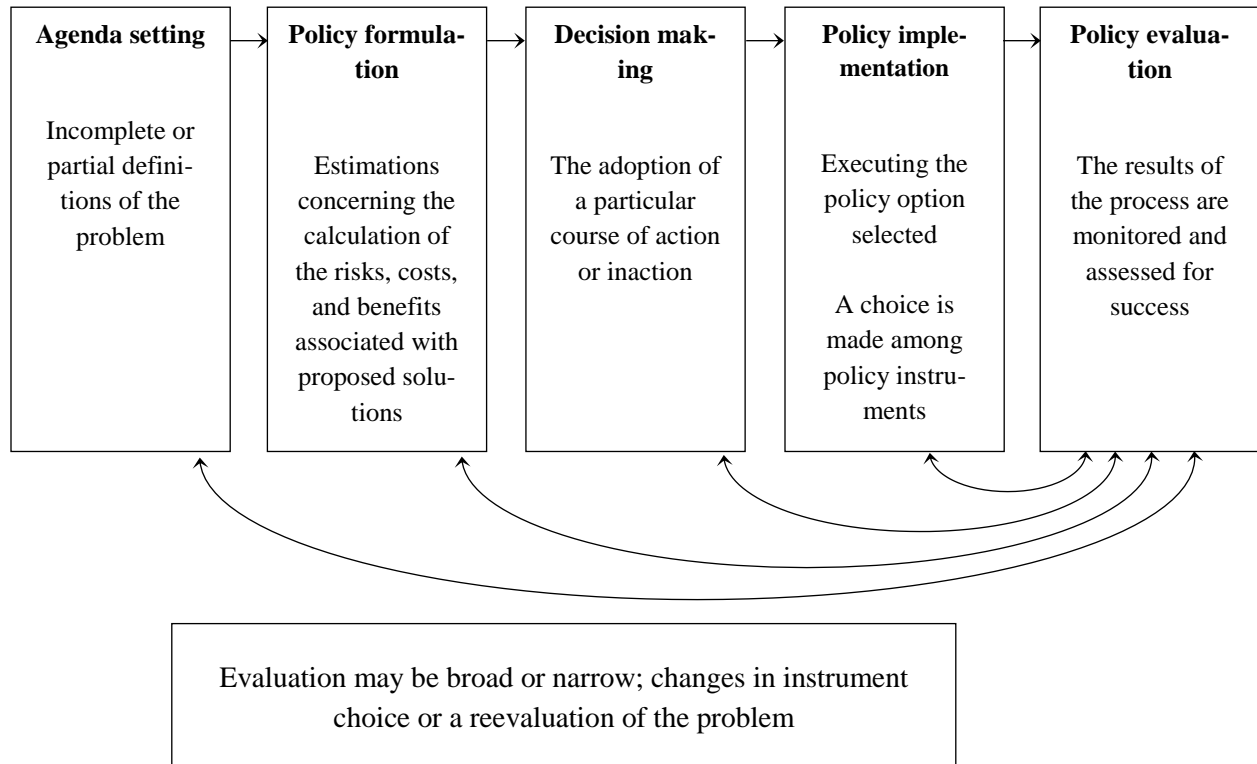


Fig. 1.4. The policy process

*Source: Canadian Natural Resource and Environmental Policy: Political Economy and Public Policy, Melody Hessing , Michael Howlett , Tracy Summerville*

This study is based on analysis of forest tenure and management information gathered by official organizations. As most forest resources in Iran are State-owned, forest tenure data are collected from government management sections. The management units of FRWO provided most of the data, with additional inputs from the Department of the Environment (DOE), forest use/management companies in the private and cooperative sectors, and environmental non-governmental organizations (NGOs). A wide range of viewpoints were collected, including those of forest communities, cooperatives, government forest use companies, provincial natural resource offices (NROs), research institutes and academic natural resource facul-

ties.

## 2. History of Hyrcanian Forest in north of Iran

Hyrcanian forest granted the areas with unique richness of biological diversity, its endemic and endangered species, its natural beauty and its masterpieces of nature creative genius in the form of this ancient forest. North of Iran as along band has diverse natural, economic and social conditions. It characterized by various ecological conditions from 550 to 2200mm precipitation, 24.6 m from sea level to 5671 m elevation and various vegetation landscape from conifers to broadleaved to Mediterranean plants. These conditions caused great diversity in species. It due to its diverse ecological condition is rich in relict species that some of them referred to the Tertiary period. Hyrcanian forest contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation. It also contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance. It is outstanding examples in the record of significant on-going geological processes in the development of landforms and significant geomorphic or physiographic features. It is also outstanding example representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, ecosystems and communities of plants. Hyrcanian forest has a high degree of authenticity and integrity. This ancient forest contains its full original complement of wild plants and animals, much of which has been lost from other adjoining areas. This natural area with its geological diversity and altitudinal range, different weathers, plant communities with high numbers of endemic species, in its most area is substantially unmodified by people and their effects. Having a total area of 1,847,886 ha is large enough to survive as a natural area, and to maintain genetic diversity even though there are outside influences. Management of the forest, particularly after 2003, demonstrates that the natural environmental quality of the area has been maintained and improved.



Fig. 2.1. Hyrcanian forest in southern coast of the Caspian sea

Source: <https://smokecurtain.files.wordpress.com/2016/04/caspian-hyrcanian-mixed-forests-map.jpg>

## 2.1 Comparison with other similar properties

Along with climate, geology, and topography, which are primary factors that determine plant distribution, similarities between the floras of Hyrcanian Forests, Middle European deciduous broadleaved forests and western North America deciduous broadleaved forests are increased by historical biogeography. Hyrcanian Forest contains remnants (refugia) of the broad leaf forests that once covered most of the North Temperate Zone 25 - 50 million years ago, in the early Cenozoic Era. As the climate and land forms changed, this forest disappeared from most of its former range, being replaced by shrublands, grasslands, and woodlands. During the Pleistocene ("Ice Ages"), glaciations had minimal impact on Hyrcanian Forest. Instead of the massive ice sheets that covered much of northeastern America, glaciers were largely restricted to high elevations in western North America. When the Europe covered by ice during the Pleistocene, Hyrcanian Forest were alive and at the end of frozen, plant species of Hyrcanian forests immigrated to Europe and these forests is mother of European forests. There are little similarities in the physiognomic and taxonomic aspects between Hyrcanian forests and European and Amer-

ican deciduous forests. Fertile soil, suitable precipitation and temperate climate causes that some species such as "*Fagus orientalis*", "*Quercus castaneifolia*", "*Alnus glutinosa*" and "*Acer velutinum*" can reach 50 meter height and 3 meter diameter at breast height but they have maximum about 25 meter height and 1 meter diameter at breast height in Europe. The Caspian forest areas are among the most unique and splendid biomes of the world. The Caspian forests have high moisture content, so forest trees are host to many epiphytes such as mosses, ferns, lichens, mistletoes and some flowering plants. Soils are productive and rich in minerals and organic matter. There are many well-known and unique communities in these forests, the most important ones being:

- Hyrcanian forest, Iran, Azerbaijan
- Wulingyuan Scenic and Historic Interest Area, China
- Canaima National Park, Venezuela
- Gunung Mulu, Malaysia
- Central Sikhote-Alin, Russia
- Redwood National Park, USA
- Grand Canyon National Park, USA
- Carlsbad Caverns National Park, USA
- Plitvice Lakes National Park, Croatia Ha Long Bay, Vietnam.

With 8,200 plant species, of which almost 2,500 are endemic, Iran is considered a unique country in terms of its plant diversity and genetic reserves (NBSAP 2000). Its forest diversity provides a wide range of benefits, including water and soil conservation, biodiversity, and landscape value. Despite these benefits, the country's forests have been severely degraded during the past half-century. Forest clearing for agriculture, firewood, and charcoal production reduced the forest area drastically, and overgrazing and overhunting are believed to be responsible for decreasing forest quality. It is based on a more extensive study that estimated the total cost of environmental degradation (COED) in the Islamic Republic of Iran (World Bank 2005). Overview of the Forest Sector With about 12.4 million hectares of forests, covering 7.4 percent of the country's area, the Islamic Republic of Iran is a low-forested country in the Middle East (SCI 2007). The per capita forest cover (about 0.2 hectares) is close to the estimated average for the Middle East and North Africa region and is only one-third of the world's average (FAO 2007). Moreover, the country's commercially usable forest area per capita is only about 0.02 hectares.



According to FAO, five distinct forest regions can be identified as follows:

- Caspian (Hyrcanian) forests, in the country's north, cover about 1.85 million hectares, comprising the humid commercial and industrial forests, and are the only forests suitable for industrial wood production in the country.
- Arasbaran forests, in the northwest, cover about 144,000 hectares, comprising semi humid forests used mainly for fuel wood.
- Zagros forests, in the west, cover about 5 million hectares, comprising the semiarid forests important for protecting water supplies, regulating climate, and providing nonwood forest products.
- Irano-Touranian forests, in the central plateau, cover about 3.3 million hectares, comprising the arid forests important for water and soil conservation.
- Khalijo-Omanian vegetation, in the south, covers about 2.1 million hectares, comprising arid tropical forests.



Fig.. 2.2. Different type of forest cover in Iran

*Source: Forest, Rangeland and watershed organization of Iran*

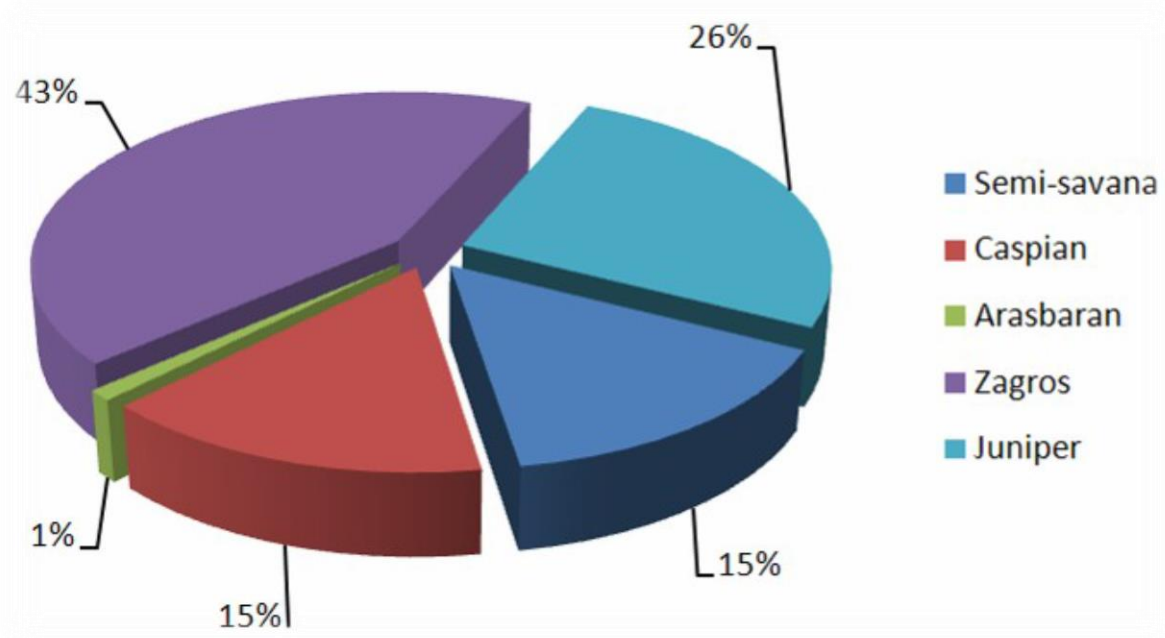


Fig.. 2.3. 15% of whole forest cover in Iran belongs to Hyrcanian forests

Source: Forest, Range and Watershed Organization (FRWO)

Since 1962, forests have been entirely owned by the state. The Forest, Range and Watershed Organization (FRWO) at the Ministry of Jihad and Agriculture (MOJA) is responsible for forest management. Forest management plans exist only for the Caspian forests. The area currently under management is about 1.3 million hectares, and the rate of forest use is about 1.46 cubic meters per hectare (Sagheb-Talebi, Sajedi, and Yazdian 2004). In 2002, the forests' contribution to the national economy (considering only wood products) was estimated at 1.6 percent of gross domestic product (GDP) (SCI 2004), compared with agriculture's contribution of 15 percent (World Bank 2004).

However, wood represents only a small proportion of forests' total value. A study valuing forest benefits in 18 Mediterranean countries found that wood accounts for less than 15 percent of the total forest value in most eastern Mediterranean countries of the Middle East and about 35 percent of the total forest value in the northern Mediterranean (Croitoru & Merlo 2005; Croitoru 2007, 2008).

### 2.1.1 Ownership Figures

Forest ownership in Iran was transferred to the government following enactment of the Forest Nationalization Law in 1963. Most forest areas are now State-owned, except for a few plantations on private land. The State's role in forest management has been defined as "balancing the use of forest resources for the entire nation as potential stakeholders". State ownership has helped to regulate forest utilization in the Caspian forests, where timber can be extracted according to approved forest management plans (FMPs). The State's most significant contribution to forests has been in preventing further forest degradation resulting from such activities as:

- Extensive conversion of forest land to other land uses;
- Deforestation or forest degradation involving loss of forest area or biodiversity;
- Illegal logging.

Forest Nationalization Law organizes and regulates industrial forest exploitation in northern Iran. FRWO has implemented activities to prevent illegal logging in Caspian forests, and (directly or indirectly) prepares FMPs for northern Iran. The plans are then implemented either by FRWO or by cooperatives or private entities (concessions) (Hess and Buys, 2007). The Forest and Rangelands Protection and Utilization Law (Article 58) makes it easier to implement FMPs through government companies and forest dwellers' cooperatives than through the usual system of bids from the private sector with FRWO receiving shares of the royalties from timber utilization. This has encouraged the assignment of FMPs to local cooperatives, under contracts that stipulate the royalties to be paid to the State.

### 2.1.2 Livelihood

It seems that about 70 years ago, local people's livelihood dependency on Caspian forests was far less than it is today. Rich old-growth forest stands, and a relatively low population allowed light traditional wood harvesting, mainly for fuel wood and construction. Later, booming population growth dramatically increased the need for livestock grazing and wood resources. An estimated 1 million people now use the forests of northern Iran.

### **2.1.3 Traditional animal husbandry using understory vegetation and pollards for livestock grazing (mainly of cows and sheep)**

According to FRWO statistics, 5.7 million livestock units are now settled in or near the Caspian forests. Of these, FRWO has plans to relocate up to 4.3 million units, and 600 000 units have already been relocated. Related plans include relocating forest dwellers (with their livestock), amalgamating small villages in low-altitude areas, and assigning non-forest lands on the plateau to forest dwellers. Relocation of residents and livestock has faced many challenges, including the unsuitability of the new residential environments assigned to former forest dwellers, and villagers have sold most of the non-forest lands assigned to them, for house construction. 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. After implementing these relocation plans from 1989 to 2001, FRWO revised the scheme as part of the recent CPPNF, which aims to make social improvements to promote forest development.

### **2.1.4 Fuel wood extraction**

Forest dwellers use wood extracted from the forest for fuel (especially in winter). To control this, fines were introduced for forest dwellers who exceed their annual wood assignments from the State. However, the basic issue of resolving forest dwellers' economic problems (e.g. fuel supply) seems to be more important.

### **2.1.5 Conversion of forest lands**

Although the government has sought to clarify its ownership of natural resources, conflicts continue to arise when different government organizations occupy forest lands for their own specific purposes. Examples are the planned construction of a petrochemical works on about 200 ha of degraded forest lands, and the recent conversion of 7 ha of forest area into a municipal waste landfill in eastern Mazandaran. Although land-use conversion of forest land should be strictly limited, or even prohibited, the traditional (and still informal) rights of forest inhabitants should also be more fully taken into account. Most land-use conversions (particularly in low-altitude areas) to orchards, farms and paddy fields – which have resulted in

significant soil erosion, heavy floods and climate change in recent decades – are at least partially rooted in poverty.

### 2.1.6 Illegal logging

Owing to increased demand for wood, illegal logging has been a source of income for some local – and a few non-local – livelihoods in recent decades. According to official data, 2 million m<sup>3</sup> of industrial timber was legally extracted from the Caspian forests in 2001, along with an equal amount of illegal timber. In response to this problem, the government has introduced a strict monitoring system, mainly through forest protection guards, and a mechanism to ease wood imports into the country. However, the considerable reduction in legal wood harvests in the last couple of years (down to 900 000m<sup>3</sup>/year) seems to have increased illegal logging. It therefore seems that creating stable income sources for forest dwellers (through NWFP utilization, agroforestry systems, etc.) and improving their socio-economic conditions would be more beneficial to rural community development – and thus SFM – than community relocation policies are. Such improvements would also help stabilize the State’s ownership of forests, thereby diminishing their conversion to other land use.

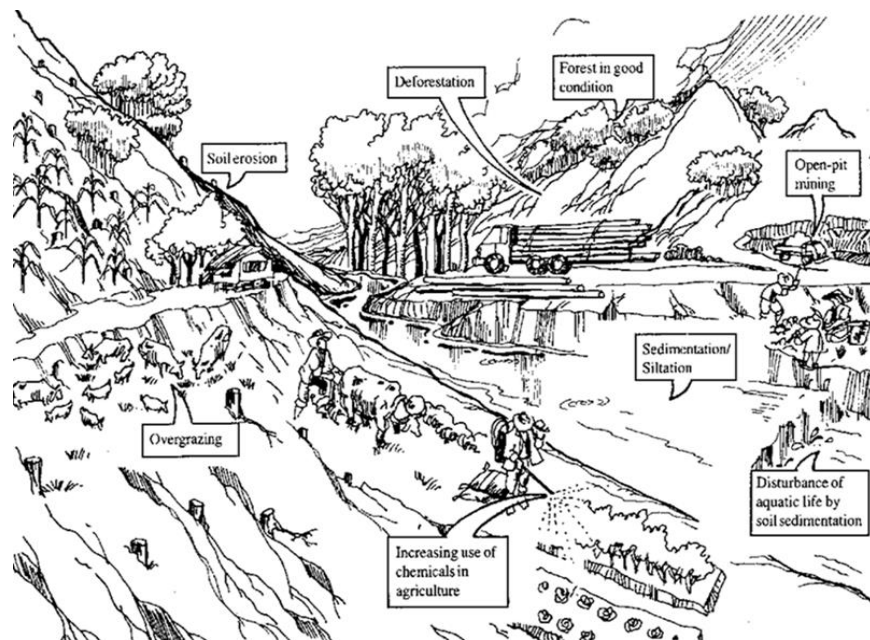


Fig. 2.4 schematic view of a forest catchment

Source: *Basic Concepts in Environment, Agriculture and Natural Resources Management: An Information Kit* (International Institute for Rural Reconstruction (IIRR))

## 2.2 Deforestation and Forest Degradation

The literature uses the terms “deforestation” and “forest degradation” in varying ways. The term “deforestation” has been used to describe three conditions: the complete loss of forest cover; the reduction of tree crown cover below a given proportion of land cover; and the loss of primary forest alone (Pagiola 2000). “Deforestation” often describes the permanent (long-term) loss of forests, but sometimes it includes temporary loss as well. The term “forest degradation” has also been defined in several ways, generally referring to reductions in forests’ productive capacity (Watson and others 2000). In this chapter, “deforestation” refers to a complete and long-term loss of forest cover. “Forest degradation” is defined as “changes within the forest class that negatively affect the stand or site and, in particular, lower the production capacity” (FAO 1995). Accordingly, estimates of deforestation do not reflect degradation.

### 2.2.1 Deforestation

Two of the major environmental hazards affecting the planet are deforestation and desertification, Marine, freshwater, atmospheric, near-space and terrestrial environments have suffered and continue to suffer environmental degradation. Shifting agriculture is the primary cause of deforestation. Iran s forests have been severely degraded during the last half century. According to data published by Forest, Range and Watershed Organization, between 1944 and 2000, total forest area diminished from 19.5 million to 12.4 hectares with an average deforestation rate of about 125,000 ha per year. There are several studies on the underlying causes of deforestation and forest degradation in Iran, of which most of them deal with processes outside the forestry sector. Up to 1960, one of the greatest factors contributing to forest degradation was fuel wood production which led to the expansion of rangelands in the country. After 1962, when the whole forests of the country was nationalized, and although forest exploitation was licensed just for traditional animal husbandry, the population growth due to high standards of living, increased needs for food and crop lands and therefore aggravated deforestation trend coupled with policies for wheat and meat self-sufficiency increase of foreign currency rate as well as urbanization, rural development and expansion of industries., On the basis of new laws in recent years any land use change of agricultural lands is forbidden. Over the last four decades, intensive deforestation and rangeland overgraz-



ing have contributed to soil erosion in watershed areas. According to the Ministry of Jihad-e- Agriculture, soil erosion leading to dam sedimentation results in a loss of reservoir storage capacity of 236 million cubic meters per year. Flooding has increased during recent decades in Iran. Furthermore, the number of floods recorded in the 1980s and 1990s is more than five times the number recorded in the 1950s and 1960s. Poor land use management and deforestation can contribute to increases in the frequency and intensity of floods (World Bank, 2005). Clearly, identifying the causes of floods is very complex and estimating a damage cost is difficult. However, it is believed that the dramatic increase in the number of floods over the last three decades is closely related to increased deforestation, which took place over the same period.

Deforestation in Northern Forest of Iran deforestation is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use. Examples of deforestation include conversion of forestland to farms, ranches, or urban use. Three provinces of north of Iran include Guilan, Mazandaran and Golestan province with best source of genetic variation, biodiversity, woody products and species of tree like "*Fagus orientalis*", "*Quercus castaneifolia*", "*Alnus glutinosa*". The study area includes 800 kilometer length and 20-70 kilometer width about 3 million hectares forest. Estimation percentage of deforestation in north of Iran landsat TM and ETM images is used in this research. Compared land use maps of 2004 and 1988 of northern forests of Iran that had been extracted from landsat TM and ETM images in 15 years period and investigated deforestation areas as well. Comparison images between 1988 and 2004 show the percentage of deforestation area in terms of provinces (Guilan, Mazandran and Golestan) was evaluated 0.21%, 0.49% and 0.69%, respectively. According to extracted maps, 12152 ha area of northern forests of Iran had been deforested in 15 years period. The deforestation area were evaluated 8101 ha per year. Iran had 18 million hectares forest on 1975. At present it has 12 million hectares. 6 million hectares remove during about 37 years. significant explanatory variables that lead to forest conversion - conversion of forest to farmlands - wood production - wood trafficking - The distances between residential area, road and villa - Construction of villa and road in the forest - natural phenomena in forest The effects of deforestation in northern forest in Iran and global effects - soil degradation and soil erosion - biodiversity loss - climate change - changing carbon cycle process Strategies for ameliorate the defor-

estation -renewable energy -education of public especially villager -Deforestation issue in curriculum in Iran -Government policy Plan and implement action strategies to educate public newest forest decree in Iran classification of the duties in diverse level executive frameworks for rehabilitation and development of vegetation optimized use of existing resources and amendment the executive and technical methods monitoring and evaluating of management Executive policies and measures for conserving the north forests of the country Iran has only about 1 percent forest cover. The major commercially useful forests are located in the Alborz Mountains in the north, especially on the southern slopes above the Caspian Sea coast. Smaller forests, principally of oak and other deciduous trees, are scattered throughout the western and central Zagros Mountains. Iran is a net importer of timber products. Illegal clear-cutting and clearing for agriculture have depleted forests in the Alborz, and government replanting programs have been hindered by illegal harvesting of trees. In 2003 the timber industry produced about 13 million cubic meters of wood products, of which about 37 percent was pulpwood and 24 percent logs.

With 8,200 plant species, of which 1,900 are endemic, Iran is considered a unique country in terms of its plant diversity and genetic reserves. Climate diversity makes the country's forests heterogeneous, providing a wide range of benefits. Despite these benefits, Iran's forests have been severely degraded during the last half century. Forest clearing for agriculture, firewood and charcoal production reduced drastically the forest area. Overgrazing and over hunting are believed to be responsible for decreasing forest quality. Deforestation in Iran is caused mainly by forest conversion to agricultural and other land uses as well as by clear-cutting for timber and firewood (Islamic Republic of Iran 2001). Although it is commonly agreed that deforestation has been extensive, there is no consensus on the extent of annual deforestation in the country. Different sources report different Figures on the issue, as the following examples indicate:

- Amirnejad and others (2006) report an annually deforested area of some 200,000 hectares and quote a deforestation rate of 2.3 percent in the Caspian forests and 1.1 percent in the other forest types.
- FRWO indicates that total forest area diminished from 19.5 million hectares to 12.4 million hectares between 1944 and 2000, corresponding to an annual loss of about 125,000 hectares, or 0.8 percent.



- The Food and Agriculture Organization of the United Nations (FAO) reports no annual forest change between 1990 and 2000, which is explained qualitatively by an increase in plantation areas combined with a low deforestation rate of natural forests (FAO 2007). Caspian forests have shrunk from 3.4 million hectares to 1.9 million hectares over the past 22 years, an average of 45,000 hectares per year (CEP 2001).

### **2.2.2 Loss of plant nutrients**

Soil erosion affects about 43 percent of the country's area (FAO 1996). The soil loss is likely to contribute to a decreasing quantity of plant nutrients, which may affect production in the long run. This valuation is based on two steps: (a) estimating the annual soil loss due to deforestation, wood over collection, and overgrazing in forests; and (b) valuing the quantity of nutrients lost annually in the soil loss. The World Bank (1995) estimated the annual soil loss at about 1 billion tons, and FAO (1996) estimated it at about 1.5 billion tons. This study conservatively considers the lower value of the two. Various sources argue that deforestation is a major cause of annual soil loss (for example, FAO 1996; NBSAP 2001).<sup>10</sup> In particular, FAO (1996) cites the overexploitation of wood as the most important cause of soil erosion in the Islamic Republic of Iran— estimating that it is responsible for about 46 percent of total erosion, the highest share among all Central Asian countries. This degree of erosion would correspond to an annual soil loss of 460 million tons because of past deforestation of 7.1 million hectares. Assuming that new deforestation would increase erosion in proportion to the area affected, the annual deforestation on 125,000 hectares would increase the soil loss by 1.8 percent. Consequently, the additional annual erosion in the country would be about 18 million tons. No comprehensive study was found regarding the average nutrient content of soil in the Islamic Republic of Iran. However, if we assume that the soil nutrient content is similar to that in Turkey (about 0.1 percent nitrogen, 0.15 percent phosphorous pentoxide, and 0.154 percent potassium oxide), the loss of nutrients totals about 72,720 tons (Environment Foundation of Turkey 1995, quoted in Bann and Clemens 2001).

### **2.2.3 Dam sedimentation**

The Islamic Republic of Iran has 151 dams in operation with a total reservoir ca-

capacity of 25 billion cubic meters. More than 90 percent of this water (23 billion cubic meters) is currently used for irrigation (World Bank 2004). Water from storage and diversion dams is used to irrigate 22 percent of the country's total irrigated areas (that is, 1.6 million of 7.4 million hectares). The watershed areas of dams under operation total 10.6 million hectares. Over the past four decades, intensive deforestation, rangeland overgrazing, and other factors have resulted in soil erosion in watershed areas. Soil erosion is estimated at 30 tons per hectare per year and sedimentation at 10 tons per hectare per year (MOJA 2004). Based on the same source, dam sedimentation results in a loss of reservoir storage capacity of 236 million cubic meters per year. This is equivalent to an annual loss of 1 percent of the potential dam capacity. The damage cost resulting from dam sedimentation is estimated in terms of the potential loss in irrigated crops. Because a significant portion of irrigated land (31 percent) in the Islamic Republic of Iran is cultivated with wheat (World Bank 2004), we focus on the potential wheat yield loss. Based on an incremental yield in irrigated areas compared to rain-fed areas of 2.33 tons per hectare (Islamic Republic of Iran 2001), a quantity of irrigation water of 4,140 cubic meters per hectare of wheat field (Soil and Water Research Institute 1997), and an average wheat price of US\$170 per ton, the agricultural productivity is estimated at US\$0.1 per cubic meter of irrigation water. Assuming that dams are used at full capacity, the average annual loss of 236 million cubic meters of reservoir storage capacity results in an annual loss of around US\$23.6 million. Because deforestation is only one factor contributing to dam sedimentation, we assume that it accounts for only half of this value; therefore, the associated cost of dam sedimentation is estimated at US\$11.8 million, Carbon loss. Deforestation results in losses of carbon stock due to wood over extraction or forest conversion to other land uses. Based on the Islamic Republic of Iran's national communication to the United Nations Convention on Climate Change (2003), the annual net emissions of greenhouse gases from the forestry sector include the following:

- About 19.5 million of tons of carbon dioxide emissions from forests and other changes in stocks of woody biomass—corresponding to the difference between 20.7 million tons of carbon dioxide release from wood exploitation (industrial wood harvested from commercial forests in the Caspian region and fuel wood consumption from other forests) and 1.2 million tons of carbon dioxide uptake due to the increase in forest area by afforestation, tree

plantations around villages, and establishment of parks and green areas.

- About 11.9 million tons of carbon dioxide emissions from conversion of forests to other land uses corresponding to about 9.3 million tons of carbon dioxide immediately released from burning and about 2.6 million tons of carbon dioxide released through decay and decomposition.
- About 161,560 tons of carbon dioxide equivalent emissions of other (not carbon dioxide) gases from forest conversion through burning. Overall, net emissions are estimated at 31.5 million tons of carbon dioxide-equivalent emissions, or about 8.5 million tons of carbon.
- Monetary valuation is based on the shadow price method, considering the average prices currently adopted by the carbon markets.

A World Bank review of the state and trends of carbon markets (2003) found that prices for certified emissions reductions in developing countries average between US\$12.9 and US\$18.1 per ton of carbon, depending on whether the buyer or the seller took the risk of the Kyoto protocol not being ratified. Based on this price range, the annual cost of carbon losses varies from US\$110 million to US\$154 million, averaging to US\$132 million. This is not a loss to the country but a global damage to the international community. Consequently, the annual loss of indirect uses affecting the Islamic Republic of Iran—loss of plant nutrients from soil erosion and loss of irrigated crops from dam sedimentation—adds up to about US\$19.1 million. When the value of the carbon loss is added, the total loss of indirect uses reaches US\$151.1 million.

#### **2.2.4 Costs of Deforestation:**

The annual deforestation-related losses in Iran are estimated to total about US\$168.1 million. This corresponds to an average loss of US\$1,345 per hectare of deforested area. The total annual losses comprise annual flows of damage costs (US\$36.1 million) and the annual stock value of carbon (US\$132 million). Using a social discount rate of 4 percent, the present value of the annual flows over a 25-year time span totals US\$564.1 million. Adding the value of carbon, the total present value of the deforestation cost is about US\$696.1 million. This is a conservative estimate; it does not account for certain indirect use values (such as water purification and damage due to floods), option values, and existence values (such as the cultural value of forests).



