CHAPTER 2: PHYSIOGRAPHIC FEATURES OF GILAN
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2.1 Location of Gilan Province:

Gilan province covering an area of 14,042 square kilometers is located between latitudes of 36˚ 34’ to 38˚ 27’ and longitude 48˚ 52’ to 50˚ 34’ is one of the northern provinces adjoining the coast of south-west Caspian Sea and the northern slopes of the Alborz mountains of western and eastern slopes of Talesh mountain.

The province is enclosed by Republic of Azerbaijan and the Caspian Sea from the north and Ardabil, Zanjan and Qazvin provinces from the west and south while Mazandaran province neighbours the eastern side (Map No. 1, 2).

The Talesh Mountains and western Alborz Mountains limit the province from west and south and form a barrier and cause abundant rainfall in the region. This barrier limits its relationship with central part of Iran and encounters the province with some limitations and isolations, with the only natural connection to central Iran lying through the Sefidrood valley.

Gilan province is one of the most beautiful and fertile provinces of Iran given its unique geographical location. It has a mild climate and a privileged and strategic position, whether by land or via sea to be linked with newly independent countries of the former Soviet Union. In addition, this province has a Geographical proximity to the political centre of the country in comparison to many of the provinces of Iran.

Although the province of Gilan is to some extent small comparing to other provinces, it is one of the rarest regions where all its plains and mountains have a rich environmental diversity, allowing flourishing agriculture and animal husbandry.
2.2 Geology of Gilan:

The topography of Gilan is rugged and related to late orogenic movements of the earth's second geological periods in which the final formation of the Alpine orogenic geology has affected the upheaval of the earth, resulting in the formation of high-rising mountains.

Most of the mountainous regions of Gilan belong to the pre-Quaternary period but the plains of Gilan attained the present shape in the Quaternary period. A part of this land located in the northern mountain range belongs to the Pleistocene period and the formations located near the Caspian sea are of recent origin, i.e. The Holocene period (Azimi Dobakhshri 2006: 32)

The plains of Gilan have a gentle slope and are almost tabulate, but region, adjacent to the plains may reach to a height of 100 meters by this steep slope. However, this 100 meters including 27 meters below the water level of the Caspian Sea. In fact, it is 73 meters higher than the open water level. Therefore, most part of the plain in Gilan have been lower than the water level in spite of the height of 1 to 27 meters above MSL.

Most of mountainous areas of Gilan are of 500 meters altitude above MSL (Map No. 2.1). Gilan benefited from four high peaks known as "Samamus" of 3719 meters height in the East, "Masoleh Dagh" of 3050 meters height in the southwest, "Poshte Koh" of 2867 meters height in southwest and "Dorfak" of 2705 meters
height located in south-central part of Gilan province. Respectively, they are the highest mountains in the province.

Gilan is physiographically divided into two parts: the mountainous and highland parts and the other paved and tabulate parts are as follows:

**A) High and mountainous region:** this is an area of rough landscape to the south of the Caspian Sea that begins from Astara River Valley in the north to Somam Mountains in the East. It consists of two separate sets known as the West and the East Chain Mountains separated by a Sefidrood tectonic valley.

Western Mountains are known as Talesh Highlands drawn from Astara river valley up to Manjil canal by the North-South asymmetric flexures including mountains of Talesh region, Masoleh and Posht Koooh Mountains. Eastern slopes of these mountains connected to Caspian Sea which is covered by forests and deep valleys have been created there by several rivers. The chain of mountain ranges is an obstacle for moist winds of the Caspian Sea to reach the Ardabil and Zanjan provinces.

The eastern chain of mountains is in fact the continuation of western Alborz Mountains which has been established by several parallel and asymmetric flexures approximately in West-East direction. It includes regional Amarlu heights, Dailaman, Lahijan and Eshkevar in Roudsar from Sefidrood Valley to the East. The Steep slope is towards Caspian Sea and the low slope to the Shahrood Valley.

