CHAPTER SEVEN

COMPARISON BETWEEN IRAN & CANADA

FORESTRY SECTOR
7 Comparison between Iran & Canada forestry sector

Introduction

Iran is sparsely forested with around 1 percent forest cover and 6 percent of other wooded land\textsuperscript{217}. The majority of Iran's forests are found the Caspian coastal plain and on the northern slopes of the Alborz mountain range. The Zagros range in the west of the country also has significant areas of forests, though much of the Zagros has been converted to grazing land. Around 97% of Iran's forests are comprised of subtropical forests. In Iran forest sector is a governmental sector which, private and cooperative sector can also be involved.

Canada's forests with about 10% of world forests cover comprise approximately half of country's landmass (about 417 million hectares out of the total land area). Of the total forests area more than 50% is commercial forests. Canada's forests are temperate and boreal forests which, comprise of 67% softwood, 18% mixedwood, 15% hardwood. Canada is unique in that 94% of the forestlands are public owned. Under the Canadian constitution, the provinces have ownership over most public owned forestland (71% of the total forestland) and are legally responsible for it. The federal government's responsibility for forest is based on its ownership of 23% of Canada's total forestland, most of, which is located in the territories. The federal government has, however devolved responsibility for management to the territorial governments. And finally 6% of total forestland has owned by private\textsuperscript{218}.

\textsuperscript{217} http://www.fao.org/forestry/fo/country

\textsuperscript{218} www The state of Canada's Forests 2001-2002
Roughly 0.4 %, or about one million hectare (almost same as forest area in northern part of Iran) of Canada's commercial forests are harvested annually. The forest industry is significant to the Canadian economy and acts as backdrop for tourism industry worth several billion US dollars.\textsuperscript{219}

\textsuperscript{219} - www.globalwatchtheforest.ca/Canada
7.1. Basic data

Comparison between Iran and Canada reveals that: Iran with just 17.5% of Canada's land area possess population twice and that's why its population density is 14 times more than Canada. Population living in rural areas in Iran is about 85% of total population in Canada, and Iran's per capita GDP is less than 10% of Canada. The vast differences between socio-economic conditions in the two countries have been considered in the chapter (see Table 7.1.).

Table 7.1. Basic data

<table>
<thead>
<tr>
<th>Country</th>
<th>Land area 000 ha</th>
<th>Total</th>
<th>Density N/km²</th>
<th>Annual change</th>
<th>Rural</th>
<th>GNP per capita USD</th>
<th>Annual change %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>162,201</td>
<td>66,796</td>
<td>41.2</td>
<td>1.7</td>
<td>38.9</td>
<td>1581</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>922,097</td>
<td>30,857</td>
<td>3.3</td>
<td>1.0</td>
<td>23.0</td>
<td>19267</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Source: FAO Global forest resources assessment 2000 (Main report)
7.2. Forest cover and change in forest cover 1990-2000

It is interesting to note that around 4.5% of Iran's land area is covered by forest. Per capita forest area is 0.1 hectare. Forests make up 42% of Canada's roughly 1 billion hectare\textsuperscript{220}. Canada has the most forested area per person at approximately 17 hectare. Some 57% of Canada's forestland is considered to be "commercial forest" capable of producing a range of timber and non-timber forest products. International standard area is 7 hectare per capita. There is large difference between forest area per capita in Iran and international standard per capita forest area (see Table 7.2.).

<table>
<thead>
<tr>
<th>Country</th>
<th>Total forest area</th>
<th>Forest cover change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000 Land area</td>
<td>Per capita</td>
</tr>
<tr>
<td>Iran</td>
<td>162,201</td>
<td>7,299</td>
</tr>
<tr>
<td>Canada</td>
<td>922,097</td>
<td>244,571</td>
</tr>
</tbody>
</table>

Source: FAO Global forest resources assessment 2000 (Main report)

\textsuperscript{220} Canadian Council of Forest Ministers (1997).
7.3. Type of forests

Distribution of total forest area by ecological zone is different between two countries strongly. Iran's forest area mainly located in subtropical ecological zone, however Canadian forests are temperate and boreal (see Table 7.3.).