### **2.2.5 Costs of Forest Degradation**

Currently, only 1.3 million hectares of forest in the Caspian Sea region are commercially exploited (Sagheb-Talebi, Sajedi & Yazdian 2004). In these areas, the potential annual growth is estimated at 7 cubic meters per hectare, while the actual maximum annual growth is about 3 cubic meters per hectare. The difference of 4 cubic meters per hectare is mainly a result of past wood overexploitation. Considering a degradation time span of 50 years, the average annual loss is about 0.08 cubic meters per hectare. Assuming that the current overharvest will reduce the future MAI (Mean Annual Increment) at the same rate as past overharvests, the annual loss on 1.3 million hectares is about 104,000 cubic meters. Based on an equal distribution between timber and firewood and an average stumpage price of US\$150 per cubic meter of timber and US\$30 per cubic meter of firewood, this is equivalent to a total annual loss of about US\$9.4 million. Using a social discount rate of 4 percent, the present value of the damage cost resulting from a loss of 0.08 cubic meters per hectare of Caspian forest over a 25-year time span totals US\$146.9 million.

### **2.3 Water erosion and dam sedimentation**

Over the last four decades, intensive deforestation and rangeland overgrazing have contributed to soil erosion in watershed areas. According to the Ministry of Jihad and Agriculture, soil erosion is leading to dam sedimentation which in turn is resulting in a loss in reservoir storage capacity of 236 million cubic meters per year. In this report, the damage cost resulting from dam sedimentation is assessed in terms of potential loss in irrigated crops. Since a significant portion of irrigated land (31 percent) in Iran is cultivated with wheat; the study focuses on the potential loss in wheat. The net present value of this loss in 2002 was assessed at US\$370 million. In addition, dam sedimentation also results in the need for dredging activities in irrigation networks.

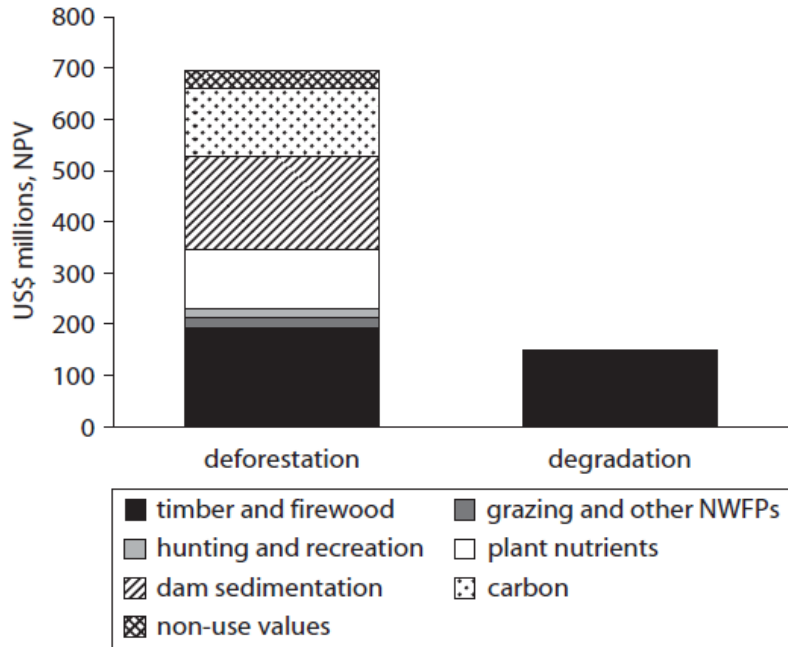


Fig. 2.5 Annual Costs of Deforestation and Forest Degradation in the Islamic Republic of Iran, by Category

Source: Lelia Croitoru, *The Cost of Environmental Degradation Case Studies from the Middle East and North Africa*, World Bank

Note: NPV = net present value (t = 25 years, r = 4 percent).

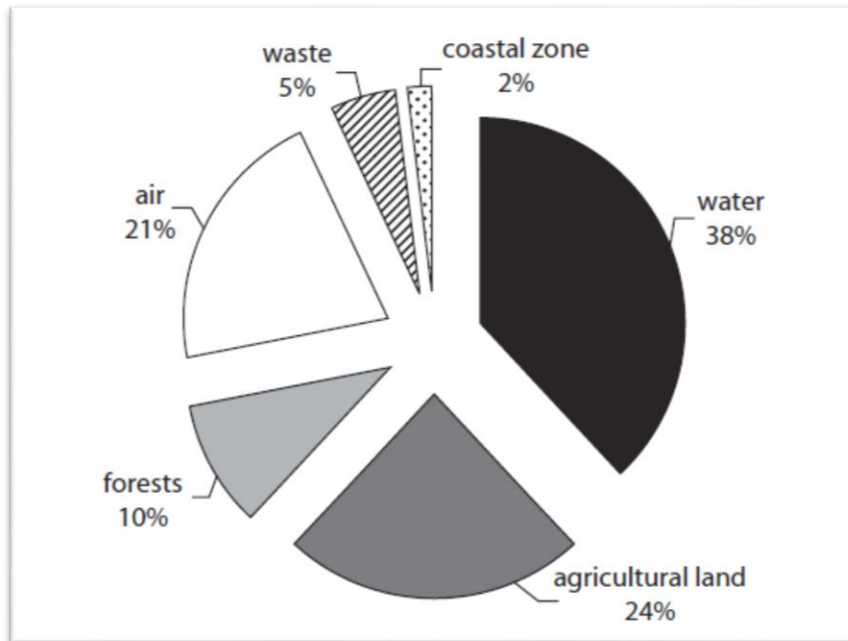


Fig. 2.6 Shares of Environmental Degradation Cost in the Islamic Republic of Iran, by Category

Note: Percentages represent the estimated share of US\$8.4 billion (total annual COED in Iran) attributable to each damage category.

### **2.3.1 History of forest utilization in north of Iran**

Iran has a long history of utilizing natural resources, stretching back for about 10,000 years. Early human societies in the country (particularly in western parts) generated major ancient civilizations, based mainly on the use of natural ecosystems. As the population grew, societies became conscious of their natural ecosystems, including forests, and started to explore sustainable and long-term ways of using resources. This led to the development of different natural resource management and forest tenure systems in different areas. Natural resource tenure systems, especially those for forests, have been affected by periodic changes in basic policies and management systems. This case study is part of an FAO study of central Asia. It examines changes in forest tenure, management and institutional arrangements in Iran, and the potential effects of these on sustainable forest management (SFM) and poverty alleviation. 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 the Forest Nationalization Law (FNL) in 1963.<sup>6</sup> Ownership of major forest areas, such as in northern and western Iran, is disputed/claimed by local communities that still hold traditional forest title deeds. This has created challenges for central government, as the official owner of forests, and local communities, as potential forest user groups. These challenges are reviewed in this case study. Most inland forests are managed and monitored by the government, and the case study reviews the challenges, advantages and weaknesses of this, particularly in relation to local livelihoods. Existing forest tenure types – local forest management cooperatives, private companies and long-standing customary resource management – are deforest ownership in Iran was transferred to the government following enactment of the Forest.

Nationalization Law (FNL) in 1963. Most forest areas are now State-owned, except for a few plantations on private land. The State's role in forest management has been defined as "balancing the use of forest resources for the entire nation as potential stakeholders". State ownership has helped to regulate forest utilization in

the Caspian forests, where timber can be extracted according to approved forest management plans (FMPs). The State's most significant contribution to forests has been in preventing further forest degradation resulting from such activities as:

- Extensive conversion of forest land to other land uses;
- Deforestation or forest degradation involving loss of forest area or biodiversity;
- Illegal logging discussed and a set of proposals put forward.

Table2.1. Amount of wood trafficking, wood production and prices between1995-2005  
(all prices are calculated according to constant rate of 2004)

Year	Wood trafficking (cubic meter)	Wood production in forestry plans in north of Iran(cubic meter)	Average domestic wood price Rial/m <sup>3</sup>
1995	10368	1435986	124664
1996	6778	1415860	157809
1997	7923	1488483	173085
1998	5447	1299826	194521
1999	7167	1156092	244694
2000	7168	1164349	242240
2001	9628	1156660	244301
2002	5914	999181	255530
2003	4700	964300	236643
2004	4773	869220	243574
2005	4687	825169	235625

Source: FROW (Forest, Rangeland and Watershed organization)

FNL organizes and regulates industrial forest exploitation in northern Iran. FRWO has implemented activities to prevent illegal logging in Caspian forests, and (directly or indirectly) prepares FMPs for northern Iran. The plans are then implemented either by FRWO or by cooperatives or private entities (concessions) (Hess & Buys, 2007). The Forest and Rangelands Protection and Utilization Law (Article



58) makes it easier to implement FMPs through government companies and forest dwellers' cooperatives (FDCs) than through the usual system of bids from the private sector with FRWO receiving shares of the royalties from timber utilization. This has encouraged the assignment of FMPs to local cooperatives, under contracts that stipulate the royalties to be paid to the State. Over the 45 years of FMP implementation in northern Iran, approximately 1.4 million ha of planned forest land has been subject to at least one revision. As a result, although forest management rights belong to the State, FRWO reports that approximately 1 million ha of forest resources have been assigned to private, cooperative and government companies. (Anonymous, 2004)

State ownership of forest resources and land incurs massive forest management costs for the government. Between 1960 and 2000, for example, the State invested 602,500 billion Rials (approximately US\$ 670 million) in northern Iran, including the costs of employing experts for 178,570 working days and technical staff for 357,000 (Anonymous, 2004). Over the last decade, the gradual shift of FMPs towards greater involvement of local communities in forest management operations has revived local people's interest in protecting forest resources.

Caspian forests are Iran's main source of commercial timber, so one of their most prominent uses is for timber extraction. A law of 1959 stipulates that this must follow approved FMPs, which are prepared by FRWO's technical office or by private consultants under FRWO's administration, according to Terms of Reference. For the last 20 years, most FMPs have been prepared by private consulting companies, but FRWO holds the overall responsibility, providing TORs, supervision and control, and approving the forest management booklets. For some small areas of Caspian forest, FMPs are prepared by universities (e.g. of Tehran, Tarbiat-e-Modarres, Gorgan and Mazandaran) under FRWO supervision. The universities implement these FMPs as experimental forests. Since the 1980s, FMP implementation (e.g. forest utilization) has gradually been devolved to government/semi-governmental companies and local cooperatives. According to statistics, FRWO used to implement the FMPs for 487,000 ha of forest resources, most of which (almost 80 percent) was solely managed by the government. The planned forest area has now expanded to 1,350,000 ha, with FMPs on almost 1,034,420 ha, 48 percent of which is managed by the government, 36 percent by private companies and 15 percent by local cooperatives. All extracted timber enters the domestic market, as wood ex-

ports are prohibited (Anonymous, 2004). Another important use of Caspian forests (and probably the most widely applied) is local community utilization of resources. Traditional uses of timber products, such as the extraction of lumber and fuel wood for construction, fencing and heating, are widespread in the Caspian forests. Most rural inhabitants of these forest areas live in poverty. Among the main causes of increased poverty in forest communities are severe population growth (especially in the last three decades), longstanding feudalism prior to the national land reform (1961), long-term neglect of rural livelihoods and inappropriate management schemes in forest policies (e.g. pressurizing forest dwellers to relocate their villages). Local communities have enormous potential to contribute to efficient forest management projects (Yachkaschi, 2006).

A third category of forest uses in the Caspian range are the activities carried out by FDCs. Considerable areas of forests, mainly in lowlands, are semi-degraded or degraded and not economically viable; many of these forests are on low-density and erosion-prone sites. These areas are characterized by densely populated communities, and FMP implementation is almost impossible without the participation of forest dwellers and villagers. FRWO has facilitated the formation of small FDCs to promote local communities' cooperation in organizing and implementing FMPs. The main aims of the FDCs are to (FRWO, 1991):

- rehabilitate and enrich degraded forest resources using local capabilities;
- generate employment and income for local people;
- introduce commercial timber utilization based on FMPs;
- Reinforce the provision of welfare facilities in forest villages.

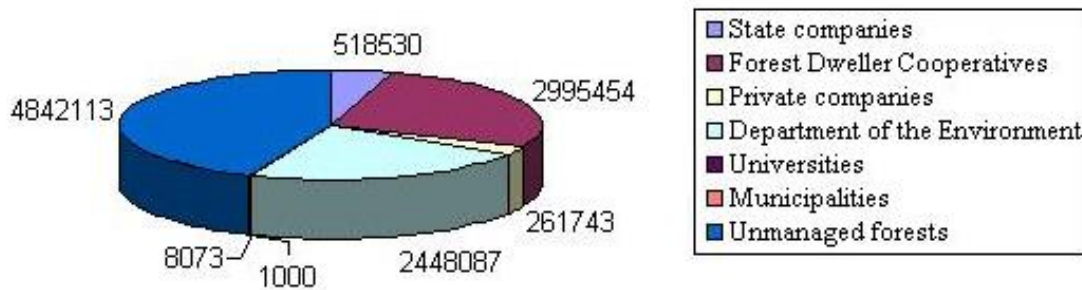
These goals can be effective in alleviating poverty among rural communities and forest dwellers.

#### **2.4 Southern coast of the Caspian Sea and Hyrcanian forest as an integrated ecosystem with different actors**

Owing to State ownership of forests, policies are regulated by the government and enacted/announced by Parliament. Forest management according to these policies is then implemented by the relevant bodies, such as State companies, cooperatives, private entities and FPAs. The activities of private landowners (of plantations) are also subject to government policies, and private landowners are excluded from pol-

icy-making processes. This factor discourages private reforestation in Iran, which now covers only 261 243 ha according to official data. The same problem affects the forests managed by municipalities. Although the devolution of forest park management would seem to enable municipalities to implement their own management systems, they are still bound to apply FRWO legislation. The nature of the contracts between municipalities and FRWO has resulted in only a few forests currently being under municipal management. The universities managing devolved forest areas are also bound to apply FRWO forest management legislation, but they have the additional right to conduct small- and medium scale research in the forests they manage.

**Share of different sectors in management of the state forests (area in ha)**



**Fig. 2.7 Shares of State forests under different management bodies**

*Source: Forest, Range and Watershed Organization (FRWO)*

FMPs have not been prepared for approximately 4,842,113 ha of forest resources, Figure 3). According to the legislation of the National Environmental Protection Council, DOE owns and manages approximately 2,448,087 ha of natural forests. Local cooperatives manage 2,995,454 ha under joint forest management (FDCs). Local people’s involvement in FPAs is mostly in low-skill (and thus low-paid) forestry work, such as forest protection, reforestation and road construction, rather

than in district management planning. This often reduces local people's interest in participating in FMP implementation, in both western and northern regions. Public awareness of forest policies is relatively low across the country. Many forest communities are not informed about changes in national forest policies, news of which is transferred to local NROs, often to the benefit of State and other companies. There is no mechanism for disseminating informative to stakeholders, including local communities. This situation could be improved by workshops among forest communities to raise their awareness of policies and legislation that affect their local forest resources. The media (radio and TV) are another potentially effective tool.

The Forest, Rangeland and Watershed Organization (FRWO) is the sole implementing agency in charge of planning and managing natural resources, including forests, across Iran. FRWO has a wide network of provincial and district offices in close contact with its headquarters in Tehran. FRWO has five departments for:

- Range and soil;
- Forestry;
- Watershed management;
- Conservation and land affairs;
- Planning and logistics.

The Ministry of Agricultural Jihad (MoAJ) plays a key role in natural resource management and rural development. MoAJ is responsible for forest, rangelands and agricultural lands. It is also responsible for watershed management and for nomadic affairs. MoAJ responsibilities include implementing well-funded physical infrastructure projects, controlling land-use on state-owned land – especially forest land, and projects providing technical support to communities. It implements projects aiming to improve agricultural and rural development. Key agencies within MoAJ include:

- Research Institute for Forest and Rangelands (RIFR) – responsible for research, monitoring and policy preparation;
- Forests, Rangelands and Watershed Organization (FRWO) – directly responsible for program and project implementation. Significantly, FRWO is responsible for protecting forests on the large areas of nationally owned forestland. FRWO is responsible for many protected areas. Community activities are greatly restricted on these areas;

- Nomadic Affairs Bureau (NAB) – largely responsible for overall policy regarding nomads, for integrating nomadic concerns into other policies and related coordination, and for providing social services to nomadic communities;
- Department of Women and Pastoral Affairs (DWPA), with programs to support women and women headed families in rural areas, including training and micro-credit programs.

MoAJ was formed by the recent merger of two large ministries. Since the merger, many organizational changes have taken place within the Ministry – for example the formation of the FRWO. The fact that these major changes were only recently undertaken means that some duplication and coordination challenges within the Ministry have yet to be fully resolved. Also, at the provincial level, many agencies have not yet merged, for example watershed management is usually separate from forests and rangelands management at the provincial level.

#### **2.4.1 Forestry policy, institutions and major programs**

The economic role of forests became important in the nineteenth century when the exploitation of the northern forests of the country, mainly for timber for export, was transferred to foreign contractors. In addition, before the nationalization of the forests in 1962 some landowners exploited their own forest lands. Although the High Council for Forest, Range and Soil was established in 1951 and forest management regulations were ratified in 1958, forest areas continued to be exploited by foreign enterprises and forest owners. In 1959, the first forest management plan was prepared and implemented in the Caspian area. Forestry plans covered only limited areas until 1963, when nationalization of forests led to the preparation of forestry and exploitation plans on a large scale. Multiple-use forestry plans are now based on non-wood products with wood production exclusively to cover local needs for fuel wood and fine wood industry. Fisheries, apiculture, animal husbandry and fodder production are integrated in forestry planning in suitable areas.

#### **2.4.2 Institutions**

In Iran, forestry is in the hands of the Forestry and Range Organization, under the Ministry of Agriculture Jihad-e-Sazandegi. The Forestry and Range Organization

gives special importance to rural development and people's involvement in harvesting and afforestation activities. The main administrative and management body for conservation and protected areas is the Department of the Environment, which was established in March 1972. Its responsibilities include the conservation and enhancement of wildlife resources and the prevention of pollution. It also puts forward regulations on habitat management. Existing capacity for the enforcement of conservation legislation and regulations, however, is limited. The Department of the Environment is divided into a series of divisions dealing with different environmental matters; of these, the Division of Parks and Wildlife is the main body undertaking protected area management. The division prepares recommendations for the establishment of reserves or changes in reserve classification. Before they are presented to the High Council of the Environment for approval, they are reviewed by all appropriate divisions of the Department of the Environment so that all government organizations with jurisdiction over lands proposed for protection have an opportunity to assess the impact on resources administered by their organizations.

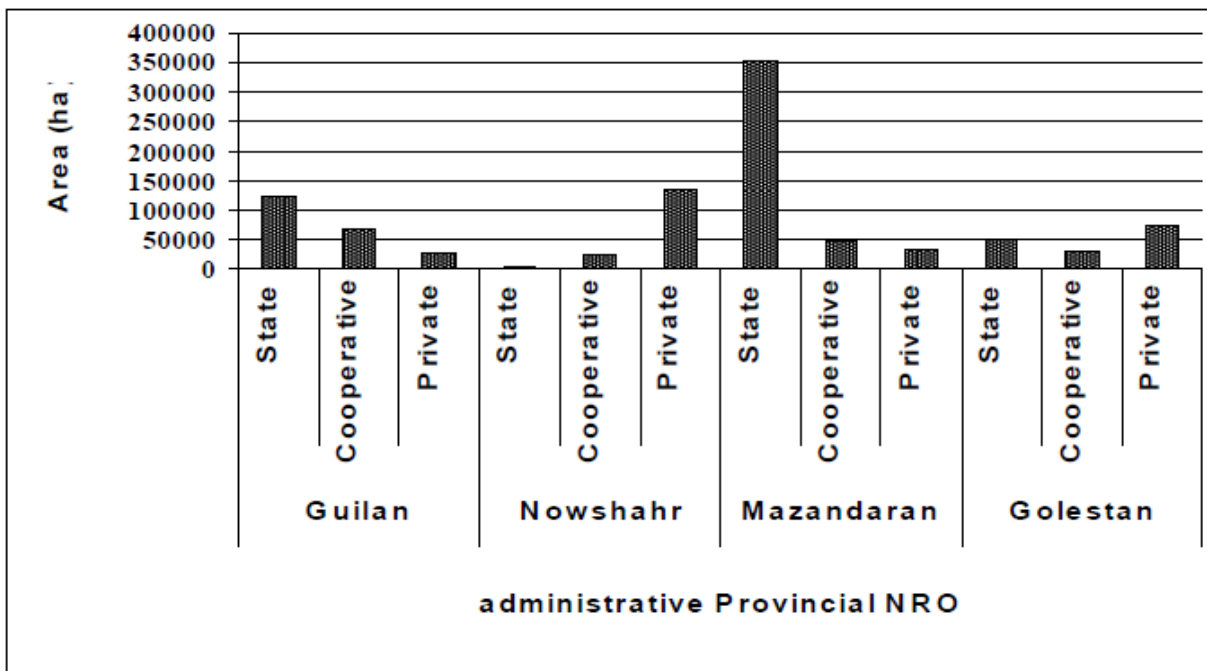


Fig. 2.8 Forest management plans areas assigned to different sectors in north of Iran

Source: Forest, Range and Watershed Organization (FRWO)

Control of grazing and forestry within reserves is determined by regulations adopted jointly by the Forest and Range Organization and the Department of the Environment. Research is conducted in ministries and universities. Almost all ministries have their own research institutes and centers. The Faculty of Natural Resources, University of Tehran includes the Department of Forestry and of Forest Economics which conducts studies relating to forest status and protection.

### 2.4.3 Policies

Forest protection is one of the most important objectives of the Forest and Range Organization. The government has a policy to engage local people in all forest activities, especially in forest protection, including fire prevention. Forest fires in Iran are generally caused by humans.

The main objectives of Forest Policy in the Islamic Republic of Iran are:

- preparing integrated plans for all natural resources of the country and applying proper exploitation systems based on modern technology suitable for the sustainability of natural resources and increasing timber and fodder production for economic exploitation;
- establishing wood industry units to create income-generating possibilities for forest dwellers;
- establishing forest cooperative societies to manage, preserve, rehabilitate, develop and exploit the forest in collaboration with local people and within the conditions and limitations prescribed in the developed plans;
- procuring technical facilities and required investment to develop road networks;
- industrializing the traditional animal husbandry systems in the northern forests by creating income-generating possibilities and procuring animal husbandry facilities in marginal areas outside forested lands;
- procuring the required equipment and inputs to implement the country's natural resources development plans;
- improving timber production through mechanization and modern technology, and decreasing waste;
- procuring the required facilities to replace fuel wood by other suitable kinds of fuel;

- determining rational ways of exploiting forest by-products to supply local needs and export the excess materials;
- extending agroforestry, the plantation of multiple-use wood species and the plantation of fast-growing tree species to meet timber needs through short and medium rotations;
- preserving rare forest communities and species as national reserves;
- Promotion of State, private and cooperative investment in developing, rehabilitating and utilizing all touristic areas and landscapes of the country;
- promoting training and extension programs and awareness rising about the importance of natural resources preservation and rehabilitation. Local cooperatives have recently undertaken the implementation of forestry management plans, which helps to prevent conversion of forest lands into agricultural lands and to improve rural people's livelihoods. Since 1986, 18 plans covering 130 000 ha have been transferred to 18 cooperatives with more than 5 000 members.

#### 2.4.4 Changes and trends

Generally, renewable resources (including forests) in Iran were not subject to government attention before the early nineteenth century. No management scheme for technical or scientific forest utilization was implemented, and there was no institution responsible for natural resources management. Forests first received official central government consideration when the Ministry of Commonwealth was founded in 1823. Thereafter, forests attracted growing institutional attention as Iran's population grew and timber harvesting was industrialized (particularly in the northern Caspian forests). The following are some examples of this attention:

- Foundation of the Routes, Railways and Forests Department in 1905;
- Establishment of the first Forestry Department of Iran in 1920 (dissolved in 1934);
- Foundation of the Forestry Division in 1938;
- Formation of the Forestry Administration in 1942 (renamed the Forestry Agency in 1948);
- Foundation of the Forestry Organization in 1960;
- Constitution of the Ministry of Natural Resources in 1968 (dissolved in 1971);



## **2.5 Chronology of the national forestry plan process**

Following UNCED in June 1992, the National Committee on Sustainable Development (NCSD) was formed in 1996 to follow up and achieve UNCED main objectives. In 1993, formulation of a National Strategy for Environment and Sustainable Development (NSE) started under a UNDP and World Bank-funded Capacity 21. National reports were prepared on 20 cross-sectoral environmental issues and a NSE framework was fashioned from these reports. The NSE is linked to the National Development Plan (NDP), which is prepared every five years and delineates Iran's principal environment development objectives, establishing linkages with cross-sectoral plans. The environmental objectives of the second NDP (prepared in 1994) recommended: coordination of environmental activities; development and amendments to environmental norms, standards, criteria and legislation, as well as adjustments to the structure and mandate of the department of Environment (DOE). In keeping with these objectives, Iran has decided to formulate a national Biodiversity Strategy and Plan (BSAP) as a priority action to complement and achieve better linkages with the Second National Development Plan, NSE and other cross-sectoral plans (GEF 1997). The Forest, Range and Watershed Management Organization (FRWO) is responsible for the formulation of the national forestry plan, as emphasized by the National Committee on Sustainable Development. In 1996, FRWO launched the forest management plan for sub-humid forests. Since 1997, the following economic and policy instruments have been applied to attain sustainable forest management:

### **2.5.1 Policy instruments**

- Support participatory process in planning, implementation, monitoring and evaluation of forestry plans.
- Support and encourage private sector, local communities and NGOs involvement in forestry related activities.
- Promote cross- sectoral and international cooperation.
- Delineate and specify the boundaries of private forest and range lands.
- Organize training programs and provide technical services to participants.

### **2.5.2 Economic instruments**

- Provide low-interest loans for plantation programs particularly, multi-purpose tree species.
- Provide low-interest loans for forest-related cooperatives.
- Eliminate tariffs on wood import.
- Entrust low price lands for plantation.

The Enabling Activity Project known as "The National Biodiversity Strategy and Action Plan" started in 1998 in collaboration with UNDP, GEF and IUCN. In 2001 four strategies were ratified as follows:

- Promotion of the public awareness and participation;
- Formation of biodiversity information systems;
- Sustainable use of biodiversity resources;
- Integrated conservation of biodiversity.

The National Action Program to Combat Desertification of I.R. of Iran was finalized in 2004.

Formulation of NFP requires capacity building. Recently, many actions have been taken to combat deforestation and forest degradation including transfer of livestock from forests and resettlement of the forest dwellers, forest extension, and rehabilitation of degraded forests as well as replacement of fossil fuels with fuel woods parallel to measures taken to update and enact forest laws (I.R. of Iran, 2005).

### **2.5.3 Mechanisms and procedures**

In 1999 the open-ended international expert meeting on "Special Needs and Requirements of Low Forest Cover Countries and Unique Types of Forest" was held in Tehran (4 to 8 October). The meeting, a government-led initiative in support of the program of work of the IFF, was attended by 77 participants from 39 countries and 6 international and bilateral organizations and NGOs (I.R. of Iran, 2005).

### **2.5.4 Stakeholders' involvement**

Forest management plans are being implemented by the government, cooperatives and private sector. At present forest and rangeland protection is mainly carried out with the collaboration of local communities. Private sector involvement in planning, formulation and implementation projects is stipulated by law. Local commu-

nities, NGOs and indigenous people involve formally in the process of formulating, planning and implementing forest management plans and forest policy (I.R. of Iran, 2005).

### **2.5.5 Use of technology**

In formulation of forestry plans modern technologies such as GIS are being used in cooperation with the private sector. In fact, the forest policy aims at capacity building of the private sector, local communities and NGOs (I.R. of Iran, 2005).

### **2.5.6 Awareness rising**

Action has been made to raise the awareness of public and policy-makers on forest resources and hazard forest degradation and deforestation in collaboration with other sectors. In this regard, a number of publications and documentary films funded by FRWO were produced. TV and radio also play a major role in this direction. The Ministry of Education has included subject matters in the curricula to further acquaint students with environmental issues and consequences of forest degradation. The Bureau of Extension and Public Participation of FRWO also encourages NGOs to play an active role in this regard. The Cabinet and the Parliament support for forest protection illustrate the public awareness towards forest issues (I.R. of Iran, 2005).

## **2.6 Reforestation and restoration initiatives**

Plantations have established and managed to meet local needs. In recent years, the areas forested to combat desertification (sand dune fixation) are being managed and their goods and services are utilized. Since 2003, formulation of management plan for these plantations have begun and implemented with the collaboration of local communities and private sector. In the Caspian region forest policy aims at forest promotion. Therefore, parts of the woodlands in mountainous areas which are converted into summer ranges are being afforested each year. Forest promotion of the Caspian region is of high importance because of wood production, protection of biological diversity and soil and water conservation in watershed basins.

The program was commenced in 2001. Iran is among wood importer countries which has enhanced import volume to support its forests. FRWO has formulated and implemented a master plan to promote forest resources using single or multipurpose species. To produce wood and non-wood products, the woody species as well as multipurpose trees were planted in private lands as well as state-owned lands which were entrusted to private sector with bank loan. Disadvantages of the plan were shortage of irrigation for new plantations and late-yielding period compared with farming. The main objective of the plan is to support sustainable forest management at national level through meeting the needs for forest goods and services (I.R. of Iran, 2005).

### **2.6.1 Main constraints**

Insufficient data and information on the extent of traditional use of forest goods and services by local communities. In forestry services valuation, there are some problems with methods of valuation due to their limited application.

### **2.6.2 Future actions**

Expansion of forest resources in the private farm lands is not so successful in comparison with farming and crop production. To this end, it is necessary to provide incentives such as bank loans, land transfer and even training and extension. The current policy can have positive effects only through involvement of all the stakeholders who provide themselves parts of investment and protection.

### **2.6.3 Main achievements**

The economic role of forests became important in the nineteenth century when the exploitation of the northern forests of the country, mainly for timber for export, was transferred to foreign contractors. In addition, before the nationalization of the forests in 1962 some landowners exploited their own forest lands. Although the High Council for Forest, Range and Soil was established in 1951 and forest management regulations were ratified in 1958, forest areas continued to be exploited by foreign enterprises and forest owners. In 1959 the first forest management plan was prepared and implemented in the Caspian area. Forestry plans covered only limited areas until 1963, when nationalization of forests led to the preparation of forestry

and exploitation plans on a large scale. Multiple-use forestry plans are now based on non-wood products with wood production exclusively to cover local needs for fuel wood and fine wood industry. Fisheries, apiculture, animal husbandry and fodder production are integrated in forestry planning in suitable areas.

## **2.7 National Action Program to Combat Desertification**

The National Action Program to Combat Desertification of I.R. of Iran was finalized in 2004. A National Committee (NCCD) was formed, chaired by Minister of Jihad - Agriculture and comprised of deputy ministers of various Ministries and concerned public organizations. The Committee is mandated to coordinate government organizations and institutes as well as to establish the macro policies for anti-desertification activities. The NAP framework consists of four pivots (I.R. of Iran, 2005):

- Identification and control of the factors contributing to desertification;
- Support for the sustainable use and management of natural resources through conservation and reclamation;
- Promotion of sustainable livelihoods in affected areas through job creating, income generation and the improvement of socio-economic standards;
- Strengthening the role of rural communities in terms of decision-making, planning, designing, implementation, monitoring and evaluation.