**B) Plains region:** The plains of the province immediately begin from the sea and extend to the foot of the north-west Alborz Mountains and the eastern foot of Talesh Mountains. The incline of the plain is variable in this area. The area of the plains is minimized in some parts of the province like Astara and Talesh regions in the west and Roodsar to Chaboksar in the East due to the advancing mountains while the plain is extended as its width is increased to 60 kilometer along the Sefidrood coast from Emamzade Hashem to
the coast of Kiashahr Port in Astaneh Ashrafiieh. Though river sediments being deposited along the sea coast is one of the main and major factors for the formation of Gilan plain, other factors such as level of river water, the area of river basin, sea depth near coast, sandy coastal strips, strength of rocks and geologic structure, and the fluctuations of the water level of the Caspian Sea are involved in the development of the plain particularly the difference in its limitations and progresses. The fluctuations in the sea water level implies that the Caspian MSLs were higher in the past but have since retreated, thus forming alluvial and marine terraces along the coast to expand the plain land (Mahmoudi 1995, 61).

Fluvial processes are the most important factor in morphogenesis in the plains, but marine and aeolian processes have greater impact in the coastal regions. Riverbeds, deltas, sandy bunds/dams, sandy tabs, sandy coastal hills and wetlands are among the most common landforms. The plain of Gilan is generally flat and smooth with good soil cover and sufficient water resources.

The province of Gilan is located in the territory of Alps - Himalaya folding and the low thickness of the continental crust, is considered as one of the unstable regions of the earth that has many faults. These faults caused the breakdown of the alluvial fans and earthquakes, range motions, sea loads, the emergence of numerous springs and so on. Of the major faults of Gilan, Alborz, Astara, Sefidrood, Lahijan, middle faults of western Alborz and southern Talesh faults are some of the important geological features that play an important role in the physiography of the region as a whole.

2.3 Climate of Gilan:

The province has three recognized types of weather:
1 – Temperate and Humid Weather; which is experienced in the region of plains and mountains and mild winters, hot and humid summers and annual rainfall of between 1000 and 2000 mm are its main features.
2 - Humid Mountainous Weather; covers mountains over 1500 meters altitudes and cold snowy winters and temperate summers are its specifications.

3 - Semi-Arid Weather; covers small regions of Gilan province and Roudbar city and its most important feature is low rate of rainfall and dry weather.

The Province of Gilan is located in the most humid region of Caspian Sea. The weather features include: continuous precipitation in all seasons, high humidity, and temperature stability in day and night and cold and hot seasons and superior flow rate as the annual evaporation rate in most parts of the region. Such climatic characteristics have led to the scenic beauty, diverse vegetation, and wildlife. The rich natural resources and climatic stability with land being extremely fertile has made the province different and distinct from other provinces in Iran.

The important weather features in Gilan include:
1- The presence of Caspian Sea as its water vapour increases rainfall and provide a balance of daily and annual temperature as well as the intensity of hot and cold seasons.

2 - Alborz Mountains located around the plain of Gilan act as the main natural barrier against the rain-bearing clouds moving towards the central plateau of Iran, and thus bring much rain in these regions.

3 – Arrival of air masses of polar origin in winter and autumn in Gilan usually result in very cold weather, rain and snow in the region.

4 - Arrival of the western air masses from the Atlantic Ocean, the Mediterranean and Black Seas in autumn and winter seasons usually lead to severe winds and rainfall.

5 - The hot winds locally called ‘Garmish’ or Von are affected by the Manjil wind that warms the area even in cold seasons sometimes leading to forest fires.
2.4 Temperature and Rainfall in Gilan:

A) **Rainfall:** Mean annual rainfall of the province is 1402 mm which is much higher than the average national rate (255 mm). Rainfall distribution is not the same across the province. The rainiest part of Iran is Bandar Anzali, located in the territory of Gilan with little more than 2000mm of annual rainfall. Furthermore, the longest annual rainfall is recorded at Rasht, capital city of Gilan province. Totally, the province has an average of 1500 mm annual rainfall in the plain as well as humid mountainous ranges and almost 400 mm annual rainfall in the dry mountainous regions to the south.