Table 7.3. Type of forests

<table>
<thead>
<tr>
<th>Country</th>
<th>Tropical</th>
<th>Subtropical</th>
<th>Temperate</th>
<th>Boreal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rain Forest</td>
<td>Moist</td>
<td>Dry</td>
<td>Shrub</td>
</tr>
<tr>
<td>Iran</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: FAO Global forest resources assessment 2000 (Main report)

Specification of different types of forests are briefly as follows:

7.3.1. SUBTROPICAL FOREST221

The importance and fate of tropical and subtropical forests are topics of widespread and enduring interest long recognized as centers of high biotic diversity (perhaps containing more than half of the world's terrestrial plant and animal species).

The tropics proper lie between the tropic of Cancer (23.5° N) and tropic of Capricorn (23.5° S). About 23°-30° north and south of these latitudes are regions similar in climate and vegetation type and

221 -Source: FAO Global forest resources assessment 2000 (Main report)
form, referred to as subtropical (Fig. 6.1). There are perhaps 28-32 million km² of (sub) tropical forest, about 60% of which is dry or seasonal forests, the remainder being humid or wet.

7.3.1.1. HUMID FOREST

This ecological zone has its main distribution in southeastern China south of the Yangtze River. The southern tip of the republic of Korea and the southern half of Japan. There are two distinct small geographic units in the Near East, humid forest at the foot of the Caucasus Mountain extending westward along the Black Sea and in the foothills of the Talysh Mountains at the Caspian Sea. Winter are mild to warm and summers are hot and wet. Northerly cold fronts from Siberia heavily influence winter temperatures while in summer the pacific monsoon brings large amounts of precipitation to the region. Annual mean temperatures range from 15° C to around 21° C. Annual precipitation varies between 800 and 1300 mm throughout the northern region, but further south it becomes wetter, up to 1800 mm and sometimes 2500 mm in low mountains. Annual rainfall diminishes towards the west, away from the coast. In the northern and central parts of the zone rainfall is evenly distributed throughout the year. In the sought, most of the rain falls between May and October. A dry season from November to April is distinctive.

The climate of the coastal plains and lowlands south of the Black Sea is warm-temperate with annual average temperature around 14° C to 15° C. large amount of precipitation fall throughout the year (1500 to 2000 mm, locally up to 4000 mm).

7.3.1.2. DRY FOREST

This zone is confined to the Near East and occupies a relatively narrow belt along the Mediterranean Sea and the low hills running parallel to the coast. The northern part of the Jordan-Arava Rift
Valley is also included. The zone has a typical Mediterranean climate with mild, humid winters and dry moderately hot summers. Annual rainfall ranges from around 400 to 800 mm, decreasing from north to south.

7.3.1.3. FOREST-STEPPE

This zone is confined to western Asia, mainly the Near East but also in Afghanistan and Pakistan. The climate is semi-arid. Annual rainfall ranges from above 200 to 500 mm and falls during winter in the Near East. Although difference in temperature between seasons are relatively high, winter are not severe.

The vegetation consists of low shrubs and grasses interspersed with sparse trees, particularly at wetter locations. Owing to prolonged human activity the original vegetation has been considerably altered.

Forest-steppe and steppe vegetation occupies major parts of the center highlands and plateaus of Turkey and Iran. At humid locations grows a deciduous oak forest dominated, often in combination with juniper. Trees steppe with pistachio, almond and juniper occur a sub-dry location.

7.3.1.4. MOUNTAIN SYSTEMS

Subtropical mountain systems cover extensive areas in Asia in a nearly continuous west- east belt from the mountains and highlands of Turkey to the eastern reaches of the Himalayas in southern China.