### **2.7.1 The National Biodiversity Strategy and Action Plan**

The Enabling Activity Project known as "The National Biodiversity Strategy and Action Plan" started in 1998 in collaboration with UNDP, GEF and IUCN on the basis of the obligations related to CBD. The activities for identification of the natural resources in Iran have led to the preparation of a series of 28 reports, each assessed by members of the Steering Committee. According to the approval of both the Steering Committee in February 2001 and the National Committee on Sustainable Development in May 2001, four strategies have been ratified as follows (I.R. of Iran, 2005):

- Promotion of the public awareness and participation

- Formation of bio diversity information systems
- Sustainable use of biodiversity resources
- Integrated conservation of biodiversity.

### **2.7.2 Forest, trees and land tenure**

In 1962, the whole forests of the country became nationalized and are still owned by the government. Forestry projects are carried out in the framework of forest management plans prepared, approved and supervised by FRWO on the basis of specific principles and guidelines. The existing principles and standards guarantee sustainable forestry at the area unit level. Customary rights of the indigenous and local communities are recognized in all forestry projects and their involvement in the process of decision making is encouraged. Besides the land tenure right of the local communities is also officially recognized and respected by law. Wood trade is undertaken and managed according to customs laws and regulations (I.R. of Iran, 2005).

### **2.7.3 Forestry legislation**

Constitutional Act No. 50 of 1979 states that "all citizens are required to honour the conservation of nature and natural resources". The Law of Protection and Exploitation of Forest and Range, enacted in 1967, includes specific legislation relating to areas which may be declared as forest parks. They are administered by the Forestry and Range Organization and are maintained as parks designated primarily for recreation, although they often include important representatives of unique woodland stand types.

The Environmental Protection and Enhancement Act, 1974 identifies four categories of protected natural areas: national park, wildlife refuge, protected area and national nature monument. The first wildlife reserves were established in 1927. In 1956 the Game Council was created with a policy to set up hunting centres for the protection of endangered species and the control of hunting. In 1967, the Game and Fish Department was empowered by law to declare certain areas for the protection of flora and fauna.

## **2.8 Soil erosion in Iran and juridical challenges**

When classifying natural resources, soil is grouped with air, water, flora and fauna as renewable resources whose use should not exceed their production by natural processes. Otherwise, they may become depleted and be even lost for good. Soil does not solely mean land, which is only of value when it is used for agriculture or construction, but is an asset for present and future generations and is much more valuable than land and its various uses. Therefore, destruction, erosion, contamination and lack of protection for soil do not merely lead to reduced production and, given the true value of soil, there would be numerous environmental consequences. If such resources were depleted, the rehabilitation process would require hefty sums of money and protracted periods of time.

Soil degradation is a most serious environmental problem in many countries. One of the most important driving forces of soil degradation is human activities. Human activities often influence the natural processes in soil. Deforestation is a perceptible aspect of human activities in environment. This change has many interlink effects that can appear through the reduction of chemical and physical qualities of the soil resources (e.g. Doran et al., 1998; Cavelier et al., 1999; Chew, 2001; Liu et al., 2002; Johnson & Lewis, 2007; Seeger & Ries, 2008). According to FAO (1993) soil degradation is the sum of geological, climatic, biological and human factors which lead to the degradation of the physical, chemical and biological potential of soil, and which endanger biodiversity, land use and thus the survival of human communities. Lal (1997) stresses that soil degradation leads to a decline in soil quality with a continuing reduction of productivity. In many cases the loss of soil productivity has been caused by overgrazing, deforestation, inappropriate agricultural practices and other human activities. On a global scale, according to World Bank (1991) about 60 per cent of the deforestation in the developing world may be attributable to the advance of agricultural practices, about 20 per cent to logging operations (including mining) and 20 per cent to household use of fuel wood. Various types of the human-induced soil degradation are visible in many parts of Iran. Evidence shows that long-term human activities and inappropriate exploitation of soil, water and vegetation have had environmental degradation impacts. Regional forest cover in Iran has been declined with the expansion of arable land and population growth, economic development, technological advancement and changes of social and political situation (Emadodin, 2008). Although improvement in the agricultural sector increased productivity greatly during the last 50 years, intensive

farming and mismanagement of the deforested areas brought environmental problems and soil impacts such as soil erosion, salinization, acidification, soil compaction and pollution (Dewan and Famouri, 1964; Valles et al., 1990; Farahpour et al., 2004; Hajabbasi et al., 2006; Salehi et al., 2008; Qadir et al., 2008). Land-use changes in Iran have been more rapid in the past 50 years than at any time in Iran's history and are expected to continue or accelerate in the future (Emadodin, 2008). With a rapidly increasing population and a strong rise of the standard of living, the need to intensify agricultural production increased; this situation puts pressure on other resources. The natural forests in Iran have been reduced from 19 million hectares in the 1950s to 12.4 million hectares in the 1990s (Michaelis, 1960; DEI, 2003). During the past 50 years, the amount of Iran's cultivated land has grown by more than five times, increasing from 2.6 million hectares (Wilbr, 1948) to 24.5 million hectares (DEI, 2003). Many studies have addressed effects of land-use changes and land management on soil properties, and most of them have analyzed soil properties under different land-use systems (e.g. Hajabbasi et al., 1997; Doran, 2002; Sadeghi et al., 2007; Shrestha et al., 2007; Emadi et al., 2008; Khrsat et al., 2008; Emadodin et al., 2009).





### 3. Forest policy in Iran

Deforestation is a problem in many developing countries. In Iran, the introduction of forestry management policies in the twentieth century coincided with a period of severe depletion in forest cover. 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. The formal forestry management policies initiated in the early 1900s were inadequately enforced, leading to continuing loss of forests through largely unregulated exploitation. Despite the discovery of oil in 1908 and natural gas in 1937, gas pipeline construction for domestic consumption was slow, kerosene was only gradually substituted for wood, charcoal consumption only fell steeply after 1960, and the established forest cover decreased sharply between 1970 and 1990. In 1991, the first of the post-Revolution National Five-Year Development Plans commenced and environmental protection was allocated significant budgetary support. The Five-Year Plans implemented substantial reductions in livestock grazing in forests and encouraged reforestation, which partly offset the continuing forest removal. Using estimates based on fuel wood consumption in Brazil and USA, the forested area in Iran in 1850 would have disappeared by 2000 without the Government intervention which provided widespread access to fossil fuels. This energy-source shift decreased local pressure on the dwindling forest resources and was reinforced by Government policies to conserve and extend forests.

Plentiful rainfall, a mild climate, and a long growing season have combined to create a dense forest of high-quality timber in the Caspian region. There is an extensive growth of temperate-zone hardwoods, including oak, beech, maple, Siberian elm, ash, walnut, ironwood, alder, basswood, and Fig.. About half of the Caspian forests consist of these trees; the remainder is low-grade scrub. To curtail indiscriminate forest destruction, the government in 1967 moved to nationalize all forests and pastures. A forest service was established; by 1970 more than 3,000 forest rangers and guards were employed, and 1.3 million saplings had been planted on 526,315 hectares of land. The value of exported forest products was six times greater in 1973 than in 1984; the decrease in exports probably resulted from increased domestic and war-related consumption.

Table 3.1. Comparison of annual rate of deforestation in Iran and the world

World/country	Period <sup>a</sup>	Total forest lost (mha) <sup>a</sup>	Total years	Average annual decline (mha) <sup>b</sup>	Average annual decline (%) <sup>c</sup>	Annual decline per capita (ha) <sup>b,d</sup>
<b>World</b>						
Tropical and temperate forests	1850-1919	205	69	3.0	1.5	N/A
Tropical and temperate forests	1950-1979	336	29	11.6	3.5	N/A
Tropical forests-1	1980-90	146	10	14.6	10.0	0.05
Tropical forests-2	1990-95	65	5	13.0	20.0	0.04
Tropical rain forest	1990-2000	N/A	10	6.0		N/A
Tropical moist deciduous forest	1990-2000	N/A	10	2.4		N/A
Tropical dry forest	1990-2000	N/A	10	0.8		N/A
<b>Iran</b>						
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

Notes: For Iran-1, population with an average of 14.35 million and for Iran-2, population with an average of 54.41 million was presumed using different sources; N/A: Not available.

Sources: Williams, (2006); Arian et al. (2007); Kaplan et al. (2009); FAO cited by Lipper, (2010); <http://www.fao.org/docrep/004/y1997e/y1997e1f.htm>, 19 January 2010; average forest areas in the 'World' sub-sets were not available; b Mostly calculated by authors; c For 'World', Average annual decline (%) = (average annual decline/total forest lost) ¥ 100; and 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.

Some of Iran's forest resources were nationalized under Mohammad Reza Shah's development plans, beginning in 1963 (white revolution). Since then, the state has gradually gained control over forest use. The plentiful commercial timber in the Alborz and mountains was diminished by illegal cutting that did not show up in official statistics; approximately 6.5 million cubic meters were cut in 1986 alone. Of an estimated 18 million hectares of forest lands, only about 3.2 million hectares near the Caspian Sea can be regarded as commercially productive.

Generally, renewable resources (including forests) in Iran were not subject to government attention before the early nineteenth century. No management scheme for technical or scientific forest utilization was implemented, and there was no institution responsible for natural resources management. Forests first received official

central government consideration when the Ministry of Commonwealth was founded in 1823. Thereafter, forests attracted growing institutional attention as Iran's population grew and timber harvesting was industrialized (particularly in the northern Caspian forests). The following are some examples of this attention:

- foundation of the Routes, Railways and Forests Department in 1905;
- establishment of the first Forestry Department of Iran in 1920 (dissolved in 1934);
- foundation of the Forestry Division in 1938;
- formation of the Forestry Administration in 1942 (renamed the Forestry Agency in 1948);
- foundation of the Forestry Organization in 1960;
- constitution of the Ministry of Natural Resources in 1968 (dissolved in 1971);
- formation of the Forest and Rangelands Organization in 1971.

The forestry planning process is still traditional in Iran. The FRWOI is one of the major subsectors of the Ministry of Jihad - e - Keshavarzi (Iranian Ministry of Agriculture). Forest policy in Iran has never been rigidly defined. Only within the past fifty years the permanent modification of the forest sector and the formation of forest policy have taken on a specific character. The sector has been primarily preoccupied with the northern forests because of their importance to the economy. Before the land reform, the northern forestlands belonged to 'khans' and other large estates including royal forests. In 1962, ownership of the royal forests was transferred to the government and resulted in the nationalization of forests and rangelands. All of the forests were eventually consigned to government supervision (Mohamadi Fazel 2001).

Table 3.2. Policies and laws regarding forestry and fossil fuels in Iran since 1900

Timeframe	Forest conditions	Forest policies	Fossil fuels
1900-1920	Irresponsible and intensified forest cutting; high dependency on forests for wood consumption	Lack of any afforestation plan or forestry law; establishment of Bureau of Roads and Railroads and Forests	Oil discovered in 1908 but not incorporated into daily life or industry
1921-1940	Extensive forest destruction for charcoal and timber production	Establishment of the first policy-making administration for forestry (1920s)	Natural gas was discovered in 1937 but not incorporated into daily life or industry
1941-1978	Continued forest destruction	Enactment of the first Forest Law (1943) followed by the Comprehensive Forest and Rangeland Law (1959); implementation of a forestry programme; hiring foreign forestry advisors; nationalization of forests	Heavy reliance on kerosene as main fuel source instead of wood; expansion of hydroelectricity from the 1950s
1979 onwards	Sharp decline in dependency on forests for wood consumption due to expansion of gas pipelines; patchy destruction of forests due to development plans	Establishment of current FRWO in 2002; implementation of afforestation plans at local and national level (e.g. reclamation of 84,300 ha degraded northern forests and providing 332,000 seedlings between 2000 and 2010 at national level; FRWO, 2009)	Replacing kerosene with subsidized gas as main fuel source; widespread expansion of gas pipelines into rural and urban areas; progress toward usage of renewable energy sources; removal of energy subsidies

Source: Forest, rangeland and watershed organization of Iran (FRWO)

Scientific management of forests started in Iran with the preparation of the first forest management plan in 1959. At first, the strategy was to maximize production through the development of forest resources harvesting. The development activities hardly considered the rural people and little attention was given to the private sector (Mohamadi Fazel 2001). According to a 1994 survey based on aerial photographs, north Iran was covered by 1,847,860 hectares of forests. In comparison to the 1967 inventory Figures, the north forest of Iran lost 141,572 hectares or 7.1 percent of the cover within 27 years (Mohamadi Fazel 2001). In spite of these existing obstacles, the forest sector has prepared projects for nearly 1.3 million hectares of commercial forests. The projects include several technical aspects, such as forest inventory, silviculture, afforestation and the construction of roads and the transport of wood. Along with the implementation of these projects, consideration has also been given to the problem of destruction of the natural forests and the proactive execution of new plantation projects. By 2002, the total amount of forest plantation projects involved nearly 328,000 hectares (Hedayati 2003). Iran is relatively poor in terms of available forest area (7% of the total land). Thus it is vul-

nerable to rapid destruction. One of the problems threatening Iranian forests is illegal logging, over and above the logging permits issued by the general natural resources offices. Rural people who reside with their livestock in the forests also threaten the biodiversity assets. Since 1990 there have been relocation efforts but they have not been completed. Another source of forest destruction comes from the large number of fires. From 1991 to 2001, a total forest area of 6141ha was affected by fire in northern forest (FRWOI, CPO 2004). During the 'Third Five Year Plan' period, the main emphasis was set to expand forests. In addition, the qualitative improvement of natural forests through selective logging and artificial regeneration was also given priority. Major emphasis was placed on local people's participation, the relocation of rural forest people, and the movement of livestock from the north forest. Private sector investment in the management and development of forests is a cornerstone of government policy.

### **3.1 Formalizing forestry management**

For the first time in its history, in the twentieth century Iran witnessed the gradual institutionalization of a modern structured forest management system with relevant laws and regulations. This began with the establishment of the Bureau of Roads and Railroads and Forests, later renamed the Bureau of Roads and Mines and Forests. In 1916, the Government decided to survey and map the Northern forests, and in 1917, the Ministry of Public Benefits, Trade and Agriculture were formed by amalgamating several bureaus including the Bureau of Roads and Mines and Forests (FRWO, 2007). An office in the Northern part of the country was established, and foreign commissioners were recruited to survey forests, assess the organization of separate national and private forests, and identify both unspoiled and degraded forests (FRWO, 2009). Gradually since then, key actions to conserve Iranian forests have been undertaken. This Northern office eventually evolved into the current Forest, Rangeland and Watershed Management Organization in 2002. The establishment of the first forest policymaking administration in Iran in the early 1910s may be regarded as a serious and initial formal step towards preserving the remaining pristine forests. This was followed by further legislation. Environmental laws and regulations were first defined in 1928 (Ayati, 2003), with these laws covering different aspects of natural resources. As an example, in 1932, a law was enacted to govern the exploitation of forests surrounding the Caspian Sea; the

first Forest Law was only enacted in 1943 and was followed by the longer Comprehensive Forest and Rangeland Law enacted in 1959 (FRWO, 2009). Even though not all forest laws were respected, the formal establishment of forest management was a big step towards saving Iran's last remaining forests. As probably the first foreign forestry expert who lived in Iran for five years in the 1950s and wrote papers on the nation's forests, Kernan described the situation at that time. He portrayed the Caspian forests as unique in the Middle East and as being almost untouched until WWII<sup>2</sup> (Kernan, 1953). He blamed the impact of increased economic activities both in Iran and Western European countries that encouraged a primitive, illegal, inefficient and destructive forest industry to develop. It was reported that 90% of all charcoal kilns operated without permits, despite the enactment of the Forest Law (Kernan, 1953). During the 1960s, the first range management plan in Iran was formulated. In 1963, all forests were nationalized, a major step in preserving the remaining forests (Ehlers, 2001). In August 1967, the Protection and Exploitation of Forests and Rangelands Law was enacted at the national level and specifically addressed issues related to charcoal production (FRWO, 2009). Provisions in this law included strict penalties from the Forestry Organization for cutting trees without permission, banning of all export of charcoal and firewood, and requiring all public and private establishments to replace wood-based fuels with other energy sources (Majlis, 2010). According to Farahpour et al. (2004), the first local range management plan was also formulated in 1967 by students of Gorgan College of Natural Resources for 2,000 hectares of rangelands in Firoozkooh. In the early 1970s, Iran began to show serious concerns about sound environmental practices, and Parliament enacted the Environmental Protection Act (Zekavat, 1997). The Environmental Protection Act adopted in 1974 can be regarded as the first major law directed towards environmental conservation in Iran. According to this Act, different categories of natural protected areas were to be established and administered by the Department of Environment (DoE) (DoE, 2000).

### **3.2 The structure of the Forest, Range & Watershed Organization of Iran (FRWO)**

Forestry planning is the responsibility of the FRWOI. Forestry planning has been done in full consideration of, and with a view to supporting, the national goals for

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<sup>2</sup> World war



socio-economic development. The major objectives of forestry planning include:

- Conservation of natural forests and wildlife resources through the establishment of large-scale forest plantations.
- Efficient utilization and exploitation of forest products to meet sustainable forest development objectives.
- Provision of forestry extension services, and the improvement of the national capacity for the development of forest and pastures in terms of the required skills and technology.
- Establishment and encouragement of assembled industries and cooperative within the society useful for exploiting the forest and rangelands according to relevant regulations and laws.

### **3.2.1 Departments of the FRWO**

FRWO is one of the dependent organizations of Ministry of Jihad -e- Keshavarzi. It has the five following deputies:

- Forest Department - responsible for forest development and rehabilitation; the managing of forest parks, the forest management and the harvesting of north forests in Iran.
- Rangeland and soil Department - responsible for the planning and management of rangelands and forests outside of the north forest; monitoring stabilization and desertification.
- Department of Conservation and Soils Issues - responsible for conserving and differentiating national resources including the forest, rangeland and desert; utilize these lands for different purposes.
- Department of Watershed Management - responsible for producing, developing and conserving resources; utilizes floods and reduces the effects of dryness; supervision the conservation of soils and the reduction of sediment in rivers.
- Department of Planning and Support - responsible for supporting human resources, finances, personnel and administration, program planning and statistics, information, and computation.

There are some additional units that are under the direct control of the Organization Director. These are as follows:

Forest and Rangeland Council; Public Relations and International Office; Inspec-



tion and legal Office; Security Office; Engineer Technology Office.

### **3.2.2 Forestry Department**

The forest Department for northern forest is located in Chalous city because of its proximity to the Caspian forests in north of Iran. The department includes three offices: the Forestry Technical Office (FTO); the Plantations and Parks Office (PPO); the Harvesting and Timber Industries Office (HTIO).

The Forestry technical office offers the following services:

- investigation of forest management plans and delivering of the plans to the forest council for approval,
- provision of statistics and information required for the construction of forest resource databases,
- control and supervision of the implementation of forest management plans,
- identification and investigation of the socio-economic problems facing the rural population,
- the planning of the removal of domestic animals from forests and relocation of rural people inhabiting the northern forests,
- selection and felling of trees under the forest management plans,
- provision of the volume tables and the corresponding paperwork.

### **3.2.3 The objectives of the Plantations and Parks Office**

- Study, investigation, provision and execution of relevant plantation and reforestation plans;
- Control and to appraisal of approved plans;
- Creation of recreation areas, natural forest parks and planted parks;
- Production and collection seeds and establishment of the seed orchards in forest; also conservation of seed producing trees within forest stands;
- Co-operation with other divisions for the protection and conservation of natural forest resource.

### **3.2.4 The Harvesting and Timber Industries Office provides the following services**

- Investigation of the production and the consumption of timber resources from the northern forests; management of non-timber products and other resources in the country,

Provision of harvesting plans and utilization of the northern forests and their auxiliary products,

- Supervision of harvesting operations in order to reduce operation costs, damage and logging waste,
- Investigation of mining activities in the forests,
- Overseeing of the harvesting and utilization by the timber industries and the exploitation of non-timber forest products,
- Determination of the mean annual price of timber, industrial round wood and fuel wood and the government revenues to be generated from the implementation of the forest management plans,
- Subcontracting and supervision the implementation of forest management plans in the northern forests,
- Forecasting of the incomes garnered from forest and rangeland products in the northern Iran.

### **3.2.5 Department of Conservation and Soil Issues**

The department includes three offices: the Soils Audit Office; Soil Delivery Office and the Conservation and Protection Office. Below is a description of only one of the three offices involved in the collection of forest information.

The Conservation and Protection Office provides the following services

- drawing up of conservational and protection plans and their transfer to the provincial General Natural Resources Offices for execution,
- investigation, supervision and appraisal of the conservation and protection plans implemented by the provincial General Natural Resources Offices and subsequent revision where shortcomings are identified,
- facilitation of means of transfer of timber and non-timber forest products for processing, and provision of chainsaws to authorized persons,
- conduit to the court of justice to ensure the timely investigation of offences identified in relation to the use of natural resources,
- monitoring and evaluation of existing conservation laws and submission of recommendations for either the reform of existing laws or the implementation of new laws for consideration by the legal office,
- Planning the construction of fixed and mobile stations at different locations in forests and rangelands.

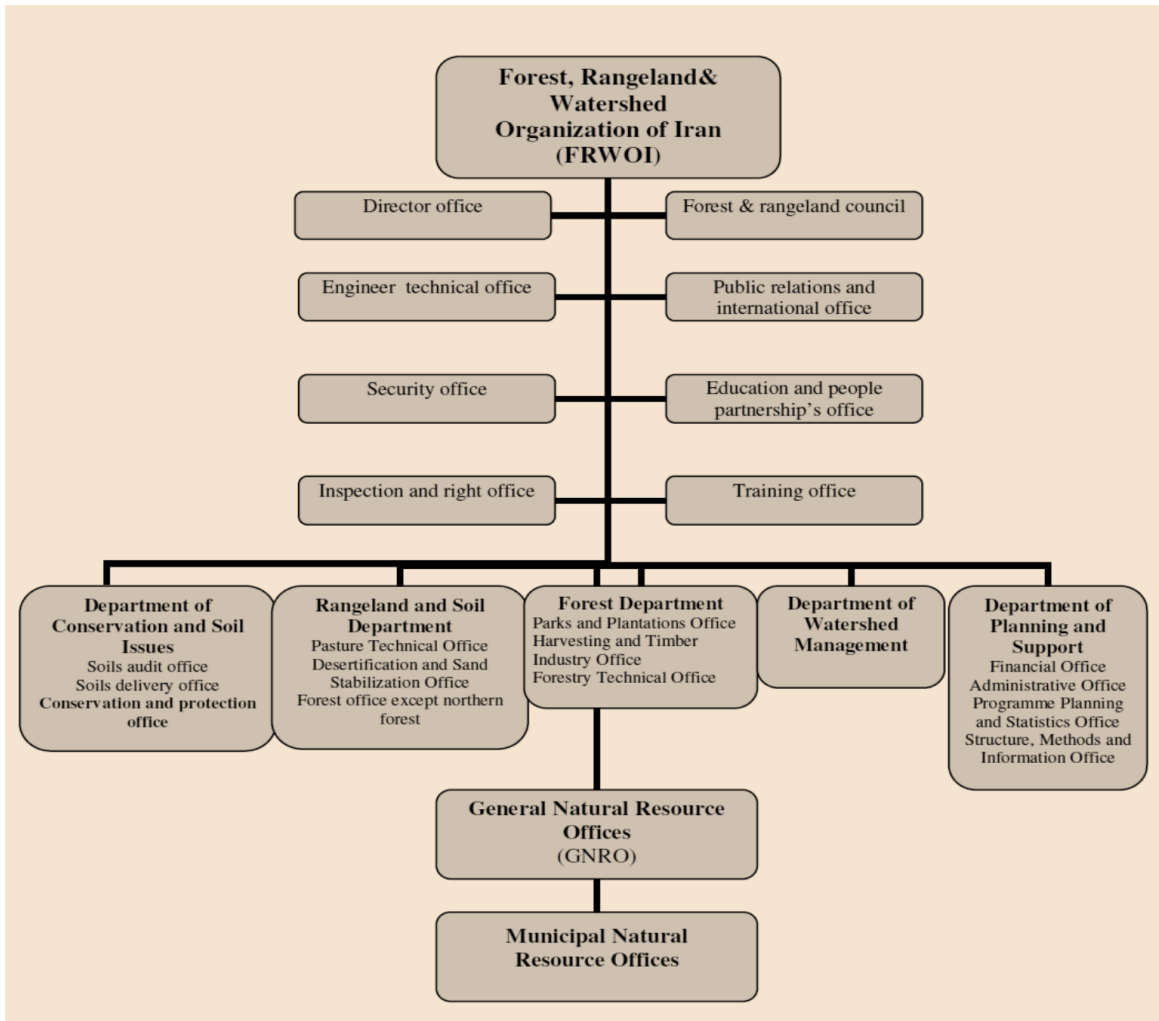


Fig. 3.1. The structure of Forest, Rangeland & Watershed Organization of Iran

Source: *Forest, rangeland and watershed organization of Iran (FRWO)*

### 3.3 Analysis of tenure systems

Caspian forests have always been important as the main source of commercial timber in Iran. In addition, these forests have outstanding natural values, especially for research. Until the twentieth century, forest management practices consisted mainly of intensive and irregular utilization of commercially valuable species, such as *Boxus hyrcana* and *Quercus castaneifolia*, by foreign contractors. Legal regulation of forest management in Iran then made it necessary to organize this timber utilization, and in 1949 FAO experts presented an initial forest management system for northern Iran. This system was implemented extensively until 1959. The basic framework of the forestry system did not change significantly for almost 30 years,

owing to a lack of forestry expertise in the country (Yachkaschi, 1974). Forests were seen mainly as the source of industrial timber products. The scarcity of technical and financial infrastructure (e.g. a road network of appropriate density) also hindered change in the forestry system. Silviculture methods were gradually developed, but little attention was paid to local livelihoods during FMP preparation and implementation; local people's tenure rights were not respected, and communities had no role in FMP preparation or implementation. The institutional framework for close to natural forestry practices was provided in 1988, and has been implemented since 1991. Most FMPs in northern Iran are based on CPPNF. One of the issues associated with State ownership of northern forests is the high cost of protecting forest resources and preparing FMPs; FMPs are normally prepared through FRWO.

As mentioned previously, the Third and Fourth National Development Plans pay special attention to SFM, but there seems to be a mismatch between the legislation (e.g. the development plans) and FMPs, which still focus on maximum income generation from resources (mostly through timber harvesting).

The government's recent plans to devolve forest management to the private sector seem to contradict the FMP implementation system stipulated by law, which gives government the sole responsibility for monitoring FMPs. For instance, one prerequisite of the legislation regarding FMP implementation is that the government must have an appropriate number of experts to monitor the process, but current policies seek to reduce this governmental role by involving other (private and cooperative) sectors in FMPs. At present, the forestry operations executed by either State or private companies tend to be poorly monitored. One of the main ways of increasing local community participation in forest management has been through the foundation of FDCs in northern Iran; there were 19 such cooperatives in 1991. FDC executive managers are usually retired FRWO experts or local trustees, and most other managers are local people with appropriate education and training levels. As local people and communities have become more involved, the focus of FDC forest management has gradually changed from biological and technical forest to greater consideration of socioeconomic issues, such as the relocation of livestock from planned forest districts. However, the trend for founding FDCs has lost momentum, mostly as a result of economic inefficiency and local mismanagement. For example, there is a basic conflict between the State's and local communities' per-

ceptions of the purpose of cooperatives. In forming an FDC, the State considers objectives such as forest protection and resource sustainability, while local people living in poverty tend to view the FDC mainly as a potential source of income for their own livelihoods.

Nonetheless, the participation of local communities (and sometimes local experts) in managing FDCs can bring benefits for local forest protection, as well as commercial benefits for local people, provided the government supplies the necessary financial support in terms of forest mechanization, subsidizing of activities, etc. The main advantage of an effective FDC mechanism is the community's greater sense of responsibility for protecting forest resources.

### **3.3.1 Changes in forest ownership and policies prior to 1988**

In January 1963, a resolution was enacted to nationalize Iran's forests (FNL). Based on this, all forests and woodlands were transferred to the government as public property, and all forest management (including preservation, rehabilitation, utilization and extension) were considered State responsibilities. According to notes 1 and 2 of Forest Nationalization Law 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's permission. The government can also buy the above-mentioned lands". Later, several laws were passed to transfer all the forest ownership rights mentioned in these notes to the State. These include Article 45 of the National Constitution of the Islamic Republic of Iran, according to which "all natural resources, including forests and rangelands, are held by the government to be utilized for the national commonwealth. Details and forms of utilization are determined by the related laws". Following the Islamic Revolution, forest lands and resources were therefore considered national property held by the government. Rules were enacted to return private forests to the State. The livelihoods of forest dwellers received some official consideration in Article 8 of FNL, according to which "the Forestry Office is allowed to issue forest harvest permits for local communities' consumption without taking any share (royalty), due to their actual requirements". Local communities exploited forest sites to supply their timber needs. To prevent this, FRWO has implemented welfare plans in recent years, including providing fuel for forest livelihoods. During the eight-year war between Iran and Iraq (1980 to 1988), no significant changes were made to forest resource

policies.

### **3.3.2 Changes in forest ownership and policies after 1988**

In October 1988, as a tool for settling land disputes arising from Article 56 of the Forest and Rangelands Protection and Utilization Law, the Iranian Parliament passed an enactment by which “a seven-member board would be responsible 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”. Enactment of this law somehow resulted in the remaining private natural forest resources being transferred to the State. Following the 1992 Law on the Preservation of Iranian Natural Resources and Forests, DOE was legally empowered to hold portions of State-owned forest resources as environmentally protected areas where no timber harvest is permitted. In December 2000, the government passed an enactment indicating that tenure of some marginal forest lands (chiefly consisting of other wooded lands) would be assigned to local people for plantations. According to this law, “the leasing time would be at most 30 years, with rents adjusted every three years (based on economic factors such as the inflation rate)”. In October 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 provided that a feasible afforestation plan can be presented”. The permanent assignment of these lands will be subject to at least five years of successful devolved management. This has been one of the most effective ways of encouraging afforestation among local people (e.g. farmers) in west, east and central Iran. An amendment to FNL Article 34 states that “all the forest lands in northern Iranian plateau that were under illegal land-use conversion prior to 1986 will be assigned (i.e., rental will be paid by the former landowner) or fully sold to the government”. With the enactment of this amendment, the natural forests on the Caspian plateau that remained under private ownership were transferred to the State. Lands that had been converted to other land-use types could not be returned to forest land use.

### **3.4 First social economic and cultural development program 1989-1994**

Plans in forest subsector shows that in last 50 year had recovery process but still are

not like predictive objectives. Some factors such as dysfunctional organization structure, exciting situations, changes in way of thinking of managers, lack of financial and economic resources causes to malfunction of program in this section.