B) **Temperature:** despite the fact that the southernmost point of Gilan province has almost two latitude degrees difference with the northernmost part, the temperature condition in this low range shows a considerable difference. The main reason for this difference in temperature is the role of Alborz heights with different height levels, that moving from the coast towards mountains will reduce the mean temperature. The process of reduction is insignificant at the foot of the mountains, but a sharp drop in temperature can be observed towards the end of the day. The temperature reaches its lowest points along the Alborz Mountains and Western Talesh heights. The hottest spot is a small area in the south of province and Manjil and Lushun cities.

2.5 Water Resources in Gilan:

Water resources in any region including Gilan are a result of precipitation mainly in the form of rain or snow. Considering the climatic characteristics of the province which is most humid and rainiest in the country, one can certainly argue that it is the most privileged region as far as the water resources are concerned. Water resources of the province are divided into two parts: 1) aquifers and 2) rivers and lakes.
Aquifers are very rich water reservoirs in Gilan province. Rainfall plays the main role to feed them in the region. The numerous perennial rivers, high rate of rainfall with high thickness of sediments in Gilan led to the formation of rich aquifers. Furthermore, the water level is high and they are saturated and do have a large capacity for water since the slope of aquifers is low. (Mohamed 1995)

Surface water resources of the region can be divided into two parts: the static waters (swamps and lakes) and perennially flowing rivers that play the most important role in providing the lifeline to the living world.

The Caspian Sea is the largest source of static water located along the coast line of Gilan. Although the use of Caspian Sea is not possible for agriculture, it is a major seafaring route for trade and business relations with neighboring countries. There are large wetlands and swamps in the plains of Gilan including Anzali swamp and Langeroud. The presence of many small and large pen stocks along the rivers in the coastal plain of Gilan caused the formation of natural ecosystems. In addition, it makes the irrigation of agricultural lands, fish farming, and fishing and hunting possible.

Sefidrood, Astara Chai, Havigh, Kargan Rood, Shafarood, Masoleh Rodkhan, Polrood and Shalman Rood can be named as the most important water resources of the province (Map No. 2.2).
"Sefidrood" is the biggest river of Gilan and the second biggest river of Iran far from Gilan territory originating from the “Chelcheshmeh” mountains of Kurdistan province. It joins Shahrood River after flowing a long distance from Kurdish, Zanjan and Qazvin provinces to reach Tarom Olya region (the confluence of the three provinces of Zanjan, Qazvin, and Gilan) known as Sefidrood while passing the plain lands of Gilan to join Caspian Sea. Much of the delta formed by the alluvial plain of Gilan Center is formed by Sefidrood. Furthermore, people are living on east side of Sefidrood are known as Eastern Gilan (Bie Pish) and those who are living on the west side of it are known as Western Gilan (Bie Pas).

"Polrood" (Pile Rood = Great river) located in the east of Gilan, "Shafarood" located in the western Gilan and Astara Chai in Azerbaijan's borders are of the other large rivers in Gilan. Polrood and Karganrood are the rivers whose discharge regime is affected by snowfall and rainfall because a part of the catchment area is located in the high mountainous regions. Water regime of rivers such as Astara Chai, Havigh, Masoleh Rodkhan and Shalmanrood that originated from the northern slopes of the western Alborz and eastern Talesh mountains are affected by rainfall. Overall, hundreds of small and big rivers flow in Gilan territory. Except about 10 rivers coming down to Anzali swamp, the rest join Caspian Sea directly.