The climate of the Near Eastern mountain systems is extremely diverse, both in temperature and rainfall. Winter precipitation is predominant, ranging from 500 to 1400 mm. The rainy season is from around September to May or June, while the rest of the
summer is dry and hot. All along the Himalayan ranges the rainfall increases from west to east and the climatic regime changes gradually from Mediterranean to typical monsoon types. The rain also decreases from the outer to the inner parts of the ranges. At the submontane and montane levels, rainfall ranges from less than 1000 to 1500 mm, with at least one or two dry months even up to seven or eight. The mean temperature of the coldest month varies from around $15^\circ C$ in the submontane zone to less than $10^\circ C$ above 2000 m. Snow occurs above 3000 m, with frequent winter frost. Precipitation is 500 to 1000 mm.

### 7.3.2. TEMPERATE FORESTS (ASIA)$^{222}$

#### 7.3.2.1. CONTINENTAL FORESTS

The annual mean temperature varies greatly, from $2^\circ C$ in the north to $14^\circ C$ in the south. Climate is distinctly seasonal; winter is relatively long (four to seven months) and spring short (one to three months). In northern part, warm summers have monthly average temperature above $20^\circ C$ in the warmest month and a growing season lasting 100 to 150 days. Annual precipitation is between 400 and 800 mm for most of the area to 1000 mm over southeastern of the zone. In the southern part, mean temperature in the coldest months still falls below $0^\circ C$ warm summers bring the average temperature up to $24^\circ C$ in the warmest month except in the mountains. The growing season lasts 200 days annual precipitation of 600 to 1000 mm is unevenly distributed over the year. Coastal areas experience higher rainfall, 1000 to 1400 mm.

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$^{222}$ - FAO Global forest resources assessment 2000 (Main report)
7.3.2.2. STEPPE

The zone has a long, cold winter and short, but warm, summer. Annual average temperatures vary between 2° C and 10° C, with mean temperature of the coldest month (January) ranging from 10° C to 20° C. Mean temperature reaches 24° C in the warmest summer month. The growing season lasts 100 to 175 days. Annual rainfall ranges from 200 to 400 mm, locally up to 600 mm, and the maximum occurs during the second half of summer. Spring as a rule, is dry. Natural vegetation is primarily grass and shrub steppe.

7.3.3. TEMPERATE FORESTS (NORTH AMERICA)

Of closed canopy forests, perhaps none has been as extensively utilized and altered by humans as the temperate forests. Significant portions of Europe and eastern Asia that once supported forests have long since been converted to pasture and agriculture, and little of the original vegetation remains. Similarly, much of the temperate forest in USA has been cut, although a large percentage returned to forest after cutting or agricultural abandonment. Nonetheless, forests still occupy moderate regions of North and South America, Europe, Asia and Australia, and are of significant economic and ecological importance (Figure 7.1).

7.3.3.1. OCEAN

This relatively small ecological zone occupies a north-south depression between the Pacific Coast Range and the Cascade Mountains. The nearness of the ocean profoundly moderates the climate, an annual temperatures average 9° to 13° C. Average rainfall

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223 FAO Global forest resources assessment 2000 (Main report)
ranges from around 400 to 1500 mm. But more typically is from 750 to 1150 mm. Fog partially compensates for the summer drought.

These forests are composed of mixtures of western red cedar, western hemlock, and Douglas fir. In the interior valleys, the forest is less dense than along the coast and often contains such deciduous trees as big-leaf maple, black cottonwood, and, to the south, Oregon ash. There are woodlands that support open stands of oaks or are broken by groves of Douglas fir and other trees such as Oregon white oak and Pacific madrone. Clearing for cultivation has greatly reduced the area of these forests.

7.3.3.2. CONTINENTAL

Warm summers and cool winters are typical of this zone. The weather is highly changeable. Mean temperature range from 2° to 10° C. The mean summer temperature ranges from 16° to 18°, with the winter mean ranging from -2.5° to -7°. Annual precipitation over much of the zone ranges from 720 to 1000 mm, reaching 1500 mm near the Atlantic Ocean moderates of the climate of the eastern portion of the zone.