Lack of uniformity and consistency, lack of integrity and lack of participation Were of the main reasons for incorrect programs.

### **3.5. Forest and forest ownership in the third national development plan (1999 to 2004)**

The third economic, social and cultural development plan passed by the Iranian Parliament paid more attention to forests than the two former plans did. Article 104 of this plan introduced aspects of sustainable natural resource management, including:

- implementing management plans (e.g. livestock–rangeland balance) and re-locating livestock outside forests;
- providing local and tribal communities with their fuel and silage needs;
- Involving the public in forest planning and implementation processes.

Article 109 charges the government with organizing tribal communities over two five-year plans, providing them with appropriate social services, settlements and infrastructure, but the nature of these provisions is not clearly defined in the article.

In third Development Program chapter12 which is about environmental policies, section “A” Article 104 is about sustainable use of natural resources, and implementation of plans such as exiting cattle of the forest.

#### **3.5.1. National development plans and forest policy**

From 1990 in another phase of major changes in society, the Islamic Revolution, which took place in the late 1970s, was immediately followed by the Iran-Iraq war. The war lasted until the end of the 1980s and absorbed national assets while destroying infrastructure. During the 1980s to 1990s, Iran’s new Government faced a rapidly declining economy, brought on partly by falling oil revenue and the highly destructive war with Iraq (Esfahani & Pesaran, 2009). While the Iran-Iraq war negatively affected forests along the Western borders, the rangelands along the Eastern borders were infiltrated by Afghan refugees who contributed to vegetation destruction in their search for firewood and shelter (UNDP/GEF, 2003). A period of gradual recovery in all economic sectors occurred after the Iran-Iraq war. The

Five Year Development Plans (FYDPs) begun in 1991 paid attention to the conservation of natural resources and environment. Protection of the environment was highlighted as one of the most important chapters in each of these plans and allocated significant budgetary support. For instance, the Second FYDP (1995-1999) stated that all economic and social activities must be performed within the constraints of environmental and biodiversity conservation and management. The Third FYDP (2000-2004) addressed issues such as sustainable exploitation of natural resources, environmental liability and redress, support of green Industries and environmental impact assessment (DoE, 2000). The Fourth FYDP (2005-2009) placed emphasis on environmental protection as a means of achieving sustainable development. In the early 1990s, a new era commenced involving construction of roads, dams, industries, expansion of oil and gas refineries and networks, development of communication systems to urban and rural areas, and exploitation of mineral resources. These efforts are inevitable for any developing country, although in some cases these projects have had adverse environmental impacts. The Tehran-Shomal (Tehran-North) road project, 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. 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 channel, and wastewater flowing into adjacent rivers (Iran newspaper, 10 July 2007). This project is a response to a gradual shift in the attitudes of wealthy people living in Tehran, who would like to vacation along the Caspian Sea while staying relatively close to the polluted capital. This coastal region has attracted a large influx of people for recreation, leisure and settlement. Recent internal migration patterns (rural-urban and urban-urban) as a result of population growth, rapid industrialization and urbanization have also increased the value of land and buildings, enticing the illegal occupation of national lands across the Northern forests. Not surprisingly, some building contractors have destroyed forest areas to develop houses and businesses. Although there are no national statistics available for conversion of forests to urban land uses, reports at the local level indicate forest loss. Examples of small-scale projects causing degradation include the destruction of 20 ha of Kajoor (Aflaki, 2007b) and 120 ha of Lakan forests (Aflaki, 2007a) in the North in order to expand houses and industries, respectively. Expansion of farming 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 paddies, tea plantations, and citrus and kiwi orchards (Ramezani et al., 2008). Illegal tree cutting is still prevalent in most forests with an estimated harvesting of 2 million m<sup>3</sup> per year (Arian et al., 2007). A report suggests that as recently as 2006, about 350,000 m<sup>3</sup> of wood was harvested illegally in the Northern forests in Golestan (Iran newspaper, 25 November 2009). Given that only 4,000 m<sup>3</sup>/ha/yr of biomass is produced naturally in this area (Iran newspaper, 25 November 2009), the continuation of illegal exploitation at this level would result in serious depletion of an already diminishing resource in the region. Fire has also contributed to the degradation and destruction of forests. It was reported that 220,413 ha of forest was burned by wildfire between 1991 and 1998 (IFFN, 2003) but it is unclear whether all burned forests have been completely destroyed. Some of the most fire prone areas are Kordestan (West), Golestan (Northeast) and Khuzestan (South west) (IFFN, 2003). Since the 1950s when attention was directed towards the central regions, afforestation projects funded by the Government have increased, particularly in dry-land areas (Amiraslani & Dragovich, 2010; 2011). Some forest management plans were formulated and implemented in various other parts of the country, although not all have been successful. For example, in the Zagros region, reforestation and protection plans were ineffective because local communities in the area depended on these forests for fuel and fodder. Illegal forest destruction has therefore continued, contrary to the main purpose of the forestry plans to reduce pressure on forests and maintain sustainable yields of forest products (Ghazanfari et al., 2004).

Table3.3. Summary of increases and decreases in forest areas in Iran

Period	Location	Increase	Decrease (estimates)
1978-2003 <sup>a</sup>	All Iran	2.2 million ha (planted)	
1991-1998 <sup>a</sup>	All Iran		220,413 ha (burnt)
2005 <sup>b</sup>	All Iran		125,000 ha/yr
2006 <sup>c</sup>	All Iran		200,000
2007 <sup>d</sup>	All Iran		2 million m <sup>3</sup> /yr illegally removed
1962-1994 <sup>e</sup>	Zagros Forests		1.7 million ha
1995 <sup>d</sup>	Caspian Forests		1.44 million m <sup>3</sup> removed
2004 <sup>d</sup>	Caspian Forests		0.87 million m <sup>3</sup> removed
2006 <sup>f</sup>	Golestan		350.000 m <sup>3</sup> removed illegally

Sources: *a* IFFN (2003); *b* World Bank (2005); *c* Amirnejad et al. (2006); *d* Arian et al. (2007); *e* Ghazanfari et al. (2004); *f* Iran newspaper (25 November, 2009).

On a more positive note, a large number of conservation, plantation and rehabilitation programs in forest areas have been accelerated in the last two decades. Countrywide, total planted forest area reached 2.2 million hectares in the 25 years to 2003 (IFFN, 2003). To some extent, this reforestation has compensated for other forested areas lost in the country (e.g. 1.7 million hectares of the Zagros forests in the 32 years between 1962 and 1994, cited by Ghazanfari et al., 2004). One of the most important plans to preserve valuable national forests is a scheme titled “Relocating or removing livestock from within Northern forest areas”. This plan, commenced in 2002, aimed to preserve forest plant species. Of the 5.7 million livestock scattered in the Northern forests, up to 1.16 million were relocated outside the forest areas by 2007 (IRNA, 2007). There is evidence of declining wood harvesting from the Caspian forests from 1.44 million m<sup>3</sup> in 1995 to 0.87 million m<sup>3</sup> in 2004 (Arian et al., 2007), with 100,000 hectares still considered untouched and pristine (Ramezani et al., 2008). A summary of the incomplete data for forested areas in Iran is provided in Table 1. Over the last decade, measures have been introduced to safeguard forests through the employment of trained forest guard staff, and the implementation of new airborne technologies, specialized vehicles and fire extinguisher machinery, as well as the construction of fences. Even so, more work is necessary, particularly because a report suggests a shortage of trained staff for forest patrolling. Compared to the international standard wherein one guard is required to patrol 2,000 ha of forest and rangeland areas, the Figure for patrolling in Iran’s northern forests is one guard for 5,427 ha (Iran newspaper, 1 August 2011:23). Additional resources are thus required to fully and effectively implement forest conservation policies. Despite these investment shortfalls, the latest FAO assessment reported unchanged forest coverage in Iran for the decades of 1990-2000 and 2000-2010 (FAO, 2011). A further complication for forest conservation policies is that forest regeneration following destruction may not occur or be extremely slow in some areas because of increasing pressure on water resources and the harsh climate. Deforestation, especially in the dry central parts of the country, has likely resulted in desertification, which is now a problematic issue in several provinces (Amiraslani & Dragovich, 2010; 2011).

### 3.6. Forest ownership and the comprehensive plan for preserving

A Cabinet Enactment of July 2001 laid down the basic policies for preserving Iran's northern forests; this later became the Comprehensive Plan for Preserving Northern Forests (CPPNF) in September 2003. These policies stipulate the facilities, credits and qualifications required for plantation development, based on State and private administrative capacities. Issues mentioned focus on the allotment of forest management operations among various government sections (e.g. FRWO and DOE) and the private sector. The following are the main points made in CPPNF:

- Policy-making regarding uses of national lands/resources that might incur land-use conversion or a decline in forest area are the responsibility of FRWO and the Supreme Council of Environmental Protection.
- FRWO, DOE and the private sector are responsible for preparing natural resource plans, protecting resources, organizing forest dwellers, relocating livestock outside forest boundaries, surveying, and acquiring forest area deeds.
- FMP implementation is assigned to the State, cooperative and private sectors.

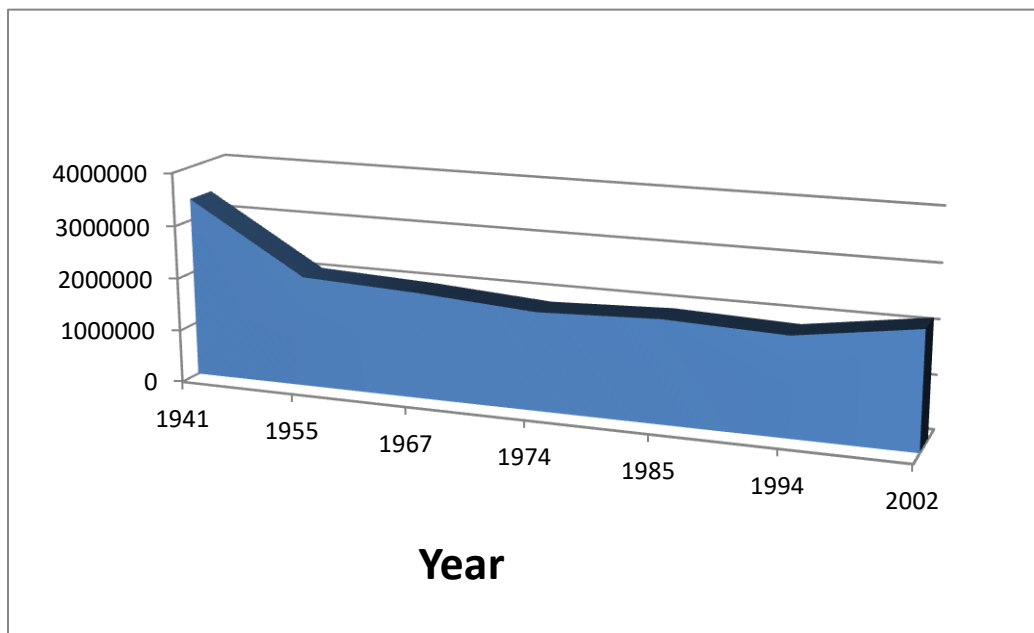


Fig..3.2. Changes in Hyrcanian forest area between 1941-2002 Per ha

Source: Forest, Range and Watershed Organization (FRWO)

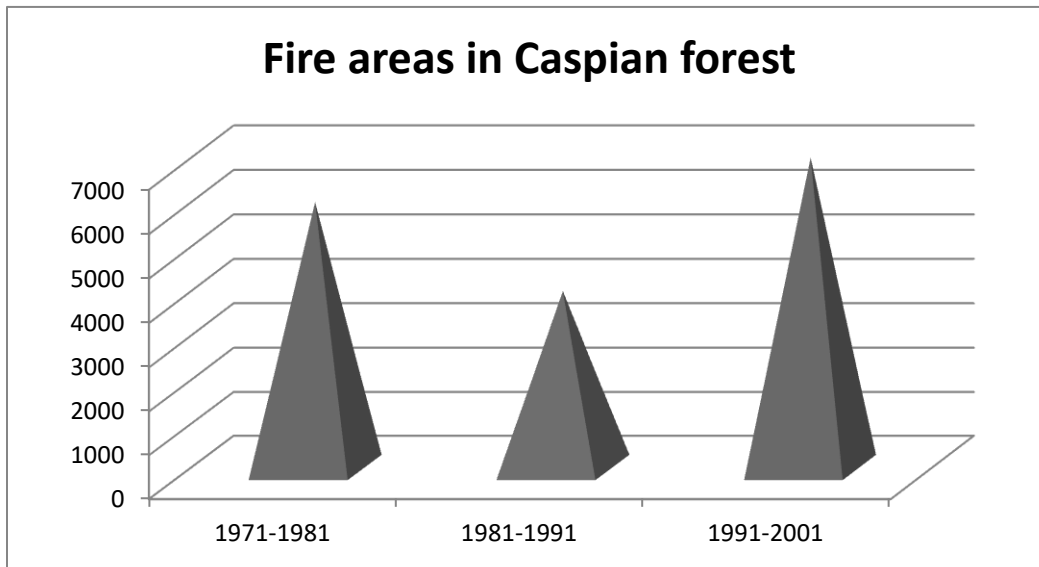


Fig. 3.3 Fire areas in Caspian Forest/ha

Source: Forest, Range and Watershed Organization (FRWO)

### 3.7. Forest and forest ownership in the fourth national development plan (2004 to 2009)

The Fourth National Development Plan of the Islamic Republic of Iran was enacted in October 2004. It puts more emphasis on crucial issues such as forest dwellers and forest management, and commits the government to extending environmental training and supporting private sector investments in forestry, especially through plantations. It also outlines the policy of providing non-wood fuel for tribes, villagers and forest livelihoods as an alternative to fuel wood use. The following are forest tenure-related administrative policies stated in the fourth plan:

- strengthening natural resource stakeholders' participation in SFM (although the mechanism for this is not defined);
- settling State ownership of national lands, and clarifying exemptions and private ownership boundaries;
- developing and supporting investments in the natural resources sector;
- Improving the efficiency of natural resource use through public outreach, revised training programs, reduced bureaucratic requirements, and decentralization.

The most recent change is Article 44 of the National Constitution (served in 2007), which lays down such issues as the privatization of government forest use companies, and private investments in increasing forest cover.

Table 3.3.summary of development plans in Forest sub sector

Title	Year	Forest subsector condition	Whole Budget of Sub-sector	Consideration
From revolution till first development Plan	1979-1988	Just development and rehabilitation of Forest resources due to achieve Forest production	-	Approved by Cabinet that was not approved by Parliament
First socio economic development program of Iran	1989-1993	Only with the total title of conservation, rehabilitation, Proper utilization, development and richness of renewable Natural Resources,	219 miliard Rial	
Second Socio Economic development program of Iran	1995-1999	Section 4, Clause 77, 81 and 82, conservation, development and utilization of Natural Resources	488 miliard Rial	
Third socio economic development Program of Iran	2000-2005	Article 104-Utilization of Natural Resources according to the capacity using implementation of different plans, Article 108- Entrepreneurship in Natural Resources	3378 miliard Rial	
Forth Socio Economic development Plan	2005-2009	Article 60, strengthening Structures and capabilities related to the Environment  Article 69-setting and implementation of conservation program,Rehabilitation, development and Utilization of renewable Natural Resources with section 10	8000 miliard Rial	

Source:Forest, Range and Watershed Organization (FRWO)

According to FRWO statistics, 5.7 million livestock units are now settled in or near the Caspian forests. Of these, FRWO has plans to relocate up to 4.3 million units, and 600 000 units have already been relocated

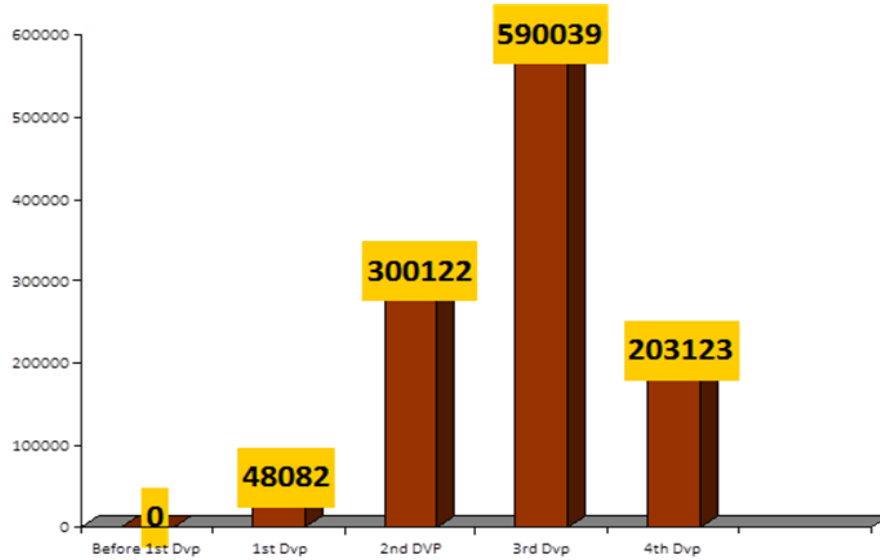


Fig. 3.4 Functionality of the livestock reduction plan from forest in different development program (livestock unit)

Source: Forest, Range and Watershed Organization (FRWO)

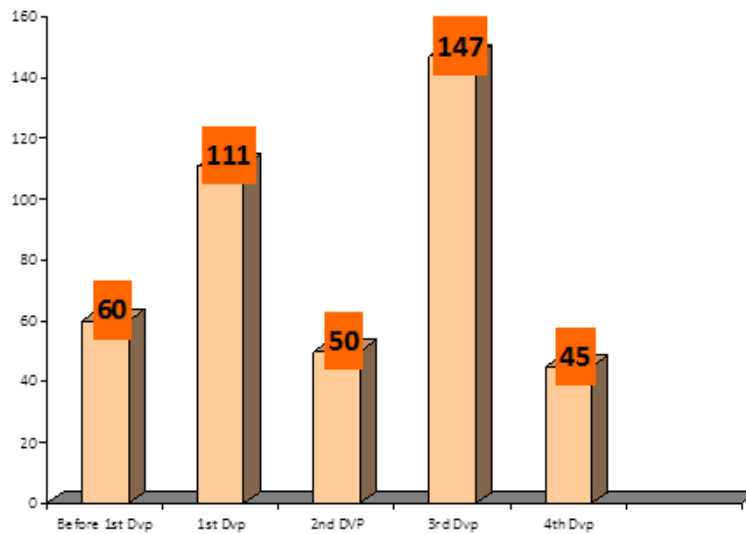


Fig. 3.5 Physical functionality for the national plan of forest plantation and rehabilitation along the development program (unit per 1000 ha)

Source: Forest, Range and Watershed Organization (FRWO)

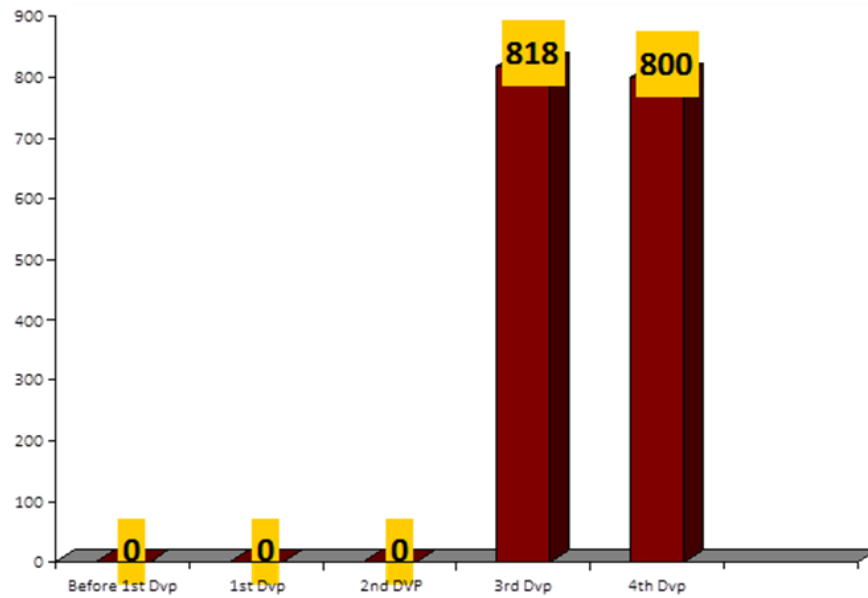


Fig. 3.6 Comparison of conservation plan of Caspian forest along the development programs (1000 ha)

Source: Forest, Range and Watershed Organization (FRWO)

The 5th National Development Program has adopted the environmental assessment of strategic level plans policies and plans as well as a countrywide “ecosystem-based approach” to the management of wetlands and biodiversity. Iran is an early achiever of the phase out milestones set by the Montreal protocol.

The fifth development plan, 2010–15, is designed to delegate power to the people. The plan is part of "Vision 2025", a strategy for long-term sustainable growth. Following annual approval of the government’s budget, the central bank presents a detailed monetary and credit policy to the Money and Credit Council (MCC) for approval. Thereafter, major elements of these policies are incorporated into the five-year economic development plan.

### 3.8 Population growth and impacts on forests in Iran

The twentieth century witnessed dramatic social, economic, cultural, political and educational changes in Iran, which have been described in books (e.g. Gheissari, 2009) and articles (e.g. Esfahani & Pesaran, 2009). Population, industrialization and urbanization in the country grew very rapidly; in particular, industrialization and oil revenues gradually changed Iran from an agriculturally-based to an indus-

try-driven country (Zekavat, 1997). A rapid increase in the Iranian population began in the early twentieth century leading to a seven-fold increase from 10 million in 1900, to 42 million in 1980, and finally to the current 74 million (Amiraslani & Dragovich, 2011). In the early twentieth century, extensive degradation and destruction of forests continued for several reasons, including rising demand for wood by an increasing population in Tehran, exhaustion of local wood supplies along the southern flank of the Alborz mountains, and tree cutting for road construction (Ehlers, 1982). Modern industrial use of wood was intensified due to the establishment of sawmills and match factories in the early 1900s (Arian et al., 2007). Most importantly, agriculture was still playing a pivotal role in the livelihood of Iranians during the early twentieth century, largely absorbing the effects of rapid population growth (Lieberman, 1979). Charcoal was still extensively used as a source of energy in Iran during the first half of the twentieth century. Motorized fuel collectors began to destroy trees and shrubs to produce charcoal after World War II (Floor, 1992). Despite some improvements in charcoal-making techniques made following training by US forestry advisors, charcoal was still produced by a very inefficient charcoal-making system (Kernan, 1957) in kilns (pits or chambers for burning wood to produce charcoal). It is estimated that two to three hectares of forest were destroyed for each kiln in each season (Floor, 1992), reaching an overall annual consumption of 6 million m<sup>3</sup> of wood (Kernan, 1953). The inefficient and disorganized state of charcoal-making was not unique at this time; all other forest operations in Iran were similarly lacking in technology and policy direction (Kernan, 1953). Overall, the period from 1918 to 1950 can be regarded as the most decisive phase of uncoordinated deforestation (Ehlers, 2001). Since the mid-twentieth century, the wood products industry has expanded through the manufacturing of plywood, fiberboard, particleboard and furniture (Arian et al., 2007). The Caspian forests were still under a real threat from charcoal production. Even though industrialization and urbanization allowed for the abandonment of numerous agricultural lands, many of these areas were converted to residential towns during the 1960s (Ziari, 2006).



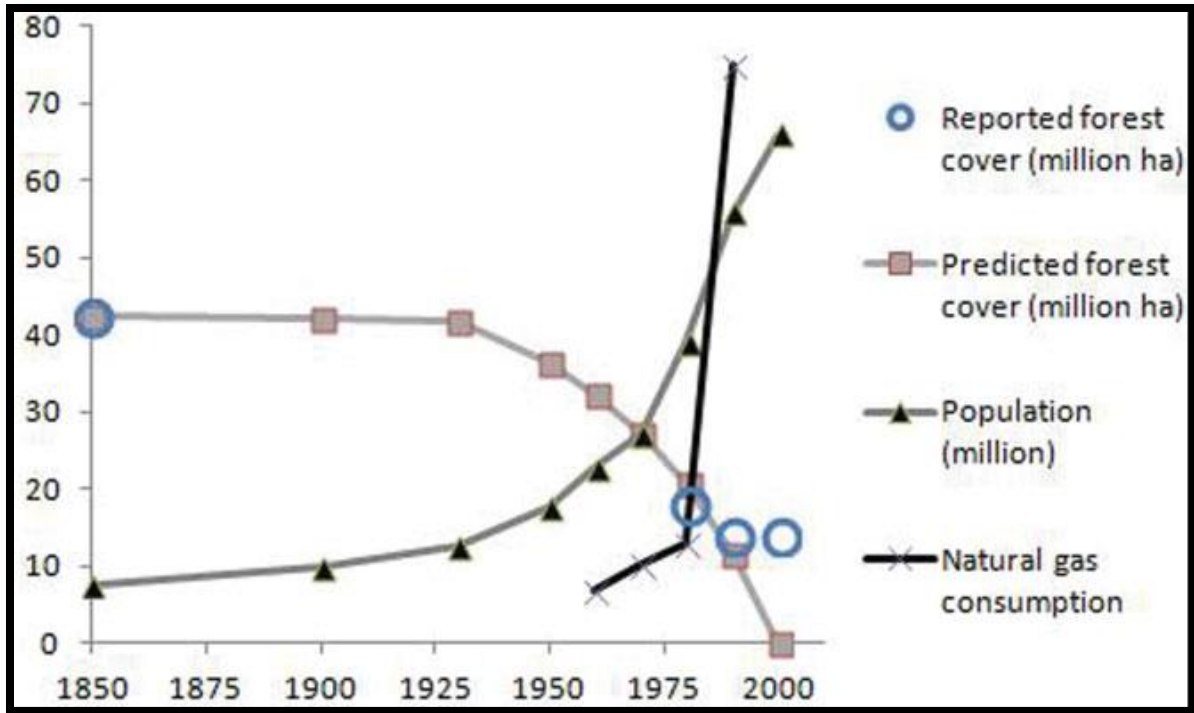


Fig. 3.7 Interaction between population increase and the decrease of forest cover between 1850 and 2000 in Iran

Note: The light grey line is predicted forest cover if oil had not been discovered.

Sources: 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).

A look at the history of Iranian forestry, including forest management and policy-making, reveals a clear distinction between the beginning of the twentieth century and previous eras. Iran's forests have experienced various interventions and intrusions over the last millennia, but it is evident that a new and different direction has been taken over the recent century. In the twentieth century, successful oil exploration has been the most important economic event in the history of the country, impacting urbanization and industrialization as well as the rate of deforestation. The interplay between oil discovery and forestry in Iran has highlighted the potential for energy substitution between petroleum products and previously used wood-based sources. Despite the dry nature of Iran's climate, vast areas of plantations (nearly 2 million hectares) have been established and other remaining forests have been conserved mostly as a result of using oil capital. Oil can be said to have provided a buffer for the forests, safeguarding their continuing existence. However,

the role of oil has also allowed for the increased urbanization and triggered unwanted development plans that have destroyed some forested areas. Amiraslani and Dragovich (2011) listed various activities such as road construction that have threatened forest plantations established in decertified areas in Iran. The generally positive impacts of oil discoveries on forestry are not necessarily reflected in environmental advantages and increased agricultural production. In some developing countries the negative effects of oil and gas exploration, processing and distribution are apparent. Oil spillages in the Niger delta region of Nigeria, for example, have led to serious environmental degradation (Jike, 2004), and oil industry development in the Ecuadorian Amazon has resulted in annual deforestation rates of 1 million acres (Jochnick et al., 1994). In Arab countries, oil-led economic growth has culminated in a “deindustrialization” trend towards service-based economies over a 40-year period from the 1960s (UN, 2010). In terms of the environment, this unprecedented growth has led to the deterioration of forests, loss of biodiversity and degradation of rangelands in these countries (Abahussain et al., 2002). In Iran, oil industry development has reshaped economic and social life over the last century. The positive effects of oil revenue have included a boost to economic growth, education and health (Nassirpour, 1985). However, during the period of high oil prices in the 1950-1970s, oil exploitation was believed to have reduced the viability of all industry in general, while encouraging wasteful use of funds for military expansion rather than investment in infrastructure and development projects (Gharehbaghian, 1987). In addition, the oil boom era contributed to a deterioration in the food-producing agricultural sector and hindered the development of small-scale agricultural industries (Katouzian, 1978), a combination that required State intervention to provide subsidies for foodstuffs (Shafaeddin, 1988).

### **3.9 Subsidy reform policy, 2010**

For decades, heavy State subsidies have absorbed substantial amounts of funding. Subsidized prices for energy and foodstuffs, especially wheat flour, have imposed a considerable burden on the national economy. It has been estimated that these subsidies have benefited the rich more than the poor by a ratio of 12 to 1 (World Bank, 2003). After several years of debate throughout the country, the current Government provided a comprehensive bill to reform the subsidy system. This bill was ratified by the Islamic Parliament and came into force in 2010. The main aim

of this law is to remove energy and foodstuff subsidies in several stages while providing cash subsidies for those with lower incomes, with the goals of ensuring social equity and improving effective management of national assets, including oil and gas. This national initiative has caused food and energy prices to escalate rapidly, with only some of the large price increases being offset by monthly cash payments to lower income groups. It is premature to evaluate the impacts of higher energy prices on subsectors like forestry, but some reports have highlighted renewed destruction at the local level of forest plantations for wood harvesting by people attempting to avoid high energy bills.

### **3.10. Reasons of non-adherence in all development program before and after Islamic revolution**

Amongst all of the development plans in forest subsector, except of first and forth development plan before revolution, in each of first till third development program and after the revolution and third program before the revolution, these four main reasons consist of inefficiency of organizational structure, existing situation, changes in mental situations of managers, shortage of human and financial resources. Also there is no long term vision in 5 year development programs Although there is a recovery flow along the time but there is no coherence between Purposes, policies and laws in different development program in context of forests. Policies and purposes have not spatial justification. The plan of exiting cattle of forests confront with problems in practice: Lack of defined land use planning policy in first to third development program which has been emphasized in forth development program. Further lack of social development viewpoints and participation in planning, over emphasize on technical solutions, lack of non-governmental sector participations and finally lack of cross sectorial point of view.

### **3.11 Conclusion**

A review on forest section in development plans (after and before the revolution) shows that, what mention before the 4<sup>th</sup> development program in forest sector was not applicable, and the purposes in these programs are more like desire and hopes. The terms like conservation of national wealth or natural resources, rehabilitation of degraded forests, afforestation, and exiting cattle of the forests in development

program are so ambiguous that is hard to follow the extend of adherence of these program during the years of development plans. Although measuring the land and separation of audit exceptions, preparing integrated forestry plans, reforestation, forest utilization and forest road construction from the first years of implementation of development programs and about exiting cattle of forests from 1<sup>st</sup> development plan and in context of forest rehabilitation and enrichment from the 2<sup>nd</sup> development plan have done, but still the results have not been caused to sustainable development of forest resources.(Amani, 2004, Jazireii, 2001)

In first and second development plan before the revolution the extend of net capital formation or in other word extend of increase in value of forests, was less than the amount of degradation of these resources which shows in this period. (Khalilian, 2001)

Before the 4<sup>th</sup> development plan (before revolution), all the development plans and programs were the same in failure to follow above (upstream) document. In order to programming for social, economic and cultural development, there are 3 levels of strategic, tactic and operational programing. These 3 levels of hierarchical programming have their own special characteristics. Strategic programing has long term horizon. What is current situation in Iran is tactic programing which has medium time horizon (5 year) and the purpose is usage of resources, conditions and environment in order to reach to suitable condition for operating programming. Operating programming or annual budget planning with short time horizon (one year) is a way for implication of tactic plans. According this, 20-year vision document of Iran forced producer of 4<sup>th</sup> development program to prepare this program according to vision document, but because the policies in 4<sup>th</sup> development plan and content of vision document are too general, it is not possible for subsectors to follow. The results show that even in 4<sup>th</sup> development program, none of forest sub sector plans didn't follow any upstream or above document.

After revolution, and privatization, assignment of the forestry plans to the private and cooperative companies became more widespread, in this regard FRWO was more in supervision role.

In a report by research center of Islamic parliament of Iran (2001) share of different sectors in forestry plan is: government sector (43%) , cooperative sector ( cooperative forest dweller, 15.3%) and private sector (41.7%).then in this report men-

tion that the term of private sector is not much suitable, because most of the revolution institution or depended companies to them , are the component of this sector such as Astan Ghodse razavi, Sepahe pasdaran, Prosecutor revolution of Behshahr and etc..

Also in this report mention about supervision role of the FRWO, and believe that one the most important problems are insufficient supervision on operation of forestry plans. In fact FRWO introduce 3 to5 persons for supervisor of every forestry plan which but because of lack of enough money to pay their salary and overtime and also payment for transport, then supervisors receive their salary by operating company. Because of these mechanisms and restricted supervision can't ever be expected that executors of forest management plans, be not a factor of more forest utilization! Especially in some cases that executor is like a powerful institution and will be overshadowed by the performance of the supervisors. On the other hand, between 1967-1981, population of forest dweller changed from 598,000 to near one million, main jobs of these people are cultivating and livestock. The trend of influx of rural around forest areas had some especial reasons, in which none of them utilization was not the first choice, but most interests and motivations was land use changes and occupy the forest land for construction and agriculture (Saeid,2003).

### **3.11.1 Ineffectiveness of organizational structures**

Role of organizational structure in implementation, success or failure of programs is essential and determining. If suitable structure were designed for implementation of the programs obviously programs will be implemented with success. In current macro structure of Iran which is functional, for implementation of development plans, there are too much problems, which have multidimensional and interdisciplinary structure.

Although Functional structure could be successful in some slight purposes but for many reasons such as lack of relations between dependent structural branches, fascination with specialist and unresponsively cause to purposes couldn't be apply properly (Alvani, 1991). DOE (department of environment, high council of forest, rangeland and soil, and high council of environment conservation are organization which are responsible for forest policy making in Macro level. Because of different

viewpoints, about the way of natural resources conservation between DOE and FRWO, the executive regulations about the conservation was approved with one year delay. More over multiplicity of policy maker institutions is not only restricted to forest subsector and all of the economic sub sector and also cultural and policy sector are face to this problem. Harvard consulting group in management of Iran book said that (Macleod, 2001).

In Iran there are too many commissions, cooperatives, governmental organizations which have officially responsibility for making and implementation of policies. In this situation preventing of implementation a policy, easiest ways is to goers' one organization against another one, or prevent it via referring the problem to another organization or another council which has similar responsibility. As a result of, in this situation it is not possible to assume none of them responsible in success or failure of governmental policy. All of these caused that administrative system of Iran couldn't be able to policy making and approximately all of the policies are not implemented consistent or meaningful.

Although there are some improvements in forest management along the development plans, but in overall the situation of forest management in Iran is not satisfactory, and plans did not apply according to the rules.

#### 4. Site selection (study area) using Multi-criteria evaluation

Iran the land of four seasons, is located between 32 and 53 degrees latitudes and being under different weather pressures, has various climates and phyto-geographical regions. Nearly 93% of the area is located on the Iran plateau, hilly and mountainous territory with 1,200 meters average altitude. Highest and lowest place is the mount Damavand, approximately 5,670 meters and Caspian Sea coasts about 27 meters below sea level respectively. Two chains of mountains have caused a vast area in the center of Iran be arid. First, the Alborz Mountains situated as a wide wall along the NW to NE of Iran, which have helped to existence of a humid to semi-humid temperate zone in Caspian Sea southern coasts (600-2000 mm annual precipitation). Alborz mountains has deprived central areas of rainy winds from Caspian Sea. Second the Zagros mountains which as an open crescent prevents spreading the Mediterranean climate to the whole country (Sabeti, 1993).

The table below shows the forest cover for the most recently available reference year. Data have been extracted from the latest available and most relevant reports. This information has been reclassified into the FAO classification scheme (Mirsadeghi, 1999).

Table 4.1. The area of different types of forest in Iran ,

Forest regions / Forest density	Arasbaran forest (ha)	Caspian forest (ha)	Iran-Turani (ha)	Khali-omani (ha)	Zagrosian forest (ha)	Total forest (ha)
Closed forest	37.50	1,905,000	0,00	40,000	505,000	2,487,50
Open forest	60.00	0,000	447,000	0,00	2,020,000	2,527,000
Shrubs	0.00	0,00	500,000	1,260,000	0,00	1,760,000
Forest fallow	52.50	0,00	1,948,000	1,100,000	2,525,000	5,625,000
<b>Total</b>	150000	1,905,000	2,895,000	2,400,000	5,050,000	12,400,000

Source: Forest, Range and Watershed Organization (FRWO)

In order to study the role of forest cover for soil conservation and preventing soil

erosion in southern coast of the Caspian Sea, firstly needs to select a suitable river in one basin in this area. This basin must be located in northern hills of Alborz mountain(southern coast of the Caspian Sea), completely covered by forest vegetation, must not be located in protected area of DOE, should have hydrometric station, without any dam or water construction on it because dams take the sediment of forest and river must not be seasonal.

In this study all of the rivers in southern coast of the Caspian Sea (northern slope of Alborz Mountain) were surveyed to choose the most suitable for erosion and sedimentation studies. Selected rivers were evaluated using spatial multi criteria evaluation (SMCE) and Analytical Hierarchy Process (AHP) and then most suitable river was selected among all.

Evaluation a set of choices according to different criteria is named multi criteria decision making (MCDM) (Malczewski, 1999). Decision making consists of chain of operations which start with problem of decision making and then concentrate on codification of evaluation criteria. Criteria are a general term for 2 concepts of purpose and indicator. Indicators are characteristics of real world. Especially an indicator is one measurable qualitative or quantitative phenomenon or is a connection between geographic phenomenon. As an instance climate is a criterion, rainfall is sub criteria and the extend of rainfall is indicator. Evaluation criteria are adjusted with geographical phenomenon and are available as maps. Map is a criterion for evaluating a geographical characteristic for decision making. That could be used for evaluation of priorities between choices.

Finally, lowest level of every MCDM is consist of defined choices from geographical point of view that one selection among them considering to a defined evaluation criterion must be chosen (Malczewski, 1999).

According to this definition selection switches could be a set of surface, points or lines phenomenon which value of criteria attaches them. This approach consists of using geographical data, priorities of decision making changes and processing of the data base on defined rules of decision making. This means that the results of the analyses are not only dependent to the geographical distribution of phenomena but also depend on evaluating values in decision making process (Malczewski, 1999).

Analytical Hierarchy process (AHP) is one of the most comprehensive designed



systems for decision making with multiple criteria. Because this technique provides to formulate the problems as a hierarchical and also it is possible to assume different qualitative and quantitative criteria in a problem. This process involved different choices in decision making and has the possibility of Sensitivity Analysis on criteria and sub criteria. (Ghodsipour, 2002).

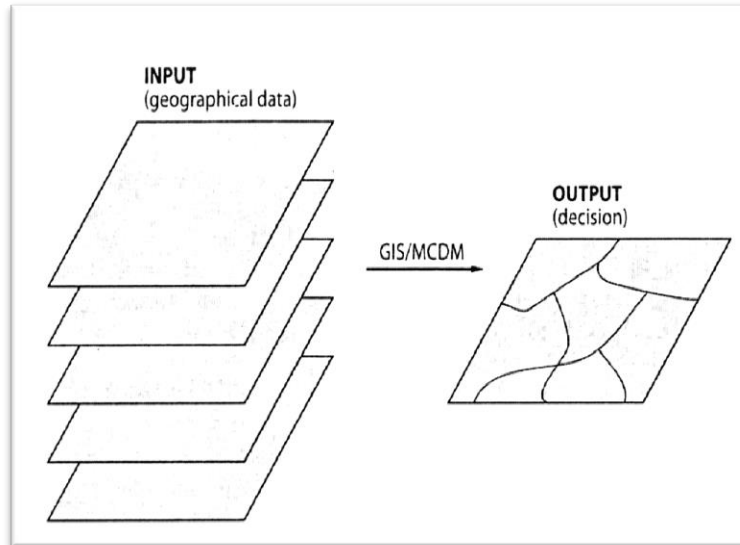


Fig. 4.1. Input and output in MCDM

*Source: Author*

Study area is located in northern hills of Alborz Mountain, the Caspian lowlands and North Slope of the Alborz Mountains receives as much as 2,000 mm of rainfall. Summers are generally warm to hot with almost continuous sunshine, while winters can be extremely cold, with cold airstreams blowing from the northeast.

The Caspian region comprises a humid region of comparatively high precipitation, ranging from 2,000 mm in Gilan in the west to about 500 mm in Gorgan in the east, and with the rainfall more evenly distributed throughout the year than elsewhere in the country. The northern slopes of the Alborz Mountains overlooking the Caspian Sea receive some of the highest rainfall in the country, and support dense deciduous forest.

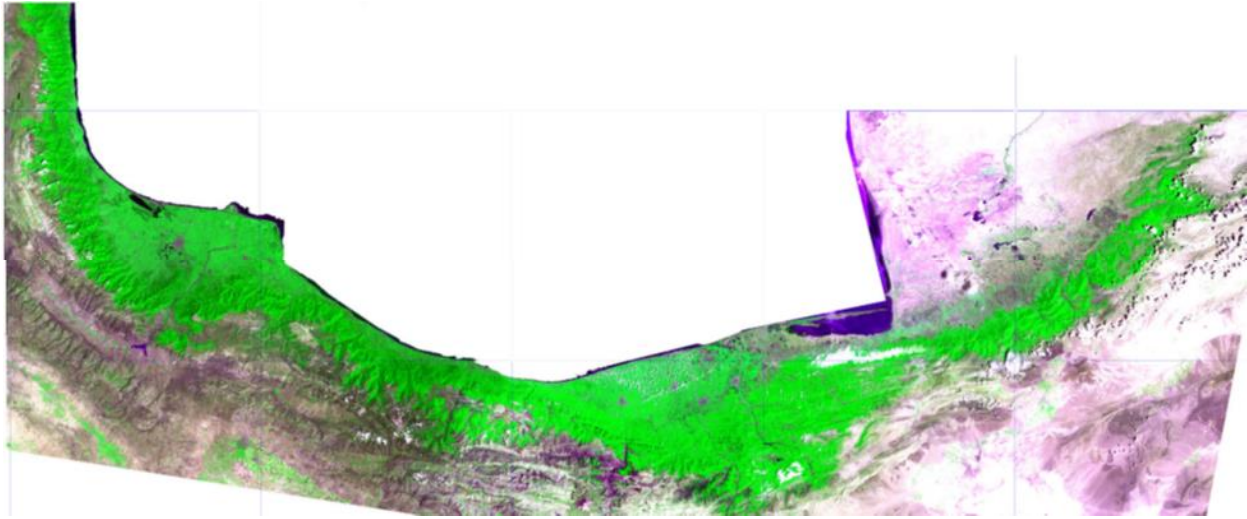


Fig. 4. 2 satellite image of Hyrcanian forest in southern coast of the Caspian sea

*Source: National cartographic center of Iran*

#### **4.1 Methodology for site selection**

Considering the purpose of the study which is choosing the most suitable river in forest ecosystem of Hyrcanian forest, effective criteria and indicators in erosion were recognized. In order to choose the criteria firstly using all of the empirical models in context of erosion, effective impacts on erosion were recognized and under the title of criteria, sub criteria and indicator evaluated.

After choosing criteria, in order to compare them and weighting them, hierarchical structure was formed and then using analytical hierarchy process (AHP), criteria towards purposes, sub criteria towards criteria and choices toward criteria were pair compared. Among the entire river in southern coast of the Caspian Sea, some rivers which were most suitable selected and underwent in hierarchical structure. Questionnaire filled by experts in context of SMCD and watershed management and finally with compilation of achieved weight from experts judgment and spatial characteristics of rivers, most suitable river in southern coast of the Caspian sea in order to study erosion and sedimentation was selected.

### 4.1.1 Codification of criteria

Criteria according to the empirical models of erosion and sedimentation and also on the basis of homogeneity were classified in 5 groups as: climate (with rainfall as sub criteria), land (with 2 sub criteria: soil, topography), vegetation cover, water resources and land use. Hierarchical structure in this study shown in Figure 4.2.

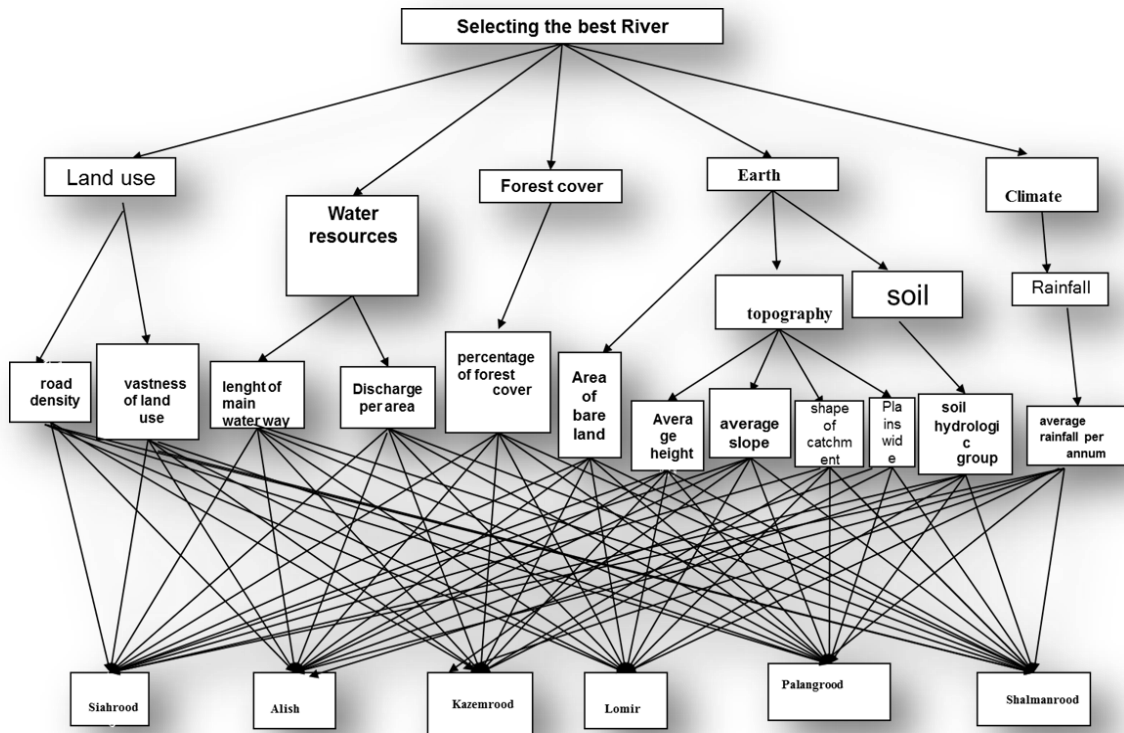


Fig. 4.3 Hierarchical structure for selecting most suitable river

Source: Author

Table 4.2. Indicators and Criteria to choose suitable river

Indicators	Sub Criteria	Criteria
Average annual rain fall	Rainfall	Climate
Soil hydrologic group	soil	Earth
Average height of catchment	Topography	
Average slope of catchment		
Shape of catchment		
Area of Bareland		
Density of water way		Water resources
Discharge per area		
Length of main river		
Percentage of land uses		Land use
Road density		

Source: Author

#### 4.1.2 Rivers selection

From all 42 continual rivers in southern coast of the Caspian Sea in Iran finally 6 rivers used for evaluation for the study.

Table4.3. Comparing Rivers according to soil Hydrologic Index

Hydrologic soil group index	Lomir	Shalmanrud	Siahrud	Alish	Kazemrud	Palangrud	Average marks Of priority for each river
Lomir	0.41	0.47	0.42	0.37	0.32	0.29	0.38
Shalmanrud	0.20	0.23	0.28	0.28	0.26	0.24	0.25
Siahrud	0.14	0.12	0.14	0.18	0.19	0.19	0.16
Alish	0.10	0.08	0.07	0.09	0.13	0.14	0.10
Kazemrud	0.08	0.06	0.05	0.05	0.06	0.10	0.07
Palangrud	0.07	0.05	0.04	0.03	0.03	0.05	0.04
Overall marks of priority	1	1	1	1	1	1	1

Source: Author

Table.4.4. Comparing rivers according to average height

Index of average Height of catchment	Siah rood	Lom ir	Alish	Shalm anrood	Kaze mrood	Plan grood
<b>Siahrood</b>	1	3	5	7	8	9
<b>Lomir</b>	1/3	1	3	5	6	7
<b>Alish</b>	1/5	1/3	1	3	4	5
<b>Shalmanrood</b>	1/7	1/5	1/3	1	2	3
<b>Kazemrood</b>	1/8	1/6	1/4	1/2	1	2
<b>Palangrood</b>	1/9	1/7	1/5	1/3	1/2	1

Source: Author

Table 4.5. Main criteria according to relative weight

Main criteria	weight
Land	0.50
Climate	0.26
Vegetation cover	0.13
Water resources	0.07
Land use	0.03

Source: Author

#### 4.1.3 Relative weight of each characteristic

Tables 1 to 4 show the weight of each characteristics. This weight calculated with special vector method. Among the criteria, land and slope in sub criteria have most weight in erosion and sedimentation

Table 4.6. Relative weight of land sub criteria

Sub criteria of Land	Weight
Average slope of catchment	0.23
Hydrologic group of soil	0.13
Areas of land without vegetation cover	0.07
Catchment shape	0.03
Width of plain	0.02
Average height of catchment	0.02

Source: Author

Table 4.7. Relative weight of water resources criteria

Water resources sub criteria	Weight
Discharge	0.04
Drainage density	0.02
Length of main river	0.01

Source: Author

Table 4.8. Relative weight of land use sub criteria

Land use sub criteria	Weight
Area of land uses	0.02
Road density	0.01

Source: Author

Result of the final rivers weight is in table 4.9. as it shown Lomir river is the most suitable for sedimentation studies in northern hill of Alborz mountain.

Table 4.9. Final weight of selected rivers

River	Final weight	Priorities
Shalmanrud	0.1291	4
Palangrud	0.2289	2
Lemir	0.269	1
Kazemrud	0.0832	6
Alish	0.0887	5
Siahrud	0.2035	3

Source: Author

## 4.2 Description of study area

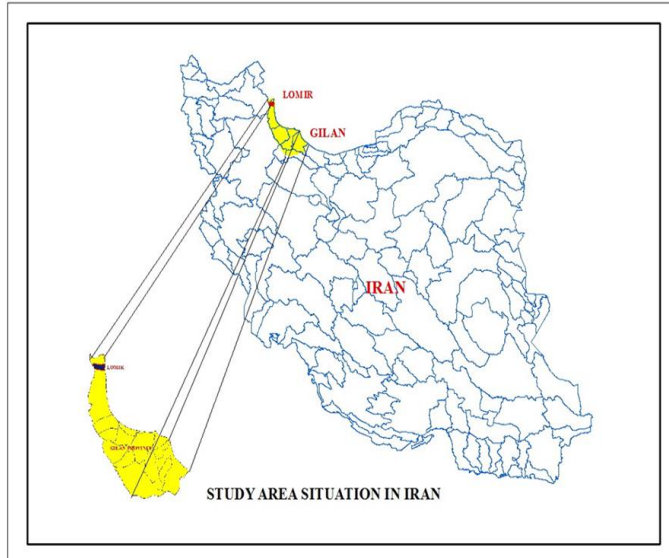
The study area is Lemir catchment in Guilan province, located in western part of Hyrcanian forests. Different field studies in this region show that the vast areas of this region are covered by volcanic stones kind of andesite. Functionality of different geological process like volcanic process, erosion and weathering create an amazing landscape consist of high waterfalls Lemir is term barrowed from Zaratustra. In ancient times the name Elmira (Great Nation) is the Zoroastrian gods. At first the name was Almeer and along the time became Lemir. From the old time Lemir was considered by different ethnicities particularly Azeris, Gilaks and Tالش due to the vast resources of forest, rivers always full of water, fertile plain areas and also the proximity of the Caspian Sea.



Fig. 4.4 Study area, lemire forest Catchment

*Source: Author*





Source: Author

Fig. 4.5 Geographical location of study area

### 4.3 Evaluation of temporal changes of forest land in selected catchment

Original old-growth northern forests of Iran are essential sources of genetic variation, biodiversity, commercial woody products, and various environmental services (e.g. ground water reservation, auxiliary forest products provision, wildlife habitation, and erosion control). Today, the forests are depleting rapidly due to population growth, and associated socio-economic problems, industrial development, urbanism, and more recently intensive/irregular tourism. Satellite image processing and other geo-spatial tools have been used in Iran from the early 80's to map the vegetative attributes of forests for environmental resource monitoring. This paper aims to build up a basic assumption of when and how the spectral, spatial and temporal features of satellite-borne remote sensing have been applied for the sustainable resource monitoring of the Caspian forests of Iran.

As a matter of fact, different statistics have been presented as to the area of the Caspian forests. Amongst the reported statistics, the initial 3,600,000 ha surveyed in 1942 (Saei 1942), 3,400,000 ha in a study carried out in 1964 (Marvi Mohadjer 2005), and 1,920,000 ha published in 1990 ( Moshtagh Kahnamuii & Rasaneh 1990) can be considered. The area of Hyrcaniyan Forests is 1.2% of the whole country area with 1,648,195 ha (Marvi Mohadjer 2005). Accuracy and reliability of the publicized data have been critically discussed. Notwithstanding accuracy, what is obvious and remains a fact is that the forest resources have been under continuous degradation over the last few decades.

National forest management officials have acknowledged this fact and have initiated actions for sustainable management of the Caspian Forests, Different forms of management schemes are planned for implementation, such as documenting and exhibiting the forest disturbance and supervision and management of the remaining natural forest ecosystems in the region. In recent years, the focus of natural resource conservationists, researchers, and managers has shifted to the application of remote sensing imagery and geo-spatial tools for the efficient, precise and continuous documentation of vegetation biophysical attributes, such as canopy density, cover type, and cover change. The application of satellite image processing, along with other forms of geo-referenced digital tools, for documenting vegetation attributes for environmental resource monitoring in Iran has a long history dating back to the 80's. Prior to that, B/W aerial photographs, acquired as two major country-

wide projects in the mid50 and 60's, served as a useful monitoring tool for forest area/ type mapping. A variety of satellite remote sensing functions have been introduced, tested and proposed by environmental analysts, many of which have been pointed out by Iverson et al. (1989). Forest type mapping, change detection, forest succession monitoring, stand's structure and physiological parameters and forest productivity assessment can be highlighted as some of the major applications, many of which are not known in Iran yet. Further information on the basic potential applications of satellite imagery in forest assessments can be found in the available literature (Danson, 1987, Gregor, 1986, Hopkins et al. 1988. Billingsley, 1984, Lillesand & Kiefer, 2000). Briefly discussed and future prospects toward the delineation of Caspian forest's structural and functional characteristics by remote sensing will be outlined.

#### **4.3.1. The applications of satellite image processing in Caspian forests of Iran**

Forest monitoring mainly focuses on detecting and estimating the land conversion rate and more recently, on assessing carbon stocks in the forest ecosystems (Desclee et al. 2006). In fact, the spatial and spectral features of the images acquired by different sensors nowadays advocate several advantages to natural resource managers and academic researchers in order to classify, monitoring, and manage natural ecosystems. As briefly outlined above, the specific natural characteristics (i.e., occurrence of various temperate forest cover types, canopy densities, and physiographic-induced microclimates) and human induced features (e.g. the destructive effects of local/regional development plans, extensive land use conversion, population overgrowth and its associated socio economic problems) of the northern Iranian forest sites, together with the obvious lack of financial/human resources for efficient land monitoring in the last decades, gradually induced official and private environmental analysts to effectively make use of up-to-date and repetitive remotely sensed data in a number of forest management practices. Nevertheless, existing literature shows that the applications have been mainly focused on a set of definite image analysis methods. They can be generally categorized as:

1. Mapping forest attributes using image classification;
2. Land use/forest change detection;
3. Delineation of structural forest attributes by image analysis.

Satellite image classification has always been one of the most regular applications of remotely sensed data. In image classification, pixels are classified according to their ground reflectance values measured by a satellite/air-borne sensor. The desired map is created by displaying the classified pixels in their appropriate geographic context (Iverson et al. 1989). The magnitude of image classification for forest mapping has also been pointed out by Beaubien (1979). In Iran, image classification (in either unsupervised or supervised forms) has historically been one of the widespread and common methods of information extraction from remotely sensed data. One of the main scopes of work of the Iranian Forests, Rangelands and Watershed Organization (hereafter called FRWO) is “producing various thematic maps using satellite data analysis and GIS”.

In this study, remote sensing (RS) with computer-based geographical information system (GIS) techniques is used as a tool for monitoring the land use changes of catchments area. Digital change detection essentially comprises quantification of temporal phenomena from multi-date imagery that is most commonly acquired from satellite-based multi-spectral sensors (Danson, 1987). So far, satellite remote sensing has been widely used to detect forest change and update existing forest maps. According to Desclee et al. (2006), many change detection techniques have been developed since the early days of earth observation, broadly grouped into three categories: (1) visual interpretation, (2) pixel-based and (3) object-based methods. Iranian environmental analysts appear to be unfamiliar with all the available change detection methods and have remained confined to a selected few. For example, few attempts have been made so far to analyze forest cover change based on remotely sensed data in northern Iran. The focus is mainly on a method of pixel-based change detection (Post-Classification method).

#### **4.3.2 Results of the land use/land cover maps of the Lomir Basin**

In order to estimate the rate of degradation, deforestation and land use changes in study area, land use/land cover maps of the catchment in 5 different periods prepared. Maps were prepared using aerial photos and satellite images in different time period. Using available maps, aerial photos and satellite images in FRWO. First map (1955) was prepared using aerial photo with visual interpretation method in Arc GIS software. Also for preparing 1967 and 1994 maps, aerial photos of these years used and the same method, like the 1955 map used, but for preparing

the map of 2004 satellite images of Landsat ETM + used, and finally map of 2012 prepared using aerial photos and google earth images with visual interpretation method. All the maps prepared in 1/25000 scale.