At one time the entire zone was heavily forested, but most of the forests around the Great Lakes and in the northeastern United States have succumbed to urbanization and conversion to agriculture. Forest cover varies from mixed coniferous/deciduous stands of white and red pine, eastern hemlock, red oak, sugar maple and white birch in the northern portions to the rich diversity of the deciduous Carolinian forest in the southwest.

The mixed mesophytic association, the deciduous forest with the greatest diversity, occupies well-drained sites.
Further inland, where precipitation is lower, the drought-resistant oak-hickory association is dominant.

Forests in the northeastern portion of the zone are generally mixed stands of conifers and deciduous species. Pin-oak forest occupies dry sandy soils along the northern coastal plain of the United States and is frequently exposed to naturally occurring fires.

7.3.3.3. STEPPE

The climate of this zone is greatly influenced by its location in the heart of the continent. The zone has a continental climate that is subhumid to semi-arid with short, hot summers and long, cold winters. Generally, precipitation is low and evaporation is high. Mean annual temperature ranges from $1.5^\circ$ to $3.5^\circ$ C. mean winter temperature ranges from $-12.5^\circ$ to $8^\circ$ C. annual precipitation is variable, from 250 mm in the arid grasslands to near 700 mm in the higher-elevation wooded portions.

Park-like stands of trembling aspen and balsam poplar lie at the northern edge of this zone, a transition to the boreal forest to the north. The parkland has expanded considerably southwards since prairie fires were effectively eliminated.

7.3.3.4. DESERT

This zone covers the Great Basin, the northern Colorado Plateau in Utah and the plains and tablelands of the Columbia-snake River Plateaus and the Wyoming basin. The aridity of this zone is the result of the rain shadow of the Sierra Nevada and Cascade Mountains. Summers are hot and winters are cold, with stronger seasonal temperature extremes on the higher plateaus. The average annual temperature ranges from $4^\circ$ to $13^\circ$. Annual precipitation
averages about 130 to 400 mm. Almost no rainfalls during the summer months. Part of the winter precipitation falls as snow.

The main vegetation sometimes called sagebrush steppe, it made up of sagebrush and other shrub species mixed with short grass. Above the sagebrush belt lies a woodland zone dominated by pinyon pine and juniper.

7.3.3.5. MOUNTAIN SYSTEM

This zone includes the Coast Range, the Rocky Mountains and Appalachian Mountains. The climate is extremely varied, from a relatively humid maritime climate at low elevations along the Pacific Coast to cold, arctic conditions above the tree line in the Rocky Mountains. Along the coast the mean annual temperature ranges from 4.5° C in the north to 9° C in the south. Average annual precipitation is extremely variable, from 600 mm in the Gulf Islands to 400 mm to the north. The interior portion of the zone is similarly variable. The climate of the Appalachian Highland is more temperate, with a distinct summer and winter. Average annual temperature range from below 100C in the north to about 18° C at the southern end. Average annual precipitation varies from 900 mm in the valleys to the 2000 mm on the highest peaks.

The temperate rain forests of the pacific Coast Mountains are among the most productive in the North America and contain some of the world's largest and longest- lived trees. This vegetation association is dominated by western hemlock and amabilis or pacific silver fire as climax species, although several other species are common.
7.3.4. BOREAL FORESTS (NORTH AMERICA)

Boreal forests are vast in size, widely distributed and remarkably variable despite a relatively low diversity of wood plants. Growing conditions range from extremely cold, low-moisture environment to perennially wet bogs and swamps of near temperate climates. The trees are predominantly coniferous.

7.3.4.1. CONIFEROUS

A broadly rolling mosaic of uplands and associated wetlands dominates this zone. The climate is generally continental with long-cold winters and short, warm summers, modified in the east by the Atlantic Ocean.

The mean annual temperature ranges from -40°C in central Canada to 5.5°C in the boreal regions of Newfoundland. Mean summer temperature varies between 11°C and 15°C, with mean winter temperature from -20.5°C in the west to -1°C in the east. Mean annual precipitation varies between 100 and 625 mm with the exception of boreal Newfoundland, where average precipitation is higher, from 900 to 1600 mm.