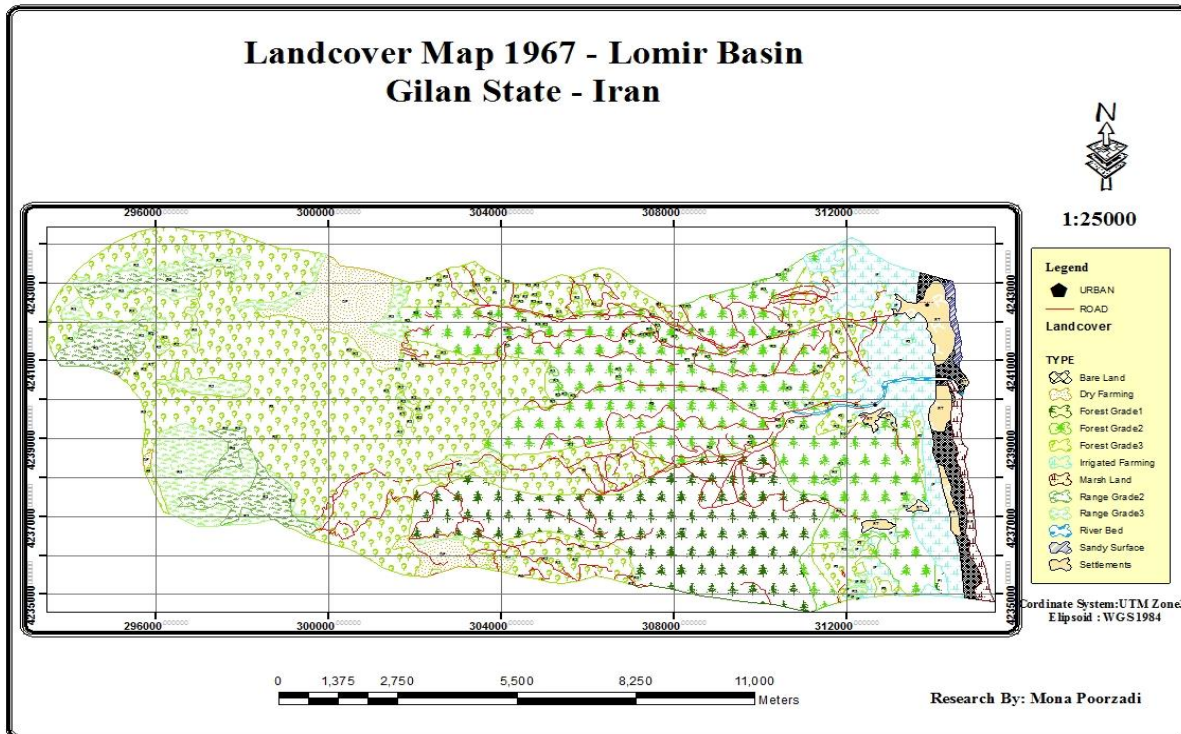
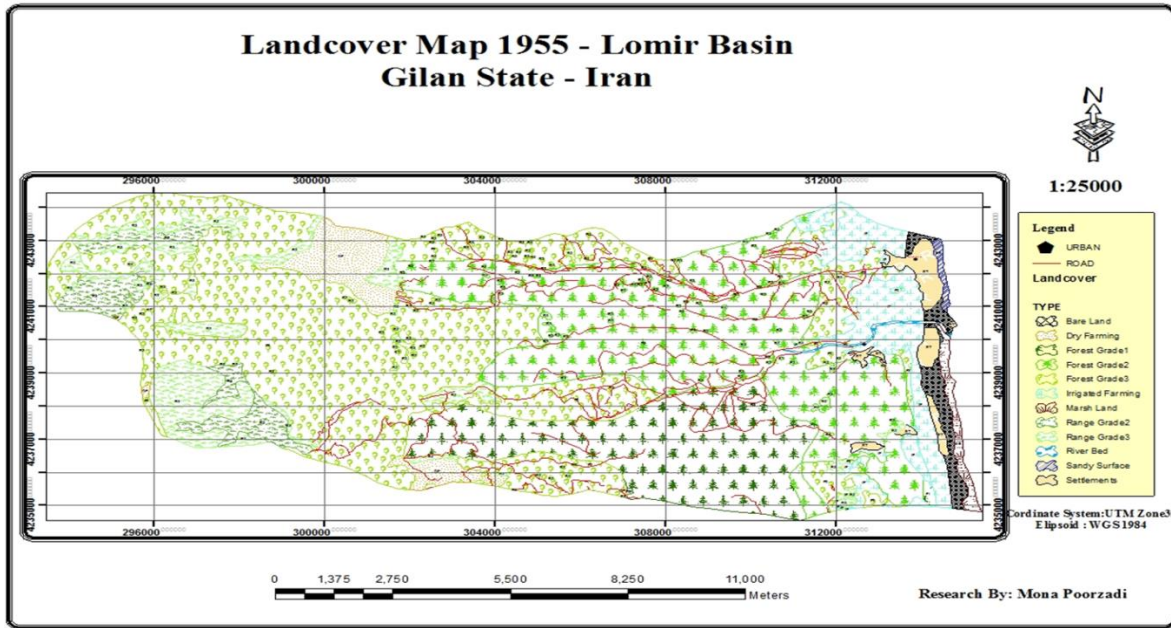


Fig. 4.6 prepared land use maps during 1955-2012



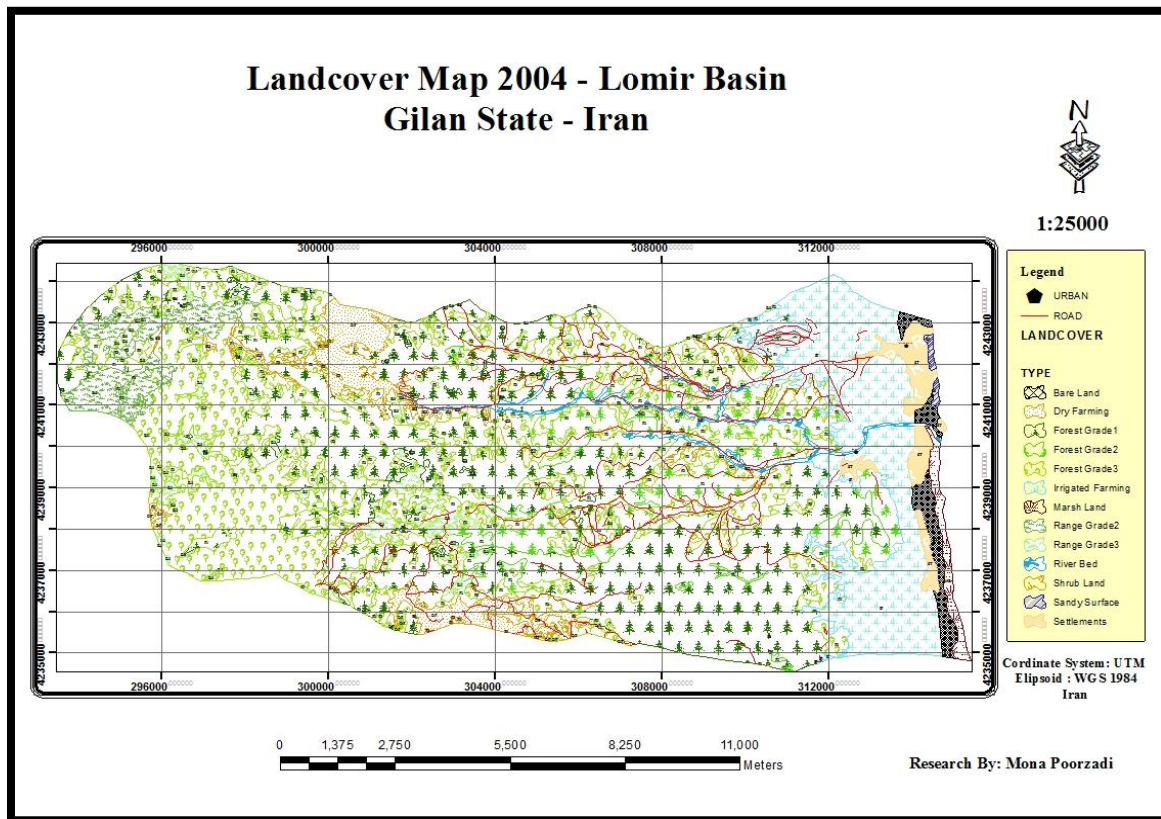
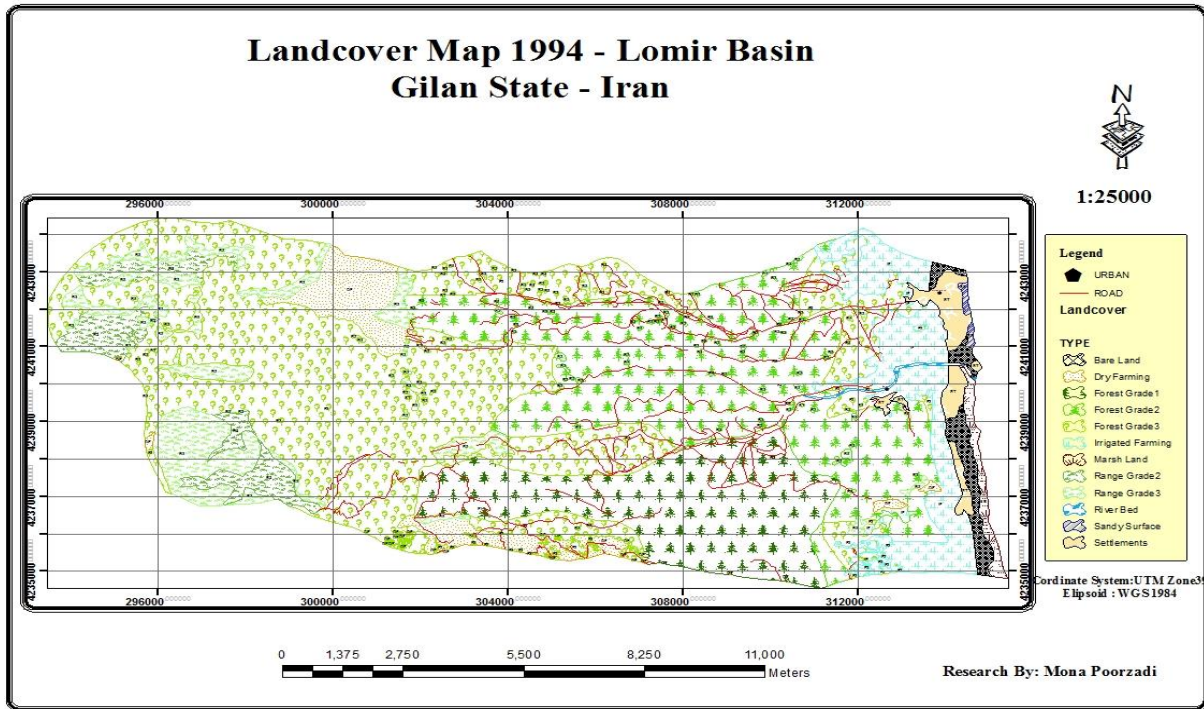


Fig. 4.6 prepared land use maps during 1955-2012

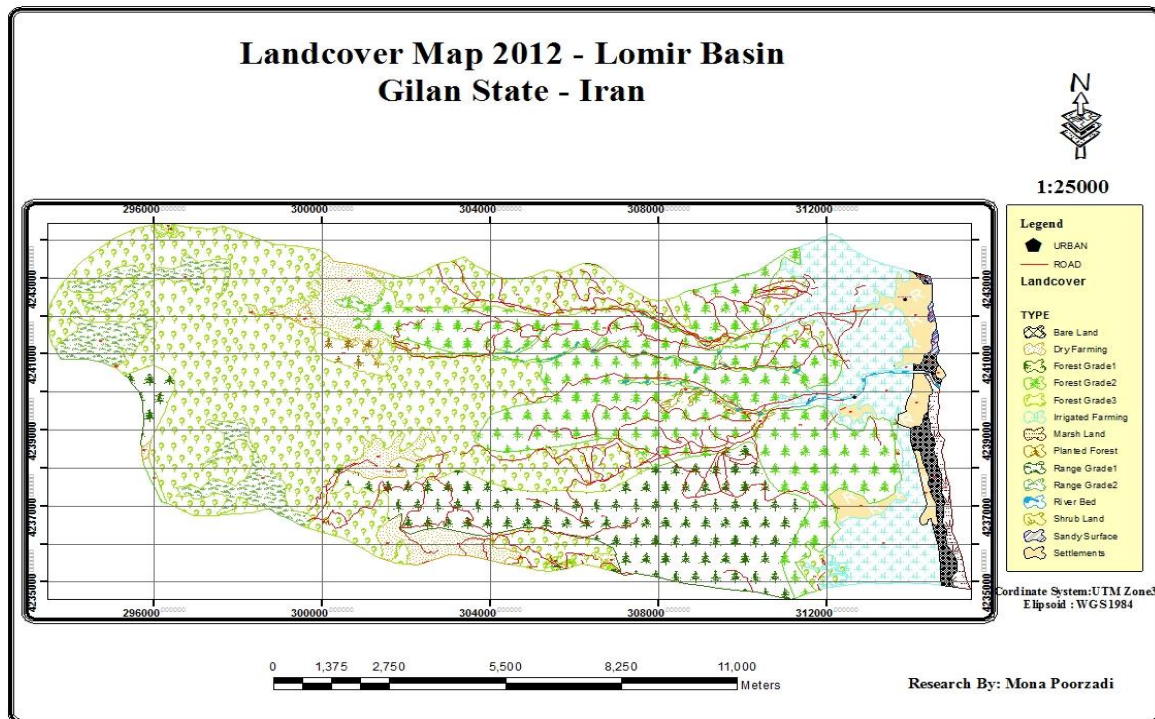


Fig. 4.6 prepared land use maps during 1955-2012

*Source: Author*

#### 4.4 Process of sedimentation in river mouth, during the time sediment dating with radio isotope

Soil erosion is carrying away or displacement of the soil on the earth due to various factors. If erosion occurs in the normal process of nature, this type of erosion is called normal erosion and it happens within the geological formation. If the erosion occurs due to intervention of human in a way that would spoil the balance of soil-water-vegetation, this type of erosion is called accelerated erosion. the soil erosion is accelerated by wind and precipitation with various factors such as destruction of forests due to overuse and misuse, fires, land clearing, acid rains as a result of industrialization, environment and air pollution; as well as the problems such as wrong agriculture soil processing, unconscious and overuse of rangelands and fields, and similar factors; and like many other regions of the world, soil erosion is the most important soil and environment problem for Iran as well. Removal of sediment from the watershed slopes (erosion) and the subsequent discontinuous motion (dynamics) to the sea, involve a variety of processes that may be analyzed and classified under different viewpoints, as described in the following. A middle size

watershed of temperate zones (but in fact applying to other climates as well) is schematically depicted in Fig. 4.7 to give an idea of what usually takes place at different elevations and distances along the watercourse, the longitudinal dimension is approximately indicated by a logarithmic scale, in such a way as to emphasize the complexity of the problems occurring at the smaller scales (farther and higher areas of the watershed). Under the action of water (direct: rainfall, overland flow, channeled flow; and indirect: freezing and melting, infiltration, etc.), sediments are removed from the surface of the watershed and conveyed downstream. Depending upon the prevalent extension of the process in three, two or one spatial dimensions, sediment motion assumes three basic forms mass, surface and linear), more or less corresponding, respectively, to (i) landslides, occasionally produced in the steepest slopes of the watershed, even if protected by vegetation; (ii) distributed soil erosion mainly occurring in undulated, scantily vegetated surfaces; and (iii) bed load and suspended transport by water flow in the stream network. There are also a number of intermediate forms which share some characteristics with the basic ones, as for example: gully development (mass/surface/linear motion) rills erosion (surface/linear movement), debris flow (mass/linear motion). Wind is often the most effective cause of surface erosion where rainfall is extremely scarce, as in the desert or in arid zones (Di Silvio, 2008).

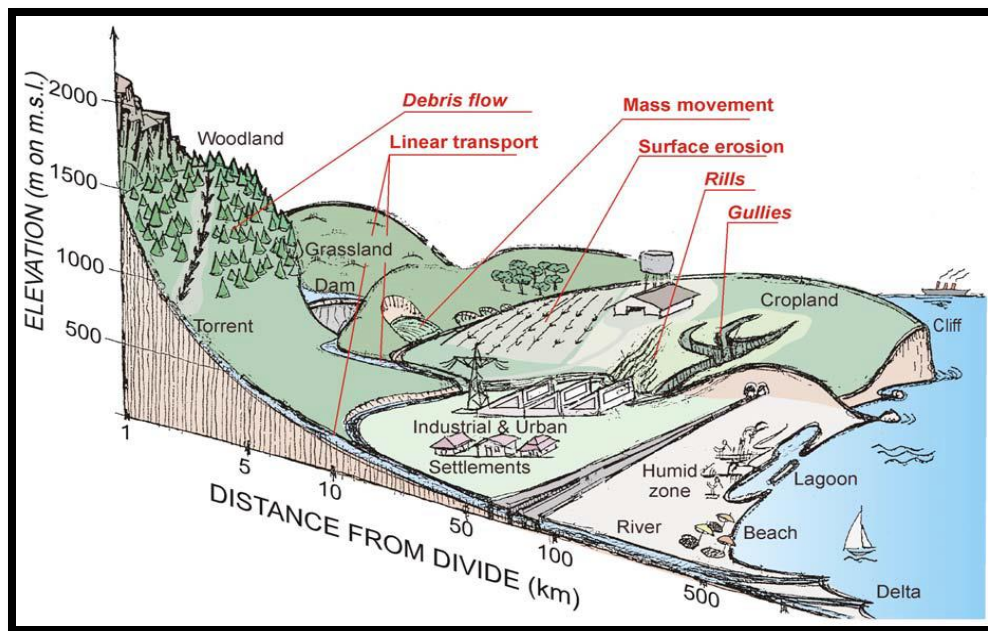


Fig. 4.7 Basic forms of sediment motion

Source: UNESCO, Paris, 2008



Mean annual sedimentation rates over the last 50 years were determined in the river mouth of Lomir River (in Caspian Sea) using Cs-137. Core samples of sediment were collected at river mouth of Lomir River where river end to the Caspian Sea. Each sample was analyzed in the field and in the laboratory for fallout cesium-137. Results of the sediment dating using cesium-137 showed that the average rate of 0.02 cm per year in study area, while average rate for whole southern coast of the Caspian Sea is 0.24 cm per year, for example in Anzali lagoon and it is lower than the average in Lomir catchment, but in general the rate of sedimentation is increasing.



Fig. 4.8 Sediment sampling at river mouse.

*Source: Author*

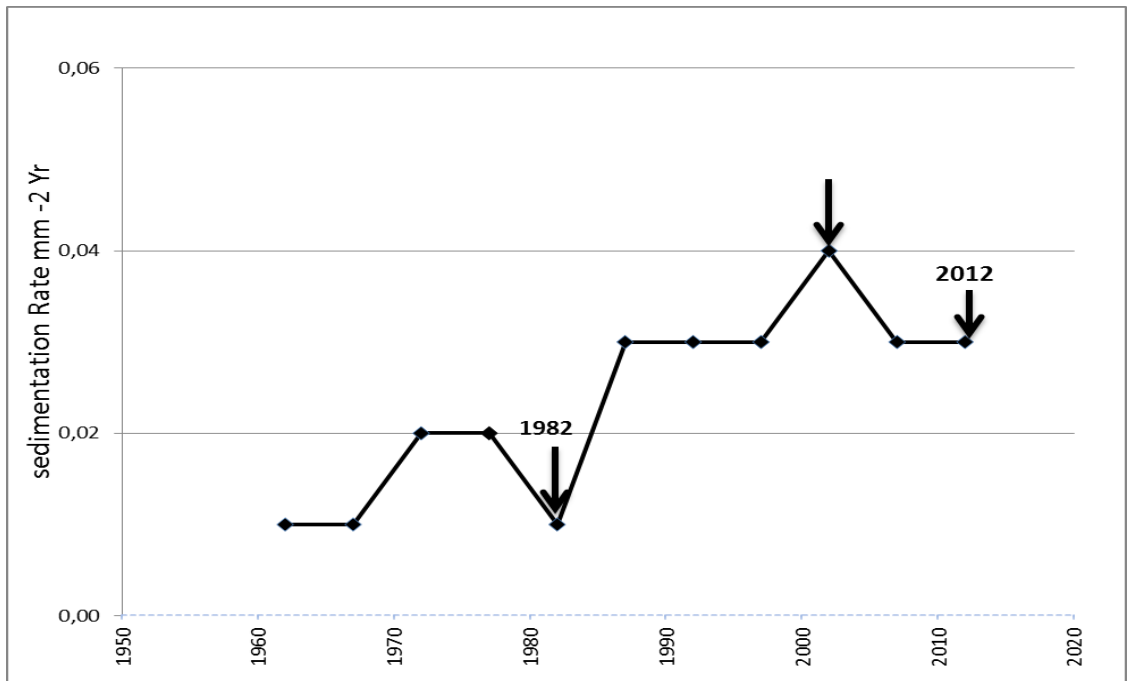


Fig. 4.9 137 cs determined sedimentation rates in Lomir river mouth

Source: Author

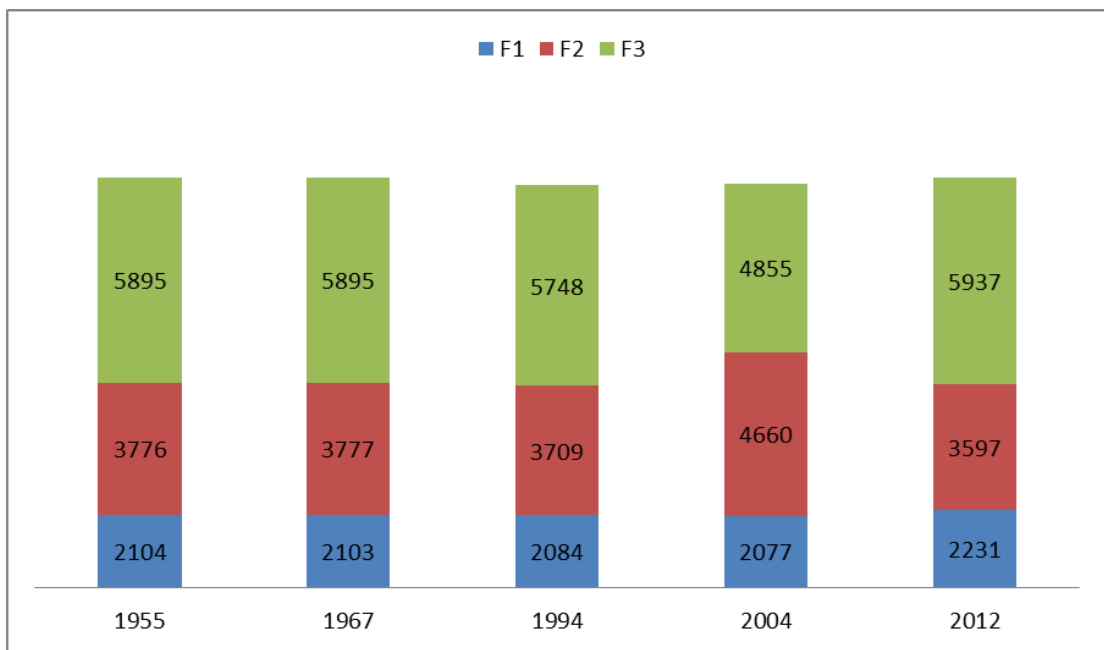
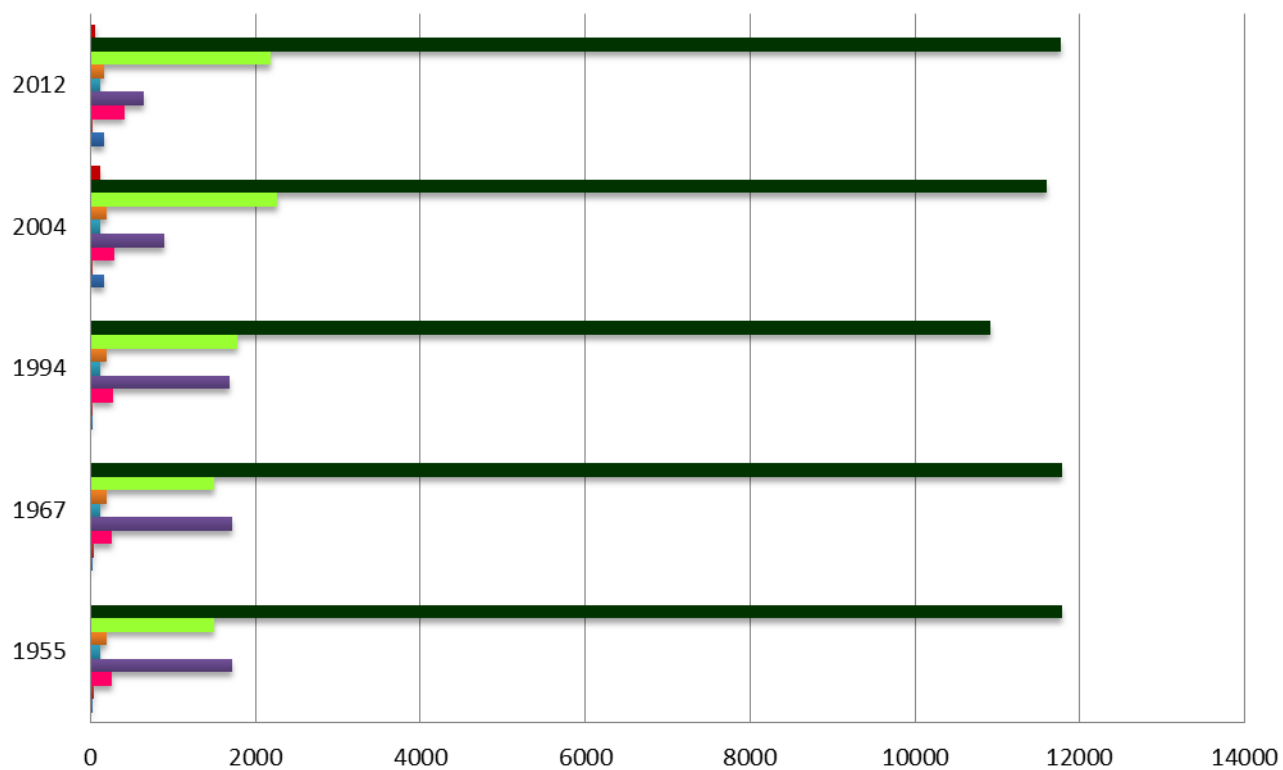


Fig. 4.10 areas of different forest cover

Source: Author

F1: Canopy cover more than 75%

F2: canopy cover between 75-50%



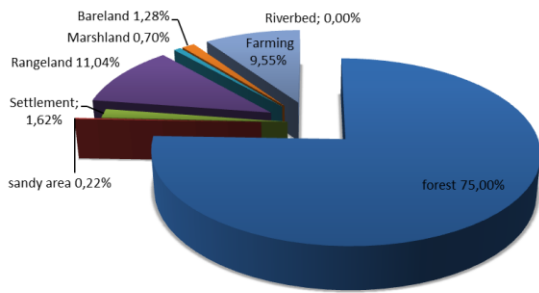
	1955	1967	1994	2004	2012
■ shrubland	0	0	0	105	54
■ Forest	11775	11775	10911	11592	11765
■ Farming	1491	1492	1776	2259	2178
■ Bareland	200	200	190	187	164
■ Marshland	110	109	109	109	110
■ Ranges	1723	1723	1691	894	652
■ settlement	253	253	257	277	401
■ sandysurfaces	34	34	22	22	17
■ Riverbed	26	26	26	165	165

F3: Canopy Cover less than 50%

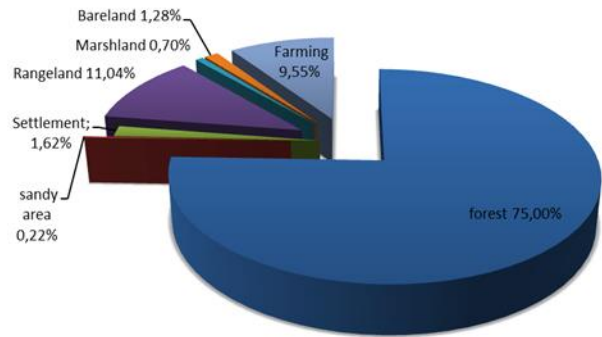
Fig. 4.11 .Areas of different land uses in prepared maps of Lomir Basin

Source: Author

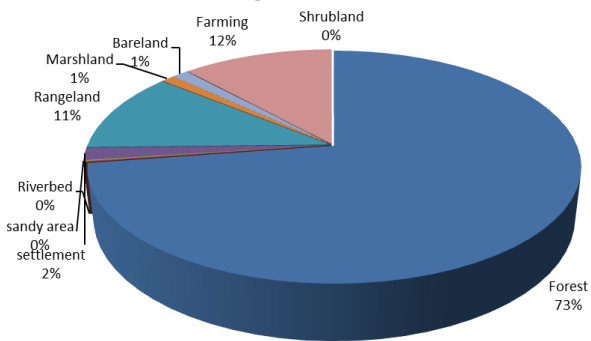
**Percentages of land cover In 1955**



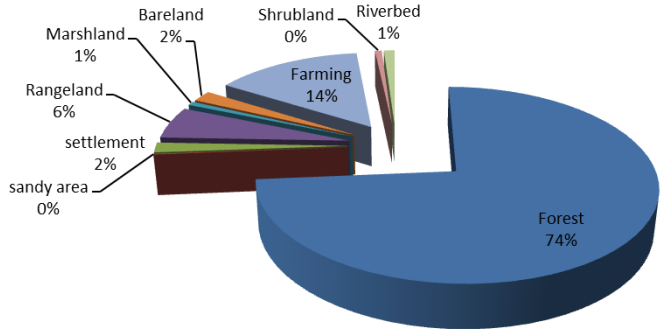
**Percentage of Land cover In 1967**



**Percentage of Land cover In 1994**



**Percentage of Land Cover In 2004**



**Percentage of land cover In 2012**

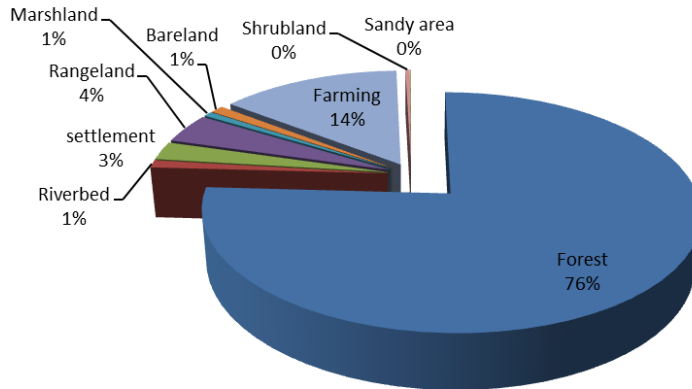


Fig. 4.12 Percentage of different land cover during the study period,

Source: Author

## 4.5. Conclusion

Prepared land use maps and change detection of the study area shows an average changes of forest cover about 3% annually in study period, Farming have average changes about 4.5%, sandy surface about 8%, settlement about 1.3% and other land covers have less than 1% changes during the time, river bed has changes about 2 ha during the time, since forest cover is the main land use in this area, in this research we are more focused on this land use. From 1955 to 1967 there is not too much changes in all type of land cover in study area, but there is a reduction in 1994 and 2004 which is during second and third development Program of the country, and also again increase in forest cover in 2012, this increase is not really because of increasing the area of forests and is because of changing in definition of forest in recent years, in past lands with vegetation cover more than 10% assumed in forest area, but in recent years vegetation cover between 5-10 percent is also belong to forest areas, and that's the reason of increase in forest cover in this study in 2012. Also, a look at Fig. 4.3 about sedimentation rate shows that the average rate of sedimentation is 0.03%, which shows there is a direct relation between forest degradation and sedimentation in study area.

Land conversion in the country has different faces. Farmland converted into land for settlement, forest changed into agricultural land or small-size farming may change into large-scale agro-industrial farming and more land may be needed to provide or should change into smaller parcels for new families. In many cases, the land conversion is not carried out in a sustainable way. Agriculture is the primary driver of land use change. Much of the pressure to convert forests into agricultural uses comes from increasing population growth and development demands. In Iran, a spatial and land use planning system is only in place in some municipalities and districts, e.g. master plans for rural areas, but not for the whole country. In particular, there is a lack of planning on the regional and central levels. The main reason for converting land and destroying the key habitats is for facilitating development plans and promoting economic activities. All stakeholders including decision makers, planners, and some local community are involved in land-use conversion. For example, converting forests and rangelands in mountain areas is usually due to agricultural development and building construction, scarifying some important ecosystems. Land conversion was easier before but now it is not as easy. Still conver-

sion is not impossible and continues to take place. Increase in human population increases the need for development plans and therefore the pressure on natural resources will continue to increase. Impacts of climate change mitigation activities on biodiversity depend on the context, design, and implementation of these activities. Land-use, land-use change, and forestry activities (afforestation, reforestation, avoided deforestation, and improved forest, cropland, and grazing land management practices) and implementation of renewable energy sources (hydro-, wind-, and solar power and biofuels) may affect biodiversity depending upon site selection and management practices. For example: 1) afforestation and reforestation projects can have positive, neutral, or negative impacts depending on the level of biodiversity of the non-forest ecosystem being replaced, the scale one considers, and other design and implementation issues; 2) avoiding and reducing forest degradation in threatened/vulnerable forests that contain assemblages of species that are unusually diverse, globally rare, or unique to that region can provide substantial biodiversity benefits along with the avoidance of carbon emissions; 3) large-scale bioenergy plantations that generate high yields would have adverse impacts on biodiversity where they replace systems with higher biological diversity, whereas small-scale plantations on degraded land or abandoned agricultural sites would have environmental benefits; and 4) increased efficiency in the generation and/or use of fossil-fuel-based energy can reduce fossil-fuel use and thereby reduce the impacts on biodiversity resulting from resource extraction, transportation (e.g. through shipping and pipelines), and combustion of fossil fuels. The direct adverse impacts of climate change include changes in precipitation and temperature patterns, water resources, sea level rise and coastal zone, agriculture and food production, forestry, drought frequency and intensity, and human health. The indirect adverse economic impacts result from the response measures taken by the developed countries. Biological diversity as fauna or flora normally refers to the different variety of life forms at various organizational levels from biomes down through genotypes. The link between climate change and biodiversity has long been established. Although throughout the history of Earth the climate has always changed with ecosystems and species coming and going, rapid climate change adversely affects ecosystems and species ability to adapt and therefore, biodiversity loss increases. To confront ecological changes, the world must adopt an economy where the carbon dioxide emission is reduced to minimum levels. Iran officials have no objections in this regard, because this is a view that is based on scientific evidence.

Iran's position stress on supporting the environmental protection conventions and the Kyoto Protocol, and Iran has long-term planning for combating climate change in its agenda. Changes in biodiversity at ecosystem and landscape scale, in response to climate change and other pressures (e.g. changes in forest fires and deforestation), would further affect global and regional climate through changes in the uptake and release of greenhouse gases and changes in albedo and evapotranspiration. Based on the research and assessment carried out during the Climate Change Enabling Activity Project under UNFCCC, and using the scenarios proposed by IPCC, it is estimated that if the CO<sub>2</sub> concentration doubles by the year 2100, the average temperature in Iran will increase by 1.5 - 4.5° C which will cause significant changes in water resources, energy demand, agricultural systems and products, and coastal zones. It can be said that during the last half century, climate in forest area in Caspian region has become warmer. Precipitation trends especially in Anzali station that has highest precipitation records in Iran and also in Gorgan station have decreased 409.4 mm and 55.6 mm, respectively. Precipitation trends in Rasht and Baboulsar stations have shown a positive change. During last 49 years in Rasht station mean annual temperature increased about 1.28° C and even its minimum temperature shows 2.45° C increases. The mean annual temperature in Baboulsar station in the last 54 years has increased 1.44° C. Distribution of plants are directly depends upon temperature and precipitation conditions in each climatic zone. Generally, with 100 meters increase in altitude temperature will decrease by one degree centigrade. In study zones especially in Guilan (western part of Caspian) and Gorgan area temperature increases more than one degree and main species of vegetation cover moved upward about 100 meters.



## 5. Land use planning documents

Iran is a low forest cover country with 11.7 million hectares of forests that consist 6.3 % of the land area. However, the variety of geographic and climatic conditions allows for high plant diversity and unique genetic reserves. Geographers maintain that Iran is the global climatic bridge due to its climatic diversity. Iran is divided into five major forest zones that encompass a vast range of humid commercial forest in Iran which is composed of 65 different tree species. Beech and hornbeam are the most important species in terms of wood quantity. The average annual precipitation ranges between 530mm in the east and 2000mm in the west. However, the other four forest zones, mainly non-commercial, is under management of their Non-wood goods and services as well as soil conservation.

Desert, wasteland, and barren mountain ranges cover about half of Iran's total land area. Of the rest, in the 1980s about 11 percent was forested, about 8 percent was used for grazing or pastureland, and about 1.5 percent was made up of cities, villages, industrial centers, and related areas. The remainder included land that was cultivated either permanently or on a rotation, dry-farming basis (about 14 percent) and land that could be farmed with adequate irrigation (about 15 to 16 percent). Some observers considered the latter category as pastureland. In most regions, the natural cover is insufficient to build up much organic soil content, and on the steeper mountain slopes much of the original earth cover has been washed away. Although roughly half of Iran is made up of the arid Central Plateau, some of the gentler slopes and the Gulf lowlands have relatively good soils but poor drainage. In the southeast, a high wind that blows incessantly from May to September is strong enough to carry sand particles with it. Vegetation can be destroyed, and the lighter soils of the region have been stripped away.

In mountain valleys and in areas where rivers descending from the mountains have formed extensive alluvial plains, much of the soil is of medium to heavy texture and is suited to a variety of agricultural uses when brought under irrigation. Northern soils are the richest and the best watered. The regions adjacent to Lake Urmia (also cited as Lake Urumiyeh and formerly known as Lake Rezaiyeh under the Pahlavis) and the Caspian Sea make up only about 25 percent of the country's area but produce 60 percent or more of its major crops.

The land reform program of 1962 affected agricultural lands and the production of crops. Implemented in three stages, the program redistributed agricultural lands to the peasantry, thereby lessening the power of the feudal landlords. By the time the program was declared complete in 1971, more than 90 percent of the farmers who held rights to cultivation had become owners of the land they farmed. The new owners, however, became disillusioned with the government and its policies as their real economic situation worsened by the late 1970s.

On average, the minimal landholding for subsistence farming in Iran is about seven hectares. If each of the 3.5 million sharecroppers and landowners in villages (as of 1981) were given an equal share of land (from the 16.6 million hectares of cropland), each family would be entitled to only 4.7 hectares, not enough land for subsistence farming. Even if there were sufficient arable land, many of the sharecroppers could not afford to buy more than four of the seven hectares needed for subsistence farming.

The basic rural landholding infrastructure did not change after the Revolution. A minority of landowners continued to profit by exploiting the labor of sharecroppers. Prior to the land reform program, feudal and absentee landlords, including religious leaders responsible for *vaqf* land, comprised the ruling elite. Over the years, *vaqf* landholdings grew considerably, providing many Iranian clergy with a degree of economic independence from the central government. Redistribution of the land resulted in power being transferred to farmers who acquired ten or more hectares of land and to the rural bourgeoisie. Uncertainty about the prospect of effective land reform under Khomeini contributed to a massive loss of farm labor--5 million people--between 1982 and 1986.

Emphasis on subsistence agriculture persisted because of the lack of capital allocated after the Revolution, perhaps because the regime's technocrats were from urban areas and therefore uninformed about agriculture, or because the bazaar class, which constituted a disproportionate share of the 1979 government, did not represent the interests of agriculture. Uncertainties about future landownership, as well as the war with Iraq, caused further disruption of agriculture. Ten percent of agricultural land fell into Iraqi hands between 1980 and 1982, although the territory was subsequently regained by Iran. The war stifled agricultural development by causing a loss of revenue and by draining the already shrinking agricultural labor pool through heavy conscription.

Iran enjoys experience of six decade of development planning. During this period the planning in general and land use in particular have gone through many changes and modification due to the economic, social and political circumstances of country. Thus, the identification of these obstacles confronted in land use planning. The study of land use historical development indicates that the lack of regional balance and appropriate use of terrestrial capabilities, or in another word, the lack of adequate development in vast areas of the country has been the primary concern of the planners before and after the revolution of 1979. Therefore during this period, extensive steps in form of study plans or the development of rules and regulation are undertaken. Unfortunately, these measures have remained ineffective and the issue of land use and equitable distribution of activities and population in this country are still the primary concern of planners and the decision-makers. During the recent decades, especially from early 1970s, oil and Iranian national development have acquired an indispensable inner-bound, which has become more acute with the rising oil price .Due to this dependency, the oil price fluctuations and its occasional boom or bust have a direct influence on national development and the spatial structure of the country (3<sup>rd</sup> Development Plan).

The aftermath of this process and heavy reliance of development on the petroleum dollars is not only the disproportional distribution of development of national wealth amongst various social classes but also the creation of false capacities and needs beyond the real capabilities of the country. The feedbacks of such policy are evident in the disproportionate development of human settlement and the concentration of activities in certain parts of the country, this has resulted in general negligence of less-developed regions and occasional attention based on their relative ties to the developed areas. Thus, the inherent capabilities of less-developed regions are not addressed properly. Two 7-year plans and subsequent two 5-year plans during 1963-1967 and 1968-1972 were implemented according to the prevalent development planning in the world. During that period the dominant regional development theory was to emphasize on small areas and patch of lands that have the highest potentials in order to create development poles in the country. In this process, the development activities were rooted in overall national economic needs and goals without accessing the internal opportunities of various regions. The end result of this process was the deration of a polarized spatial structure lacking harmony and equitable distribution of activities (Bushehr province planning and man-

agement organization 2002, Tabesh, 2004). After the Islamic revolution, three development plans were implemented, in which the land use planning and equitable distribution were theoretically emphasized (3<sup>rd</sup> economic plan, 4<sup>th</sup> economic plan). However due to some obstacles, the stated objectives were not realized and lack of national balance in this regard is still a serious challenge for the decision-makers.

## **5.1 History of land use planning in Iran**

Iran has six-decades of official development planning (land use planning) experience. During this era, the economic, social and political conditions have encountered many ups and downs and changes, which in turn have affected the planning process in the country. This era could be divided into two distinguished periods.

### **5.1.1 Before the Islamic Revolution**

The first seven-year Development Plan from 1949 to 1955 began with the depression and inflation caused by the political instability and economic hardship of country (Tabesh 2004, Budget and planning organization 1998, Scetiran consulting engineer 1975). However, it was abruptly wrapped up by the coup of 1954. The main objectives of the second seven-year plan (1956-1962). The third Development plan (1963-1967) was prepared based on modern principles and as the results of assessments conducted on the performance of the 2<sup>nd</sup> Development Plan. It was the first comprehensive and coherent development plan in Iran that was submitted by the National Planning Organization to the government. The special characteristics of the 3<sup>rd</sup> Development Plan were its well-established objectives and its comprehensiveness in predicting the amounts of public and private investments as well as the coordination of various national policies with the development policies (Budget and planning organization 1998).

In the preparation of the Forth Development Plan (1968-1972), the comprehensive and continuity was highlighted once again. However contrary to previous plans; there was an evolution in the planning structure. This was in form of the top to bottom process called the “Comprehensive Plan” as well as the bottom to top process named “section” incorporated into the planning structure with mutual final objectives (Tabesh, 2004, Setiran, 1975). Some of the significant goals of this plan were to expedite the economic growth, boost the income revenues, develop the indus-

tries, increase capital returns, expand scientific research, distribute the income equally, ameliorate development and renovate activities in the rural areas, decrease the foreign dependence, facilitate agricultural growth, domestically supply industrial raw materials, enhance the diversity of export commodities, and improve services (Budget & planning organization, 1998).

The most prominent objectives of the fifth Development Plan (1973-1977) were to enhance the scientific, cultural, health and welfare status of the society; equality distribute the national income; preserve and continue the speedy growth of the economy; create productive job opportunities; establish better equilibrium between various parts of the country in terms of economic benefits, environmental protection and preservation as well as providing means to increase the share of Iran in international trade (Tabesh, 2004, Budget & planning organization, 1998, Masoumi Eshkevari, 1997).

In other word, all the above-mentioned measures could be considered as steps towards land use planning. However, the accelerated development of certain sectors during 60s and 70s along with the unjust distribution of national wealth and lack of adequate comprehensiveness of the plans made it inevitable to prepare a separate land use plan with emphasis on the organization of land activities.

### **5.1.2 After the Islamic Revolution**

The upheaval in post-revolution planning was the natural outcome of the Islamic revolution and the subsequent impose war. Thus, the planning during this era could be divided into two periods of 1978-1988 and post-1989. The first decade of the Islamic Republic was coincided with the revolutionary of man power, nationalization of many industries and banks, the eight years of war and a negative viewpoint of pre-revolutionary Development plans. As a result, the early post-revolutionary years were practically without a particular development plan (ToFig.h, 2005).

First 5-year Development Plan (1983-1987) failed to attain the ratification of the Islamic Parliament, a bilateral interaction was embedded in its various planning levels and the flow of information from top to bottom and vice versa was foreseen. The notion of sectoral balance at the national level was reinforced and the idea of land use planning was more emphasized by the policy makers (Budget and planning organization 1998, Esfahan province budget and planning organization, Fou-

ladi).

The specifications of the Second Economic, Social and Cultural Development plan (1995-1999) were (Pourasghar et al., 2003):

- Further integration of economic development considerations and approaches in the spatial development.
- Better coordination with the Ministry of Housing & Urbanization in order to integrate the land use and framework approaches for the realization of major land use objectives.
- Taking into account the new dominant approaches in the world especially in realm of globalization as well as the remarkable growth of various technologies prominently in data gathering for industrial tourism and other sectors

The third Development plan was prepared with more comprehensive structure to facilitate the participation of all the pertinent institutions. Moreover in this plan, the environmental and land use modalities were more vividly incorporated into the planning process (planning & Management Organization 1999 and Budget & planning Organization).

The population growth and expansion of urbanization in the country along with the profound changes in the global economics provided new challenges and opportunities for decision-makers and planners of the Fourth Development Plan.

The land use planning was the focus of attention both at the expert and decision-making levels of the Fourth Development plan and the integration of land use consideration for optimum organization of activities was emphasized (Budget & planning organization, national planning & management strategies).

Thus in the preparation and compilation of the Forth Development Plan, the international changes, the new economic environment and the requirements embedded in the National Constitution were reflected in its long-term vision. Based on the previous trends of major economic, social and political variables and the assumption of their expected continuation, the desirable long –term vision of the country was prepared (Makhdoum, 2002). The land use planning and its strategies were the main pillars of the national vision. Subsequently, the major strategies and the requirements to attain the desired long-term vision were determined. Thus the planning structure of the 4<sup>th</sup> Development Plan was chosen and like the 3<sup>rd</sup> development Plan, the terms of reference and time schedule of plan were submitted to the

council of Ministers by National Planning and management Organization (national planning & management organization). The terms of reference for the land use studies have ten primary topics including analysis and assessment of natural and environmental status of each province, socio-cultural analysis, economic analysis, evaluation of the spatial structure, analysis of the linkages, security and defensive considerations, future forecasting, land use management, Geographic Information System (GIS), integration and conclusion (4<sup>th</sup> development plan, Makhdum, 2002). Concurrently, an act was ratified by the Islamic Parliament titled “The implementation Law of 48<sup>th</sup> Article of the constitution”, which obligated the Iranian government to prepare a land use plan. Meanwhile, subsequent to the official communication of a strategic document titled “20-year Vision of the Islamic Republic for 2025” a commission by the secretariat of the Expediency Council approved the general land use policies of the country under the following eight principles:

1. Effective use of the spatial geographical location of the country in order to attain its suitable regional and international role.
2. Growth of the human resources as the primary pillar of land use planning.
3. Proper emphasis on the national unity and enhancement of Iranian-Islamic identity in the land management.
4. Improvement of the economic efficiency and the facilitation of the domestic and foreign economic links.
5. Attainment of regional stability in accordance with the capabilities and capacities of each region.
6. Spatial organization of the main habitats with emphasis on public participation in the related activities.
7. Taking into account the security and defensive considerations in settlement of population and implementation of activities.
8. Optimization, protection and utilization of capitals, renewable natural resources and protection of the environment as a component of the development plans.

The rapid population growth in the last century, especially during the 70s and 80s has confronted the national decision-makers and planners with mounting social needs that require a more sophisticated infrastructure (Makhdum, 1995). Subsequently, various policies and plans in form of development projects were implemented to meet these demands (Masoumi Eshkevari, 1997). The feedbacks of these

policies were materialized in form of diverse activities and settlements throughout the land. However, they were hampered by regional instabilities and inequities. Some of these factors are:

- Concentration of population, infrastructure and production capacities in northern central-western part of the country in comparison with the southern-eastern part.
- Concentration of industrial activities and services in certain sections of the country like Tehran and central regions.
- Polarized settlement of population and its high concentration in large-scale population centers.
- Severe lack of equity between the urban and rural communities in terms of education, services, welfare etc.
- Lack of proportionality between the population settlement, infrastructure and the development potentials at the southeastern shores of the country.
- Excess infrastructural capacities in some regions with respect to their population and economic activities.
- Lack of balance and coordination in exploitation of land resources and thus, environmental stability (both the natural and man-made environments).
- Lack of balance amongst various components of the national spatial structure in terms of incoming population activities adjusted with the available facilities and their relative advantages.
- Lack of attention to large sections of the country and their isolation due to environmental conditions and bureaucratic factors.

The optimize use of land and the capabilities of various region along with the decentralization of highly dense areas have been one the concerns in the land use planning before and after the revolution. The reflection of this emphasis is quite evident within the framework of the national development plans. However, spatial planning in accordance with land use planning and proper national distribution of activities amongst various regions is not taken seriously and in reality, many of the potential capabilities are not utilized. The consequence of this approach in the random distribution of opportunities/facilities and intensification of inequity in the country.



### **5.1.3 Natural conditions**

The natural conditions of Iran including its vast mountainous regions (ToFig.h, 2000) and its position at the dry belt of the planet Earth are the main factors in determining the national climate. A lion share of the central parts of Iran enjoys very small amounts of precipitation and inadequate water sources is the main limiting factor in the development of these regions (Ministry of power 1998). Thus, water supply is one of the primary concerns in the land use and development plans, especially for the less development parts of the country.

### **5.1.4 Rules and Regulations**

Although several regulations on the issue of decentralization have been ratified and have streamlined some activities towards the less developed regions and have prevented their excessive allocation in populated areas, due to certain shortcoming and obstacles, they have not been adequate to meet the objectives of the land use plans (National planning & management organization 2005, Makhdoum, 1995). Therefore, the issue of decentralization is still an ongoing predicament at the national level.

#### **Emission standards of the Industrials Factories**

The standards developed by the Department of the Environment (DOE) for the industrial emissions are designed for the whole country without any reservation for specific regional conditions. As a result, there is no incentive to implement them in the less developed parts of Iran in accordance with the local needs and requirements (Pourasghar et al., 2003).

### **5.1.5 Political Lobbying and pressure for the Implementation of projects, which have no economic and technical justifications**

Lack of an approved land use plan as a national multi-sectoral document has opened the door to political lobbying and pressure (Fouladi, 2002, Ministry of Power 1998) for the implementation of projects that do not have economic and technical justifications. Unfortunately, some of these projects are important infrastructural plans.

### **5.1.6 Lack of proper classification of regions**

Ordinarily, there are two classifications for planning and implementation (Fouladi, 2002, National planning & Management Organization 2004). Regrettably, there have been several categorizations based on various objectives by governmental institutions (Fouladi, 2002) in the past, which have intensified the obstacles towards a comprehensive land use planning process at the national level.

### **5.1.7 Lack of appropriate model for land use planning in Iran**

Up till now, there is no suitable model for land use planning and site selection of development projects in the country. Lack of basic assumptions in form of an appropriate model encompassing all the economic, social, land use and environmental elements has resulted in unscientific site selections (ToFig.h, 2005, Makhdoum 1995, Masoumi Eshkevari 1997).

### **5.1.8 Geographical Location of Iran in the Middle East and the external Variables**

Iran is situated in the Asian Continent between two main sources of energy supply, namely the Persian Gulf and the Caspian Sea. This has put Iran at the focus of global attention (ToFig.h 2005, Iranian statistical center 2005). On the other hand, profound changes have taken place in the neighboring countries. It is important to point out that globalization as an external variable has defined new roles for various regions of the world and undoubtedly would have deep effects on the spatial structure of the country. Even though, this could be regarded as special opportunity for Iran, the fast pace of changes in the neighboring countries and whole region has prevented the decision-makers to adapt the new political realities and seize the quickly fading opportunities.

#### **5.1.8.1 Lack of National data base and sharing of Information**

Not only at the national level, but also at the sector level, many of public institutions and organizations do not have a specific policy for sharing of spatial data and information (Makhdoum 1995). Moreover, there are no regulations to facilitate the data sharing process.

During the last 3 decades, the issues of land use planning, optimized distribution of

activities and social justice have been the most important problems in the national development. Meanwhile, many attempts have been made to streamline the activities and distribute them equitably across the nation under the framework of regulations or study projects (including the studies conducted by National Planning & Management Organization and the framework plans of the ministry of housing & Urbanization). However, these measures have not provided the desired effects on the appropriate distribution of activities in relation with the land capacities. Thus, the inappropriate distribution of wealth and lack of employing the regional capabilities and potentials are still contributing to the underdevelopment of vast areas in country as one of the insurmountable challenges of Iran. Fortunately, the optimized distribution of population and activities (Hesari 2007, Iranian statistical center 2005) is being understood by the authorities, which is reflected in the recent legal instruments. On the other hand, the evolution of land use planning indicates that its role in the national planning structure is becoming increasingly significant. Thus it could be concluded that the land use planning is enjoying a strong legal support within the planning structure. But there are some obstacles in its proper implementation. Therefore, it is vital to devise measures and appropriate mechanisms to remedy these predicaments by national planners. Some of these problems are externalities imposed beyond the control of the land use planning including the political upheavals in the neighboring countries, which have influenced the land use assumptions made in the past. They have made the revisit of these assumptions inevitable and quite essential. Moreover, the presence of various regulations, which sometimes are in contrary to the objectives and stated policies of the land use planning, have hampered this process (Accumulation of taxes Act, Regulations on the establishment of industries etc.). As a result, the short-term identification and modification of these regulations are necessary. Otherwise, all the attempts to materialize the objective of land use planning would be fruitless. The political pressure of local authorities for the implementation of projects that do not have economic and technical justifications is the other bottleneck. The national planners have to find means to defuse these types of lobbying and establish measures to prevent the implementation of such projects that have severe adverse spatial impacts. Also, preparation of suitable models determining the proper site of the stated activities, sharing of data and information, tenacity in adhering to the objectives and policies of the land use planning, modification of regulations, reacting to external changes through proactive interaction are the main issues that are to be addressed in order

to achieve the land use objectives and policies in the country.

Iran has a number of programs on agendas to reserve loss of forest cover and combat degradation factors including change of subsistence of forest dwellers, withdrawal of livestock from Caspian forest and resettlement of forest dwellers aimed at poverty alleviation as well as environmental assessment of development plans for preventing resources depletion. Iran has also established the forest guard in 2005 to prevent forest degradation, deforestation and forest conversion and fighting forest fires, Iran has formulated its national action program to combat desertification and mitigate the effects of droughts for the management of arid and semi-arid forest in 2004. The NAP frame work consists of four pivots:

- Identification and controls of the factors contributing to desertification.
- Support for sustainable use and management of natural resources through conservation and reclamation.
- Promotion of sustainable livelihood in affected areas and improvement of socio economic standards.
- Strengthening the role of rural communities in term of decision making, planning, designing, implementation, monitoring and evaluation.

#### **5.1.8.2 Means of implementation for sustainable forest management**

Forest resources assessment in Caspian forests dates back to 50 years and is carried out every ten years to evaluate and determine forest trends. Forestry operations are carried out on the basis of forestry plans approved by forest rangeland and watershed management organization (FRWO). Every forestry plan is controlled and evaluated by forestry officer and consists of different components based on in situ and ecological conditions and is revised every ten years. There is also the high capacity in forestry training centers which can be shared with other countries in the region. The above centers offered schedule in service courses for forestry staff.

Iran also gives its support to NGOs and CBO s active in forestry activities specially women and youth groups aimed at poverty alleviation job creation and improvement the subsistence of local communities

Major challenges

- Over population in and around forest areas.
- Socio-economic constrains in forest areas.

- Illegal cutting and illicit wood trafficking.
- Fuel wood consumption.
- Financial resources allocation.
- Lack of infrastructure for development of new types of employment such as ecotourism.
- Major development.
- Formulation and implementation of integrated forest conservation plan for the management of humid, arid and semi-arid forests in 1,300,000 ha.
- Establishment of two million ha. of manmade forest.
- Elimination of livestock from forests and centralizing forest sporadic village out of forest areas.
- Resolving the rural energy production dependent on forest resources by changing consumption patterns and replacing other alternative sources of energy.
- Reduction of exploitation of natural forest within management plans and supply for woods through tree imports.
- Exploitation of non-wood products by cooperative of local CBO s under direct supervision of government.
- Development of projects and activities that is consistent with ecosystem approach aiming to preserve nature's equilibrium and sustainability.
- Implementation of land use planning.
- Enhancing the role of private sector and cooperatives through rendering consultation.
- Establishment of forest guard under FRWO and employment of volunteer guards (10,000 people per year).
- Formulation of security belt projects to protect natural resources.
- Formulation and submitting new legal amendments against illicit traffickers.
- Establishment of special courts for promote the investigation of cases of illicit trafficking.

## 5.2 Regional study in forest tenure in central Asia

The projects deal with trends in forest ownership, forest tenure and institutional arrangements of forest sector which was completed and submitted to FAO. It had to components the collection of quantitative data on forest tenure and ownership and the development of specific case studies on the impacts of different forest tenure system on SFM and poverty alleviation.

- Joint projects with international partner
- Alborz integrated land and water management in collaboration with World Bank
- Joint projects in pipeline with international partner
- Rehabilitation of forest landscapes and degraded land with particular attention to saline soil and areas prone to wind erosion in collaboration with GEF/FAO
- Strengthening the forest sector in Iran to conserve forest in collaboration with GEF/UNDP
- Institutional strengthening and coherence for integrated natural resources management in collaboration with GEF/UNDP.
- Conducting joint studies with the Atomic Energy Organization on the recognition
- of radioactive elements present in the Caspian Sea.
- Conducting seasonal studies on the presence of microbial contamination in the rivers south of the Caspian Sea
- National and international project in Hyrcanian forest
- Preparing diagnostic studies to analyze historical and underlying causes of deforestation and forest degradation, including processes outside the forest sector.

There are several studies about the underlying causes of deforestation and forest degradation in Iran, of which most of them deal with processes outside the forestry sector. Up to 1960, one of the greatest factors contributing to forest degradation was fuel wood production for supply that as a result led to the expansion of rangelands in the country. In 1962, the whole forests of the country became nationalized. Since then, although forest exploitation was licensed just for traditional animal husbandry, the population growth due to high standard of living, increased needs

for food and crop lands and therefore aggravated deforestation trend coupled with policies for, wheat and meat self-sufficiency increase of foreign currency rate as well as urbanization, rural development and expansion of industries. In recent years, on the basis of new laws any land use change of agricultural lands forbidden.

Formulating and implementing national policies and strategies, through an open and participatory process, for addressing the underlying causes of deforestation

Forest, Range and Watershed Management Organization (FRWO) commit itself to formulate NFP as emphasized by the National Committee on Sustainable Development. Formulation of NFP requires capacity building. Recently, many actions have been taken to combat deforestation and forest degradation including transfer of livestock from forests and resettlement of the forest dwellers, forest extension, and rehabilitation of degraded forests as well as replacement of fossil fuels with fuel woods parallel to measures taken to update and enact forest laws.

### **5.2.1 Raising awareness of the importance of issues related to deforestation and forest degradation and the multiple values of forests**

Action has been made to raise the awareness of public and policy-makers on forest resources and hazard forest degradation and deforestation in collaboration with other sectors. In this regard, a number of publications and documentary films funded by FRWO were produced. TV and radio also play a major role in this direction. Ministry of Education has included subject matters in the curricula to further acquaint students with environmental issues and consequences of forest degradation. Bureau of Extension and Public Participation of FRWO also encourages NGOs to play an active role in this regard. The Cabinet and the Parliament support for forest protection illustrate the public awareness towards forest issues.

Creating or expanding protected areas to safeguard forest and related ecosystems and their full range of values and, developing and applying criteria and methodologies for assessing the conditions and management effectiveness in protected forest areas.

One of forest strategies in Iran is to conserve biological diversity. Conservation of biodiversity is carried out by FRWO in cooperation with Department of Environment.

The conservation approach considers in-situ protection of rare species. In 2000, 10 percent of the forests were designated as protected areas in addition to forest areas already assigned to and managed by Department of Environment as national parks, as well as biosphere and forest reserves. Besides, FRWO directly manages several reserves in various regions of the country of unique and rare plant species and set the criteria and methodology for their assessment and monitoring. It is note worthy that the biological diversity standards are formulated and performed in national and regional forest Management plans. Recently, conservation of fragile ecosystems in dry, sub-dry and sub-humid areas is specifically taken into consideration and restoration of these ecosystems is given high priority in executive programs. For instance, some degraded mangrove forests are rehabilitated in recent years.

Developing and implementing partnership mechanisms to engage forest owners, private sector, indigenous people and local communities in the planning and management of forest conservation areas and developing and implementing a range of innovative mechanisms for financing and encouraging forest conservation Private sector involvement in planning, formulation and implementation projects is stipulated by law. Local communities, NGOs and indigenous people involve formally in the process of formulating, planning and implementing forest plans as well as forest policy forest management plans. At present forest and rangeland protection is mainly carried out with the collaboration of local communities.

### **5.2.2 Giving high priority in national forest programs to the rehabilitation and sustainable**

Management of forests and trees in environmentally critical areas, recognizing the linkage between forest protection and sustainable development and improving the coordination among such policies and programs in the national forest policy and forest protection strategies, priority has been given to rehabilitation and sustainable forest management of environmentally critical areas. It is believed that sustainable forestry is necessary for sustainable development. To this end, several cross-sectoral measures have taken with other organizations such as Meteorological Organization, ministry of Energy, Department of Environment and agriculture sector expanding forested area, establishing and managing plantations to enhance production of forest goods and services, while avoiding the replacement of natural ecosystems, and recognizing the role of imports in satisfying the needs for forest products and services.



Iran is one of the low forest cover countries, because its forests cover less than 10% of its total land area. Therefore, the main objective of forest policy is to protect forests in natural ecosystem. Plantations have established and managed to meet local needs. In recent years, the areas forested to combat desertification (sand dune fixation) are being managed and their goods and services are utilized. Since 2003, formulation of management plan for these plantations have begun and implemented with the collaboration of local communities and private sector. In the Caspian region forest policy aims at forest promotion. Therefore, parts of the woodlands in mountainous areas which are converted into summer ranges are being afforested each year. Forest promotion of the Caspian region is of high importance because of wood production, protection of biological diversity and soil and water conservation in watershed basins. The program was commenced in 2001. Iran is among wood importer countries which has enhanced import volume to support its forests.

Promoting the regeneration and restoration of degraded forest areas including through partnerships and building capacities to promote effective participation in decision making, and development and transfer of environmentally sound technologies.

The regeneration and restoration of degraded forest areas is undertaken on the basis of forest management plans which is primarily formulated for the Caspian forests in the past decade . Restoration of degraded forests is carried out by native species and plantation of native pioneer species. The main objective of rehabilitation is to achieve ecosystem sustainability in forest area and increased biological diversity. In 1996, FRWO launched the forest management plan for sub-humid forests, mainly dominated by oak species. Restoration of these forests carried out through natural regeneration and coppice system in which plantation is done with multipurpose species. In formulation of forestry plans modern technologies such as GIS is used in cooperation with private sector. In fact, forest policy aims at capacity building of private sector, local communities as well as NGOs. Forest management plans are implemented by the government, cooperatives and private sector s which the latter will be more involved in the process in future.

Improving the efficiency of international cooperation to support the management, conservation and sustainable development of all types of forests and building capacity to monitor forest resources

Iran actively participates in international and regional meetings and has signed some bilateral and multilateral agreements in the field of sustainable development of forest areas, biological diversity protection and forest parks management. In fact, the forest policy aims is to enhance international cooperation in order to manage all types of forests.

### **5.2.3 Promoting the creation of new forest resources through plantations and recognizing their role in rehabilitation of degraded lands and forests in environmentally critical areas**

One of the ways to promote forest resources in Iran is to plant multipurpose tree species and poplars. The plantations are normally established in private lands and on degraded wood -lands entrusted to private sector. Development of forest resources meet the need for forest products and restore degraded lands, protects biodiversity and maintains landscapes. However, it should be noted that expansion of forest resources in the private farm lands is not so successful in compared with farming and crop production. To this end, it is necessary to provide incentives such as bank loans, land transfer and even training and extension. This policy can have positive effects only through involvement of all the stakeholders who provide themselves parts of investment and protection.