Much of the zone is distinguished by closed stands of conifers, largely white spruce, black spruce, balsam fir and tamarack. Common deciduous species include white birch trembling aspen and balsam poplar. In the south, conifers such as eastern white pine, red pine and jack pine are evident. At the transition with forests to the south, species such as sugar maple, black ash and eastern white cedar are found.

Towards the western boundary of the zone the vegetation is medium to tall closed stands of trembling aspen, balsam poplar and jack pine.

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224 - FAO Global forest resources assessment 2000 (Main report)
with white and black spruce occurring in late successional stage. Lodgepole pine may dominate in some of the upland areas along with white spruce and balsam fire. Black spruce tends to the concentrated in the poorly drain valleys. Trembling aspen and balsam poplar characterize the transition to the south-white spruce and balsam fire are the climax species but are not widespread because of the occurrence of fire.

Both open and closed black spruce and balsam fire forests are characteristic in the east. White birch and trembling aspen are typical of disturbed sites. White spruce is generally more tolerant of ocean spray and is more prevalent near the ocean. Wetlands are extensive, with a cover of stunted black spruce, tamarack and shrubs.

The northern part of the zone is transitional to the boreal tundra. Pure stands of jack pine or mixed stands of jack pine, white birch and trembling aspen are typical of the drier sites, while black spruce and balsam fire dominate wet sites.

7.3.4.2. MOUNTAIN SYSTEM

Mountain ranges with numerous high and extensive plateaus separated by wide valleys and lowlands characterized this zone. The climate ranges from cold, subhumid to semi-arid with long, cold winters and short, warm summers. Mean annual temperature range from $-10^\circ$ C in the north to $5^\circ$ C in the south. Mean summer ranges are $6.5^\circ$ C to $11.5^\circ$ C and mean winter temperatures range between $-13^\circ$ C and $-25^\circ$ C. Annual precipitation is lowest in valleys in the rain shadow of the Coast Range (less than 300 mm) and increases up to 1500 mm at higher elevations of the interior mountains.
Vegetation at higher elevations ranges from arctic to alpine tundra. At lower elevations in the north, open woodlands of white spruce and white birch are mixed with dwarf birches and willows. The unglaciated Old Crow Basin has stunted stands of black spruce and tamarack with some white spruce. To the south, vegetative cover ranges from closed to open forest of white and black spruce, subalpine fire lodgepole pine, trembling aspen, balsam poplar and white birch. Lodgepole pine and subalpine fire tend to disappear rapidly towards the north.
7.4 Composition of forests cover

The majority of Iran's forests are opened broad-leaved deciduous forest. Canada's forests cover approximately half of country's landmass, about 417 million hectares out of the total land area. Of the total forests area more than 50% is commercial forests. (Fig. 7.2)

It was defined\textsuperscript{225} that a "closed forest" as land where trees cover a high potion of ground (crown cover between 70% to 100%) and there is no continuous layer of grass on the forest covers. "Open forest" are mixed forests and grass lands with less than 10% tree cover (see Table 7.4.).

Table 7.4. Composition of forests cover

<table>
<thead>
<tr>
<th>Country</th>
<th>Ref-Year</th>
<th>Total area/Forest</th>
<th>Land area</th>
<th>Figures are in 000 ha</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Forest</td>
<td>Other</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Closed</td>
<td>Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Plantation</td>
<td>Shrubstrees Forest</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>wooded land</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Other land</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Inland water</td>
</tr>
<tr>
<td>Iran</td>
<td>1999</td>
<td>163320</td>
<td>2488</td>
<td>2527</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1760</td>
</tr>
<tr>
<td>Canada</td>
<td>1994</td>
<td>997061</td>
<td>244571</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>173013</td>
</tr>
</tbody>
</table>

Source: FAO Global forest resources assessment 2000 (Main report)

\textsuperscript{225} - FAO (2000 Main report)
7.5. Volume and bio-mass

Density of growing stock i.e. volume per hectare of forest is strongly different across the states in Iran. Forest in northern of Iran with density around 280 cum/hectare and Irano - Turanian vegetation with around 2 cum per hectare has the highest and lowest density in Iran respectively. The majority of Iran's forests are opened forest which, broad-leaved deciduous forests are dominated strongly (Hardwood) (see Table 7.5.).