### **5.2.4 Promoting policies to meet increasing demand for wood and non-wood forest products and services, through sustainable forest management**

Iran has adopted a new policy in partnership of all stakeholders, to promote forest resources. In this connection FRWO has formulated and implemented a master plan to promote forest resources using single or multipurpose species. To produce wood and non-wood products, the woody species as well as multipurpose trees were planted in private lands as well as state-owned lands which were entrusted to private sector with bank loan. Disadvantages of the plan were shortage of irrigation for new plantations and late -yielding period compared with farming. The main objective of the plan is to support sustainable forest management at national level through meeting the needs for forest goods and services.

### **5.2.5 Valuation of forest goods and services**

Valuation may include, among other things, the development and use of new valuation methodologies, valuation of a wider range of goods and services, and policy decisions that reflect a more comprehensive assessment of forest values.

Iran started the valuation of forest goods and services, with partnership of forest sector and private sector consultancy in two phases in 2001. In the first stage , economic valuation of goods finished and in the Second stage , valuation of forest services which is under way. The costs of this national study are funded by FRWO. The main obstacle of the study is insufficient data and information on the extent of traditional use of forest goods and services by local communities. In forestry services valuation, there are some problems with methods of valuation due to their limited application.

#### **5.2.6 The amount, scope, or quality of market data and information for wood and non-wood forest products and their substitutes**

Data on official wood market is precisely collected, but data on non-wood forest products is not sufficient, because some parts of harvesting of non- wood forest and range products carried out by local communities is traditional and is used by themselves or sold in the local markets. There is, however, exact statistics on non-wood forest products for export Use of economic and policy instruments to facilitate progress toward sustainable forest management (these may include improved tax policies and forest revenue collection systems).

Since 1997, the following economic and policy instruments have been applied to Attain sustainable forest management:

#### **5.2.7 Policy instruments**

- Support participatory process in planning, implementation, monitoring and evaluation of forestry plans
- Support and encourage private sector , local communities and NGOs involvement in forestry related activities
- Promote cross- sectoral and international cooperation
- Delineate and specify the boundaries of private forest and range lands
- Organize training programs and provide technical services to participants

#### **5.2.8 Economic instruments**

- Provide low-interest loans for plantation programs particularly, multi-purpose tree species
- Provide low-interest loans for forest-related cooperatives
- Eliminate tariffs on wood import

- Entrust low price lands for plantation.

### **5.2.9 Efforts to reduce negative impacts of trade**

Iran is an importer of wood. Wood and wood products imports have had negative impacts on the country wood industries. In recent years, poplar wood has been exported to the neighboring countries through border cities which have raised the income of private sector. This trend has increased the price of poplar wood at home and has encouraged poplar planters. In a recent action taken by the government, the tariff for wood importation is eliminated.

Participation in forest certification and labeling schemes and work toward Mutual recognition and comparability of such schemes

In Iran forest are owned by the government and forestry projects are carried out in the framework of forest management plans prepared, approved and supervised by FRWO on the basis of specific principles and guidelines. The existing principles and standards guarantee sustainable forestry in area unit level.

Efforts to reduce illegal trade (exports from or imports into your country) in wood or non-wood forest products. Please indicate achievements made, lessons learned, constraints encountered, and planned initiatives.

Wood trade is undertaken and managed according to customs laws and regulations. So far, there has been no report of illegal trade of wood and non-wood forest products from customs. It seems that forest policy instruments and planning in initiatives have more effective role than other financial and economic ones.

Forest policy formulation is a cross-sectoral process that requires the involvement of other sectors. Therefore, in the formulation of forestry policies and programs all relevant administrative sectors are involved. The I.R. of Iran has formulated its National Action Program to combat desertification as well as National Biodiversity Strategy and Action Plan which in both of them, forest ecosystems play special role. National Action Program to combat desertification: The National Action Program to Combat Desertification of I.R. of Iran was finalized in 2004. In this connection A National Committee (NCCD) chaired by Minister of Jihad- Agriculture and comprised of deputy ministers of Agriculture, Energy, Petroleum, Foreign Affairs, Interior, Science, Research and Technology and Health as well as Management and Planning, The Meteorological and Geological Organizations and the De-

partment of Environment was formed. The Committee is mandated to coordinate government organizations and institutes as well as establish the macro policies for anti-desertification activities. The NAP framework consists of four pivots:

- Identification and control of the factors contributing to desertification
- Support for the sustainable use and management of natural resources through conservation and reclamation.
- Promotion of sustainable livelihoods in affected areas through job creating, income generation and the improvement of socio-economic standards.
- Strengthening the role of rural communities in terms of decision-making, planning, designing, implementation, monitoring and evaluation.

Iran has prepared two strategic frameworks for the assessment of long term needs of forests goods and services through a cross-sectoral expert committee consist of representatives from universities, research sector, NGOs, Department of Environment and private sector. Forest Resources Assessment (FRA 2005).

The Forest Resources Assessment is a process led by FAO and involving all countries and other partners. It aims to produce a comprehensive update of FRA 2000 for sustainable forest management, focusing on status and trends of forest resources, their management and uses. The I. R of Iran has been among countries in the region that has actively dealt with the issue through forming a cross-sectoral committee and has submitted report to FAO in December 2004.

### **5.3 Forestry Outlook Study for West and Central Asia (FOWECA)**

The Forestry Outlook Study for West and Central Asia is one among the series of regional forestry sector outlook studies initiated by FAO in collaboration of member countries to examine the direction of developments of forests and forestry. The primary objective of FOWECA is to provide a long-term perspective of the development of forestry sector in the context of economic, social, institutional and technological changes. It also aims to analyses the trends and driving forces that will shape the sector and to identify policies, programs and investment options that can enhance the sectors contribution to sustainable development. FOWECA is designed to complete other forest related strategic planning initiatives, including national forest programs.

Countries covered in the Forestry Outlook Study for West and Central Asia

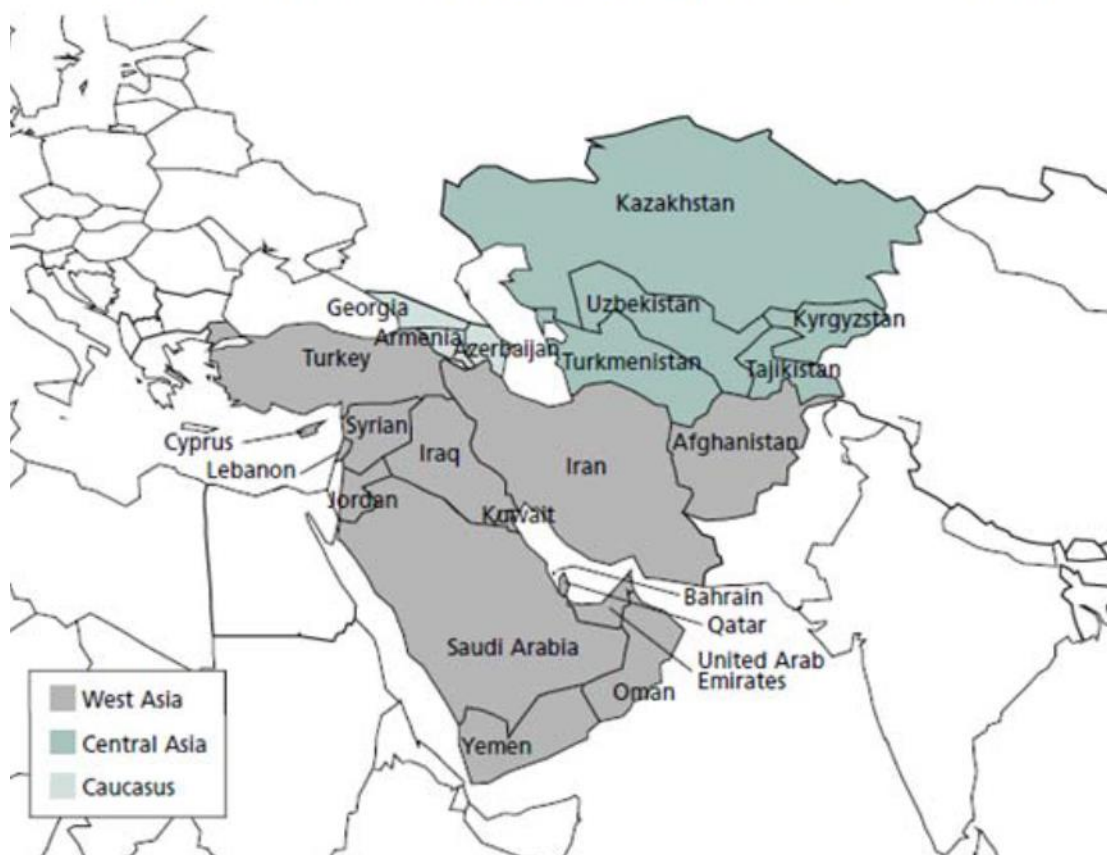


Fig. 5.1. Countries Covered in the Forestry outlook study for west and Central Asia

Source; FAO, FOWECA, October 2007

Strengthening the role of women in sustainable forest management, including through capacity building and greater participation in community-based forest management.

One of the central strategies of government is to achieve social cultural, economic and political development. There is no doubt that the gap between basic needs and Existing human capacities has put many challenges on the way of development. In the light of the above strategy, there is basically no limitation for women's participation in forestry activities in Iran. Women have equal opportunity for higher education and employment in natural resources sector parallel to other sectors. There are also a good number of women cooperatives and NGOs active in natural resources sector particularly forestry. Women in local communities also play an important role in forest related activities such as seedling production and plantation.

Therefore, FRWO organizes training workshops to enhance the skills and capacities to local women.

Integrating local and indigenous communities in sustainable forest management programs, particularly as regards (a) recognition and respect of the customary and traditional rights and privileges of indigenous and local communities

Customary rights of the indigenous and local communities are recognized in all forestry projects and their involvement in the process of decision making is encouraged. Besides the land tenure right of the local communities is also officially recognized and respected by law.

Inventorying, cataloguing, and applying traditional forest related knowledge for sustainable forest management and promoting research on TFRK with the involvement of the knowledge holders

Iran Processes rich traditional knowledge for the management of natural resources particularly forests. Nowadays application of traditional knowledge is becoming widely popular. Based on a research study the Extension and Public Participation Bureau is studying and collecting traditional knowledge in the fields of forestry, silvics, range management, afforestation and watershed management and apply the results in executive plans. Research of forestry traditional knowledge is carried out in cooperation with NGOs and universities funded by FRWO (for instance MSc. and Ph.D. thesis on traditional knowledge). Basically the involvement of local communities and traditional knowledge holders are central in this process. Traditional knowledge supports sustainable forest management in two ways. Firstly, it prevents waste of financial resources and secondly, the local communities accept to participate in forestry plans. Department of Environment also in its joint projects with FRWO utilizes traditional biodiversity related knowledge of the local communities.

Supporting the application of intellectual property rights and/or other protection regimes for traditional forest related knowledge, and the fair and equitable sharing of benefits arising from the use of traditional forest related knowledge, innovations and practices

Regarding intellectual property rights particularly in the field of traditional knowledge, the following measures have taken:

- Iran became a member of WIPO after the ratification of the parliament in 2003.
- In 2003, the High Council for Traditional Knowledge was established to adopt policies and programs on traditional knowledge, which is composed of 15 representatives from various ministries.
- In the Fourth Social and Economic 5 Year Development Plan to be enforced in 2005, the required credit to support traditional knowledge and intellectual property rights of civil societies is anticipated.

Disseminating scientific knowledge to all interested parties, including through new and innovative ways, and strengthening capacity and mobilizing funding for national and regional research institutions and networks

One of the national prerequisites for capacity building is to strengthen forest research centers and relevant faculties. In this connection, Forest & Range Research Institute that is one of renewed research institute in Iran is equipped with modern research equipment and has vast international contacts. This is of course due to increase in forestry research spending. The research results are made available through publications or compact disks in seminars and workshops for experts and free of charge or can be access on internet.

Enhancing interaction between scientific research and policy processes, including priority setting of research, addressing of knowledge gaps and using scientific knowledge to support decision-making

Collaboration between forestry sector and forest research has considerably enhanced. In this regard, research centers meet executive needs to government and concentrate on applied research. Besides, research sector and natural resources faculties have close collaboration in monitoring and assessment of forestry projects and measurement of criteria and indicators for sustainable forest management.

Monitoring, assessment and reporting , concepts , terminology and definitions

Improving information on national forest resources, making the information widely available, assisting other countries in their related efforts

The I.R. of Iran has conducted measures to meet the information needs for sustainable forest management, policy revision and international cooperation to develop and update forest resources information. Developing GIS technology and equipping the relevant units is the first step in this regard. It is believed that international



cooperation can help improve information collection methods. At present, FRWO is preparing vegetation cover map of Iran in various scales through GIS that in this way, various types of forests can be specified in the map. One of the main objectives of the plan is to determine the exact area of the forests, monitor standing volume and composition of forests. It also aims to study trees outside forest which is of high importance in sustainable forest management.

Developing and using criteria and indicators of sustainable forest management (at national level and/or sub national level and for policy, planning, management and/or monitoring purposes), and participating in regional and/or international C&I processes

Iran is located in the Near East region. The process for the development and implementation of criteria and indicators was established by FAO/UNEP meeting of expert in Cairo-Egypt in October 1996. Iran is actively involved in the formulation, measurement and implementation of C& I for sustainable forest management in 2002. FRWO in collaboration with other sectors has launched the national C & I and provided relevant national indicators. The first report was completed and published in 2003. Formulation of C& I of sustainable forest management in unit level is put in the agenda of FRWO. Meanwhile, FRWO has actively attended in international related meetings too.

- Forest legislation and policies should be fully revised to bring them into line with international sustainable development indices.
- A national land-use plan that takes into account the relationship between forest communities and forest resources should be designed. This would promote the involvement of local communities into forest management affairs.
- It is recommended that the State include public consultations in forest policy-making and legislation processes.
- FMPs should be based on local communities' capacities for participatory forest management. FMP activities can then be implemented with greater community involvement and participation.
- Local people are responsible for a significant proportion of illegal logging in northern Iran. Case studies show that the best way of solving this problem is to improve economic conditions and raise awareness of the environmental values of non-wood forest resources. To begin with, local people should be guided by planners. Then participatory income generation projects and environmental

training workshops can be introduced.

- The relevant entities – DOE, FRWO etc. – should develop a legal framework and mechanism for preventing illegal logging. Stronger human and financial resources will be required for this.
- Identifying the traditional boundaries of forest districts would be a good way of involving local people in the management of State-owned forest resources. This would encourage communities to participate in forest expansion, reforestation and forest protection, with income-generating activities financially supported by the State. Cooperation between the State and communities can be very beneficial.
- Successful participatory forest management projects in Caspian forests (e.g. Yachkaschi, 2006) could form the basis of participatory management models for other parts of the region.
- It is recommended that the State carry out comprehensive research on the types, conditions and potential impacts of traditional forestry. Traditional systems can then be modified and enhanced to suite current socio-economic situations. Forest legislation may need to be modified.
- FRWO and State forest industries should support private landowners, including through financial incentives, and encourage them to extend existing short-rotation plantations for the wood and paper industries.
- Forest tenure issues have received little attention throughout the long history of forest policy in Iran. According to the literature, main priorities have been technical forest management factors, such as forest utilization and forest resource/landownership.

Legislation for forest resource tenure has undergone a slight change, and FRWO should now pay more attention to clarifying and legislating formal and informal forest tenure in Iran. It is recommended that some forest management operations be devolved to the private sector and local communities.

- It is necessary to develop and implement efficient methodologies for a national forest inventory system, based on international experience. FRWO's efforts to establish a national forestry database should be increased and accelerated.
- All participants at the regional workshop emphasized the need to improve monitoring systems, including those to monitor the quantitative and qualitative factors of concessions and cutting areas.

In designing the policies and environmental, socio economic programs it is accepted that there is a connection between policies and programs in forest sector and policies and programs in other sectors, the relation between policies of pricing livestock and system of land use with forest situation is understandable.

On the other hand situations of national economy like: lack of economic stability, high rate of inflation, deficits of budget, Slow or negative economic growth and unemployment, deficit the investment in forestry, makes more incentive to over exploitation of natural resources. So according to this situation which occurs out of forest system and correction of them is not in responsibility of forest sector ,can be concluded that forest problems is not only a local problem and is a national problem (Shaditalab 2001).

The regional economic, social, and political importance of the Caspian Sea has continued to attract and focus strong national and international attention. All five littoral states have participated emphatically in the first phase of the Caspian Environment Program (CEP: 1998 to present), and have expressed continued support for a single, regional structure that would coordinate initiatives to address regional environmental issues associated with the Caspian Sea. The countries are anxious to initiate implementation of the Strategic Action Program (SAP), where the fruits of their hard labour during the first phase of the CEP will become evident. The need for a second phase of the GEF project has been agreed by the CEP Steering Committee, which will culminate in transition of responsibility for governance and execution of CEP from a partnership between the littoral states and the international community, to the littoral states themselves, with the international partners playing a more supportive role.

During the bridging phase of the GEF support for the CEP, national commitment will be evidenced by increased responsibilities in the riparian countries for financial, procurement/contracting, and program management activities. Indicators for this commitment will include, inter alia:

- National support of National Coordination Units and the PCU
- National Support of Steering Committee Meetings and Activities
- National endorsement of the NCAP and Ministerial agreement of the SAP
- Endorsement of the Framework Convention
- National Support to any Caspian Regional Thematic Centres (CRTCs) that

the countries agree to maintain.

In addition to strong national support, continuation of the GEF project is encouraged by the private sector, which has been a major supporter of the CEP Phase I activities, and is expected to continue to do so in second phase activities. This private sector participation is critical for both sustainability and effectiveness of many of the commitments that will be made under the Strategic Action Programme (SAP) and National Caspian Action Plans (NCAPs).

The GEF encourages the countries to demonstrate their commitment to the Caspian environment prior to the GEF C.E.O.'s endorsement of the Full Bridging Project by signing the Framework Convention and completing their National Caspian Action Plans.

Primary laws related to the environment in I.R. Iran include the Law of Environmental Protection and Development (1991), Law of Protection of the sea and internal water bodies against oil and oil-product pollution (1975), Law on Punishments for over-exploitation of the fishery resources in the Persian Gulf and the Caspian Sea (1979), and law on Protection of Natural Parks, Protected Areas, and Sensitive Areas (1975). At a high policy level, the High Council for the Environmental (HCE) oversees environmental policy. The Environmental Protection and Enhancement Act of 1974 established the Department of Environment (DOE) as the responsible party for environmental protection. Fisheries and forestry are administered by the Fisheries Organization and the Forest and Rangeland Organization respectively, both being affiliated with the Ministry of Agricultural Crusade. Environmental Impact Assessment has a policy basis in I.R. Iran, carried out by the DOE under approval by HCE (1998). The Iranian National Strategy for Sustainable Development identifies the following relevant actions among its list of priority actions and investments:

- Implementing projects to protect biodiversity and international water pollution mitigation.
- Implementing a priority investment program for “win-win” projects and investments that have environmental and economic benefits (such as watershed and forestry management projects).
- Addressing water pollution problems from urban households and industrial sectors through water pricing, institutional framework strengthening and effi-

cient prioritized investment.

Iran has drafted a draft National Strategy for Biodiversity Protection, and has signed, accepted, or ratified a number of international conventions including Biodiversity, Ramsar, CITES, World Heritage, Basel, Climate Change, London Convention, Stockholm Convention, OPRC, and Desertification Control. The three northern provinces of Gilan, Mazandaran, and Alborz border the Caspian Sea, and support some 6 million populations along about 1000 km of coastline. This is the most densely populated national coastal area; nearly the entire Iranian coast has villages and towns dispersed along it. Population growth rate is very high especially in urban areas where it is close to 5% per annum. Agriculture, industry, and urbanization all contribute to the degradation of the Caspian Sea and the coastal areas including the narrow forested watershed. The Sea provides income to much of the region through fisheries, transport, and tourism. Oil and gas exploration has begun in Iranian waters, although no proven resources have been announced to date. The coastal zone has a special significance as a major food belt for I.R. Iran, due to the high rainfall and excellent soils. Lack of sewerage and sewage treatment facilities, lack of coastal planning, and intersectoral cooperation all contribute to degradation of the Caspian. I.R. Iran's seriousness to the CEP has been demonstrated by their strong participation in Phase I CEP, and their offer to host the CEP PCU/Secretariat during the next phase.

Extensive logging and clearing of forests for agriculture have nearly eliminated the forests ecoregions. The invasion of non-native plant species has also posed a serious threat to native plant communities. The yield of forests has been reduced from 300 tons/ha to 100- 110 tons/ha during the last four decades. The area of forestlands was estimated at around 3.4 million hectares 50 years ago with a biomass of 30 tons/hectare. Currently the most optimistic figures are 500,000 hectares, with a biomass of 5 tons/hectare. The national goals to improve the conditions of forests and reduce the speed of degradation include:

- Utilizing forests based on their carrying capacity
- Moving livestock out of forests and strengthening control mechanisms on grazing
- Halting commercial and industrial use of forests
- Improving soil and plant cover in the forests

- Developing ecotourism in forest ecosystems, considering benefits and rights of Local communities
- Promoting values of forests
- Rehabilitating native species
- Increasing the area of forests
- Conducting EIA for large scale development projects near or within the forest.

#### 5.4 Vision document

In 2002, Iran's Expediency Council approved the 20-Year Vision Plan to promote the position of the Islamic Republic of Iran in national, regional and international levels in which Iran becomes a developed country in twenty years, with the first economic, scientific and technical stand in the region. The 20-Year Vision Plan, has considered and emphasized twenty-year goals for developing countries and focuses on the economic dimension of the first scientific, economic and technical stand in the region. In order to meet the ends of the program, it must equip national and international forces. In this part, the basic issue is the requirements for achieving this goal.

Iran faces chronic environmental problems, but the country's administration has to date shown little competence in terms of management or improvement of the environment. The most urgent challenges include the population's rapid expansion, and related to this, an advancing urbanization that has left cities with increasingly inadequate infrastructure. The major cities are overpopulated. Tehran, the capital city, has more than 12 million inhabitants. Millions of old cars running on leaded petrol still pollute the air. Thousands of companies and refineries producing inside the city or its surroundings fail to meet modern environmental standards. According to a November 2010 report from Iran's Ministry of Health and Medical Education, air pollution kills more than 10,000 people every year in Iran, with approximately one-third of these in Tehran (although only about 15% of the Iranian population resides there). Since 2009, Iran has increased its refinery capacities, and now produces its own low-quality gasoline. This has contributed to an increase in air pollution.

The causes and effects of Iran's environmental problems are thus evident, but eco-

logical concern has only recently gained in importance for Iran's government. Though awareness of the need for environmental protection is growing rapidly in the Iranian public, the state is still far from undertaking action sufficient to the scale of the problems, even though protection of the environment is grounded in Article 50 of the constitution. The share of the budget earmarked for environmental programs was increased in 2010, but still accounts for just 0.2% of Iran's total spending.

Iran's Department of the Environment warned in April 2010 that Iran is among world's top 10 countries in terms of causing environmental degradation. The 2010 Environmental Performance Index (EPI) ranks Iran at 78th place out of 163 countries (compared to 67th place of 149 countries in 2008).

Structural constraints in Iran are in part responsible for the country's socioeconomic regression. The country has an educated workforce. There are no serious geographic or infrastructural deficiencies which could not be overcome by good political management. However, peripheral areas and provinces with a major share of ethnic and religious minorities are comparatively poorer, and are administratively neglected. Management efficiency is undermined by the high prevalence of nepotism, bribes and corruption.

Iran has access to tremendous natural resources, and possesses enough financial and human capital to rectify any geographic or infrastructural deficiencies, given competent decision makers. But the tendency of Iran's political officials to act from ideological motives instead of technical expertise is a major barrier to the implementation of effective policy.

### **5.5 Weakness in social development view especially in programming**

It is a reality that till there are poverty, hunger and its negative consequences such as forest degradation, deforestation for fire wood supply, fodder and grazing, land use changes to cultivation to supply food, integrated management in forestry and natural resources is remain like unattainable dream. And that is one the reasons which indicate that low degree of state intervention according to the theory of the dissertation, but my suggestion is high degree of intervention and more economic instrument because poverty and hunger in rural areas cause to immigration of people to the cities, Inappropriate development around cities. Also land use changes

and degradation in mountainous area of Alborz mountain both southern and northern hills that all shows imbalance and abnormalities in relations between cities and rural areas, also degradation of natural resources, instability of nature and in other word incorrect land management (Amani, 2004).

In five development plans before the revolution, main aim was urban development and decreases the rural population, the slogan of industry is engine of economic development was the main purpose in management before the revolution caused to more money and facilities to the cities and industrialization of the country (Motieilangroudi, 2003).

### **5.5.1 Level of international relations is Low in forest subsector of Iran**

After earth summit in 1992 in Rio, the necessary framework for coordination, cooperation, supervision and sustainable management with 3 achievements of earth summit, Agenda 21 and forest was established, and after that forests were as an important subject in international policy and political agenda.

During the last decade position of the forest in united nation organization change from house to palace, and Iran accepted many commitment in this context, but the problem is that there is no progress commensurate with it in rules and management of environment in Iran especially in forest sector (Shamekhi, 1999).

Main purpose of international contrivances in forest context is reinforced management, conservation and sustainable development of forests and making long term policy decision. Other purposes of this contrivance are international action in forest context in national, regional levels.

Because formation of intergovernmental organization of forestry was not enough for surveying complicated political subjects in forest context, these organizations along their activities were welcomed of innovation of some countries about the expert meeting in context of forest (Hatami, 2002).

In these meeting political problems of the forests were discussed before examined in intergovernmental meeting , while the problems of countries with enough forest cover were on the pick of international association debate, problems of the countries with low forest cover were neglected.

The history shows that in1995, Iran for the first timed in united nation place in



New York proposed the concept of developing countries with low forest cover which included in forest intergovernmental panel agenda's. finally Tehran Process was one of the achievement of this meeting in October 1999. Tehran Process is an association for low forest covers developing countries that survey the low forest countries problems in political meeting agendas.

Forest in developing low forest cover countries, supply a parts of Livelihoods of rural communities, on the other hand this livelihood economic in countries with low forest cover generally is not calculated in national economy and development statistics. Whilst a complete analysis of importance and values of forests for poor rural people will shows the real value of these forest, and will absorb more investment in areas with low forest cover. Because Iran is responsible secretariat for Tehran Process and will follow the subject of countries with low forest cover in international level, it is expected to prepare conservation and rehabilitation approaches for forests with focus on this subject and necessary research, and close relations with other countries with low forest cover. Although international meeting of sustainable development in Johannesburg (2002) emphasize on accelerating of suggested plans and intergovernmental forest panel by countries and multilateral cooperation (secretariat committee of national development, 2002), however high council of forest, rangeland and soil says that some problems such as political conflicts in country, underdevelopment, improper management caused Iran attendance in these discussions doesn't have any positive results yet. on the other hands because international negotiation in forest context are a kind of political negotiation and is behind the level of forests organization, thus forest organization doesn't have much power in this context and only can support political candidate those participate in these negotiation, in context of technical dissections, and it needs to close relation between related unit in foreign ministry with secretariat members. While after holding meeting in Tehran, foreign ministry didn't support enough. On the other hand related subjects to the forest like all other problems in developing countries such as Iran, effects of under development, especially political underdevelopment .unfortunately lack of scientific management in all political levels and also in natural resources sub sector, and more importantly is that natural resources are not in priority in national level, cause that solving these problems face to many problems in all over the country.

Although we need transferring technology to our country or much more financial

help, but roots of underdevelopment have seen in all levels of management system, thus only high level of national commitment and political will, could be a step towards successful in solving all problems such as natural resources and forests. Obviously we will be affected by forest international political flows, and political powers in international society are more powerful than us. But the functionality of most of the responsible person about forests shows the weakness of FRWO and dispatched representatives. While discussed subjects are of important problems of developing countries.

According to chapter 11 of Agenda 21 all countries have to prepare and operate national forestry plan (NFP). In this regard, according to decisions of international panel of forestry (IPF & IFF) countries must prepare their own NFP based on sustainable development policies in sustainable forest management. Especially in 2002 international meeting, sustainable forest management accepted as necessary approach for sustainable development as an essential tool for poverty reduction, to combat with deforestation, reduction of biodiversity loss, access to drinking water and cheap energy resources.

National forest program consists of programming for different levels of activities in forest sector, policy formulation, approaches. Goal of forest national plan is to prepare a framework for conservation, management and sustainable forest management. Forest national plan is a part of national policy process which the purpose of it is to ensure and reliability of forest conservation, management and sustainable development of all kind of forests

National forestry plan is a national strategy for sustainable development in forest sector of the country which provides the strategic directions for development of forest sector in coordination with other national economy sectors and some of the fundamental principles are as below (Amani, 2004):

- 1) Making cooperation between all actors in forest sector and making situation easier for cooperation of important stockholders in this process
- 2) Strengthening the cross-sector approach in forest national plan with try to introduce sustainable forest management in national strategy to combat with poverty
- 3) Consistency and coordination of national forestry plan with national strategies and plans for biodiversity conservation, also with other relative Interna-

tional treaties

- 4) Preparing and applying systematic control mechanism such as criteria and indicators of forest sustainable development
- 5) Access to international aid for forest sector. To strengthen the capacities and exchange scientific information via best usage of mechanism programs of forest committee of FAO in order to conduct and support of preparing forest national plan for the country.

Forest management during 100 years ago caused to forest dweller according to their experience and previous generation believe that is better for them less deal with government officer, except that they can receive something of them, because bureaucratic methods and Unilateral decision-making, led people to suspicion of experts ideas. It means that until forestry has the legal power to control forests and ownership of forest land is national, for forest resources management programs could be suggested which is consistent with forestry programs. in other words characteristics of each forestry program determines the kind of management (Shaditalab, 2001).

Although Tabesh (2007) in his thesis suggested preparing forest national plan and support of community forestry and using indigenous people for forest management As the best ways to prevent more degradation, but I believe that this two suggestion in his thesis, are kind of low degree of intervention, and the previous experience showed that these are not enough for a successful forest management and preventing more degradation, although preparing forest national plan is an international commitment according to Agenda 21, what the remaining Hyrcanian forests in southern coast of the Caspian sea need is more conservation and high degree of intervention via economic instrument such as financial funding and more regulatory instrument such as direct control like what the DOE (environment organization) do about protected areas or one of the other ways of direct control is to import wood instead of forest clearing in Hyrcanian, by the government. According to the report by one of the manager of FRWO today only 10 percent of Hyrcanian forest which is the area about 200,000 ha of all, are sustainable and productive and remaining don't have the power for rehabilitation. Also financial problems accelerate the rate of changes of forests near the roads to the economical units, because some people buy the property of rural people with very low price and change it to villa. So the only way to prevention of such these problems is regulatory instrument with

direct control via elimination wood tariff, and supplying the wood demand of the country only with import or wood plantation.

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