Forest type in Canada comprised of 67% Softwood, 18% Mixedwood and 15% Hardwood. Approximately 50% of Canada's forestland is commercial forests, considered to be "mature, old, or mixes aged forests" with a slightly lower amount (40%) in the "young Forests" category. Despite the "old-growth characteristics" of much Canada's forests. Canada's forests are quite dynamic.

Table 7.5. Volume and bio-mass

<table>
<thead>
<tr>
<th>Country</th>
<th>Total forests 2000 000 ha</th>
<th>Volume By area M³/ha</th>
<th>Total M³</th>
<th>Bio-mass By area T/ha</th>
<th>Total M t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>7299</td>
<td>86</td>
<td>631</td>
<td>149</td>
<td>1089</td>
</tr>
<tr>
<td>Canada</td>
<td>244571</td>
<td>120</td>
<td>29,364</td>
<td>83</td>
<td>20240</td>
</tr>
</tbody>
</table>

Source: FAO Global forest resources assessment 2000 (Main report)

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7.6. Non-wood forest products-major product groups

The most important non-wood forest products (NWFP) of Iran are dying (Crocin extracts with annual export 50 ton, henna with 1-2 ton product per hectare) medical plants (cumin annual production around 50'000 ton) and exudates (gum tragacanths, average annual production 400 ton and export 257 ton). Other non-wood forest products include aromatic plants (export Rls 14 million) and essential oils, honey (1'331'877 colonies with around 12000 ton product) and edible foods (nuts) such as Pistachios (production volume 1587 ton) and walnuts (see Table 7.6.).

<table>
<thead>
<tr>
<th>Country</th>
<th>Plant products</th>
<th>Animal products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food</td>
<td>Living animals</td>
</tr>
<tr>
<td></td>
<td>Fodder</td>
<td>Honey, beeswax</td>
</tr>
<tr>
<td></td>
<td>Medicines</td>
<td>Honeycomb, beeswax</td>
</tr>
<tr>
<td>Iran</td>
<td>Medicinal</td>
<td>Bushmeat</td>
</tr>
<tr>
<td></td>
<td>Perfumes, Co</td>
<td>Other edible</td>
</tr>
<tr>
<td></td>
<td>Dying and</td>
<td>Hides, skins</td>
</tr>
<tr>
<td></td>
<td>Tanning and</td>
<td>Edible</td>
</tr>
<tr>
<td></td>
<td>Handicrafts</td>
<td>Edible</td>
</tr>
<tr>
<td></td>
<td>Exudates</td>
<td>Edible</td>
</tr>
<tr>
<td>Iran</td>
<td>Ornamental</td>
<td>Edible</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Edible</td>
</tr>
<tr>
<td>Canada</td>
<td>Exudates</td>
<td>Edible</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Edible</td>
</tr>
</tbody>
</table>

Source: FAO Global forest resources assessment 2000 (Main report)

228 -FAO "NON-WOOD FOREST PRODUCTS, A REGIONAL AND NATIONAL OVERVIEW-iran "

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7.7. Endangered, endemic and forest occurring for seven species groups

Five major biomes are identified: I) Irano-Touranian (ITP), arid and semi-arid plains and desert. II) Irano-Touranian (ITM), arid and semi-arid mountains. III) Zagrosian (Z), semi-arid Zagros mountains. IV) Hyrcanian (H), Semi-humid and humid Arasbaran and Hyrcanian mountain and Caspian plain. V) Khalijo-Ommanian (KO), dry southern costal plain with high humidity. Iranian habitats support some 8200 species of plants (a conservative estimate), of which almost 1900 are endemic. Field studies in Iran confirm the presence of over 500 species of birds and 160 species of mammals. The wetlands of Iran are globally significant; large populations of migratory birds winter at these wetland or use them at their way to and from wintering areas in Africa or the Indian sub-continent. The marshes of south Caspian lowlands in Iran's northwest are particularly important for over 20 species of ducks and geese229.

Canada's forests are increasingly recognized for their importance beyond production of commercial timber products. Canada's forests provide habitat for over 200'000 species of plants and animals, some of which are considered to be in jeopardy230. The number of forest dwelling species at risk as of 1995 is about 100 species comprise of about 40 species plants, about 20 species birds and about 20 species mammals. Wood-harvesting practices have been altered and protected areas set aside231(see Table 7.7.).

231 - Luckert M.K. and Salkie F.J. (1998) "Forestry in Canada: Transition and Emerging Policy Issues", Canadian Public Policy,
Table 7.7. Endangered, endemic and forest occurring for seven species groups.

<table>
<thead>
<tr>
<th>Country</th>
<th>All 7 species groups</th>
<th>Country-endemic endangered species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total species</td>
<td>Endangered group</td>
</tr>
<tr>
<td>Iran</td>
<td>1006</td>
<td>45</td>
</tr>
<tr>
<td>Canada</td>
<td>1013</td>
<td>43</td>
</tr>
</tbody>
</table>

Source: FAO Global forest resources assessment 2000 (Main report)
7. 8. Carbon stock and annual carbon sequestration

Canada's forests play an important role in global carbon cycles, and are significant for global warming policy. Canada's forest bio-mass, soil, and products store approximately 89 billion tons of carbon, while forest peatland contain 135 billion tons. Calculation of carbon stored in Iran's forest has been done in chapter 4.

The carbon that could be sequestrated on forests land can be calculated based on average carbon sequestration rates. Although it varies somewhat by tree species but methodology is same; the weight of a cubic meter of dry wood multiply by carbon constituting. The mentioned coefficients are different for hard wood and softwood clearly which comprise majority of forest wood in Iran and Canada respectively.

In Iran one cubic meter of wood has to be converted to ton by multiplying it with standard conversion factor of 0.8 (800 kg/m³). Around 45% of this weight comprise of carbon, so average carbon sequestration rates for Iran comes to; 0.36 or 360 kg per cubic meter. Northern forest of Iran sequesters about 3.28 Mt of carbon per year (Chapter 4).

In Canada the weight of a cubic meter of dry wood matter is about 450 kg or 0.45 ton, with carbon constituting 58% of this weight therefore, it can be assume that carbon fixation in wood occurs at rate of 260 kg per cubic meter timber or 0.26. Based on

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232 Forestry Canada (1993).
235 Chopra (2002)
above explanation Canada’s forests sequester about 203 Mt of carbon per year. By considering forestland 437.6 million hectare, carbon sequestration per hectare in Canada comes to 0.46 ton\(^2\) (203/437.6). (see Table 7.8(a)).

**Table 7.8. Total carbon stock**

<table>
<thead>
<tr>
<th>Country</th>
<th>Total forest</th>
<th>Carbon Stock</th>
<th>Growing Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>000 ha</td>
<td>Mt</td>
<td>M(^3)/ha</td>
</tr>
<tr>
<td>Iran (north)</td>
<td>1300</td>
<td>360</td>
<td>280</td>
</tr>
<tr>
<td>Canada</td>
<td>453000</td>
<td>89000</td>
<td>120</td>
</tr>
</tbody>
</table>

Source for data about Iran is present study.


Source for data about Canada (growing stock) is FAO main report (2000)

\(^2\) VAN KOOTEN G. C. ARTHUR LOUISE M. AND WILSON (1992),
### Table 7.8(a) Annual carbon sequestration (Mt)

<table>
<thead>
<tr>
<th>Country</th>
<th>Total forest 2000 (000 ha)</th>
<th>Annual Carbon Seq. (Mt)</th>
<th>Growing Stock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Annual growth rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>By area</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Iran(north)</td>
<td>1300</td>
<td>3.28</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>280</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>364</td>
</tr>
<tr>
<td>Canada</td>
<td>437.6</td>
<td>203</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>29363</td>
</tr>
</tbody>
</table>

Source for data about Iran is present study.


Source for data about Canada (growing stock) is FAO main report (2000) for commercial forest 24457000 hectare.

Source for annual growing rate (Canada) is Kooten G. C. Van et. al (1992).
7.9. Eco-tourism Value

National parks in Iran occupied about 5650 hectare. Number of visits from the national parks was estimated about 295,777 and recreational value was estimated about Rils $2.2\times10^{10}$ or US $2.75$ million (chapter 4).

National parks in Canada with the area about 24.5 million hectare occupied around 6% of forestland (so forestland comes out $24.50/0.06 = 408$ million hectares)\(^{238}\). As an indicator of the importance of forest-based recreation, national park visits increased between 1988 and 1994 from approximately 25 million to 30 million with many from foreign countries, such as Japan and Germany. Banff National park alone received more than 7.6 million visitors\(^{239}\). Forests acting as backdrop for a tourism industry worth several billion dollars\(^{240}\).

Table 7.9. Eco-tourism value

<table>
<thead>
<tr>
<th>Country</th>
<th>Total forest 2000 ha</th>
<th>Eco-Tourism (No. of visits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>1.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Canada</td>
<td>408</td>
<td>30</td>
</tr>
</tbody>
</table>

Source of data about Iran is present study.


7.10. Value of production

The majority of Iran's industrial roundwood production is used for agricultural purposes such as posts and poles. Forest industries in Iran produce sawnwood and wood-based panels, as well as pulp and paper from hardwood species. Moderate volumes of forest products, mainly paper, are imported. Modest quantities of wood are burned as fuel because of cheap fossil fuel. High productivity of the forest (7 cum/ha/year) allowed the government to harvest higher quantity wood. Value of industrial wood due to calculation has been done in chapter 4 is about US$ 387 million. By considering the forest area (1.3 million hectare) forest product per hectare comes to: US $ 297.7.

Annual allowable cut (1999) is 225.3 million cubic meters with harvesting (volume) industrial round-wood about 193.2 million cubic meters in the area of 1.03 million hectare. Canada's forests are the engine behind a US $ 51 billion ($73.6 billion) industry. They help drive the Canada economy by generating more than US $ 23.6 billion ($ 34 billion) toward the trade surplus. United Stated with 81% is the most important importer of Canadian forest products. The forests sector in Canada contributes about 3% to GDP with US $ 19.8 billion ($ 28.5 billion). Composition of forest products are as below:\textsuperscript{241}:

25% Other paper and paperboard, 25% Softwood lumber, 16% Newsprint, 16% Wood pulp, 14% Other products, 4% Waferboard. About 60% of forest products were exported and about 40% were sold domestically. By considering commercial forests area (234.5 million hectare) forest product per hectare comes to: US $ 217.5.
In this chapter north forest in Iran has been compared with total forests in Canada. The data reveals differences with respect to carbon sequestration, eco-tourism, output of forest products and so on. In north forest of Iran the rate of carbon sequestration is much higher as compared to the average rate of Canadian forest due to forest type (hardwood) high productivity and growing stock even in small parts of Canada productivity is higher than north forest of Iran (8 m³/ha)\textsuperscript{242}. The total amount of carbon sequestered is higher in Canada since the forest area is much greater.

By considering basic data some of differences between the two forestry sectors (eco-tourism and forest products) seems reasonable and shows that forestry sector as any other sector is affected by socio-economic conditions.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|}
\hline
Country & Total forest 2000 ha & products \\
\hline
Iran(northern forest) & 1.3 & 387 \\
Canada & 244 & 51'000 \\
\hline
\end{tabular}
\caption{Value of production (US$)}
\end{table}

Source of data about Iran is present study.


\textsuperscript{242} Kooten G. C. Van et. al (1992).
Map 7.1 North and Central America: ecological zone

Map 7.2 Forestland of Canada

Source: The State of Canada's Forest 2001-2002