Ali Zakhani and Zemzemeh mineral water springs in Masoleh, salt water springs of Lacan in Rasht township, Cheshmegol spring in Tulem, warm spring of Mast Khor in Manjil, mineral water springs of Sajiran in Eshkavar region of Roudsar township, Kota Komeh spring in Astara, Damash spring in Amarlu are of the most important mineral water springs in the province and are considered as the current water sources of the province.
2.6 Soil Condition in Gilan:

Humidity, rainfall and moderate weather conditions have played an important role in the formation of the soil of Gilan. The evolution of Gilan soils was highly affected by moisture, the drainage pattern and plant coverage. Washing of soils and degradation of rocks, rippling, plant coverage, soil organisms, time and human impact on soils led to a variety of soil formations in Gilan. In general, the soils have two different origins: mountains and plains.

The plains of Gilan are alluvial flats on which numerous soils have formed by degradation of a variety of sedimentary, igneous and metamorphic rocks. The process of sedimentation is considered as the most important factor in the formation and evolution of soil in this section. The soils of these areas are coarser and more textured. Changes in soil type and its application can be observed due to the differences in the aggregation and evolution of groundwater in the soil and changes in groundwater levels.

In the mountainous regions of Gilan, climatic factors have a greater influence on the evolution of the soil. So, erosion rates vary in accordance with the difference between weather and different heights and type of rock. Consequently, the type and thickness of soil and plant coverage are observed differently at different heights.

There is no vegetation cover in very high mountainous regions with high slopes and rocky surfaces that are free of weathered soil cover. Wherever there is rocky and gravelly soil coverage, they are used as rangeland or dry land. However, most of the high mountains and low-lying parts of the north are covered with dense and aggregated forests since the thickness of the soil and its moisture content was higher.

In general, the soils of Gilan region are very diverse. Different soils have evolved together. These soils are strongly influenced by water and the amount of organic material in the soil is very high.
2.7 Vegetation of Gilan:

2.7.1 Forest: Forest as the supreme form of plant coverage is the symbol of nature’s balance of air, water and soil. In Gilan province, though the merciless deforestation has made serious damages to the landscape and reduced its spread from distant past, yet 40 percent of the total area of the province is covered by forest at the present time (Map No. 2.3). the landscapes of Gilan can generally be divided into two parts: plains and mountains.

Forests in the Plains: the plains of the province have two distinct types of forest due to the differences in soil type and its water content as follows:

1) The wetland forests with double feature of swamp-forest and with trees such as alder, Lerk and Sefidpelt where some types of ferns grow on branches of trees having a particular view.

2) The forests that grow on lands with relatively good draining and their dominant types are oak, Shemshad, beech, elm and other deciduous trees such as sycamore known as Hyrcanian, forests.

Most of the forests in the plains have been destroyed and eliminated due to uncontrolled exploitation and agricultural development as those forests have been replaced with rice
cultivation now trees and tea farmers have expanded their territories by occupying Shemshad and oak tree jungles.

**Forests in the Mountainous Part:** The mountainous forests have progressed up to an altitude of 4000 meters and moved for 2500 to 2700 meters occasionally. Different types of forests regarding differences in range of temperature, humidity, slope, soil thickness and so on can be identified at this altitude and can be introduced as follows:

1. The trees of average amplitude including the fig forest society and beech at low heights and oak up to 1000 m altitude (*Boland Mazo* is the most important type of oak in these forests).

2. The trees of high altitude in which the most important tree type is beech covers areas up to 2000 meters above MSL. In this area, there are still untouched forests in some places due to transportation problems caused by the form of roughness and human settlements.

3. The oak trees appear above the beech forests and hornbeams are sometimes seen as high as 2700 meters.

4. The mountain forest ranges extend to the mountainous steppe and comprise a wide variety of flora including dry shrubs, thorny plants and grasslands. The steppe region beyond the forests is known as rangelands. The dry environment and the intrusion of very arid air from the central plateau of Iran is the reason for the presence of mountainous steppe vegetation in the Alborz region.

Overall species found in the forests of Gilan are very diverse. Some of the most important ones include: Oak (*Oak Apple*), Azad, hazel, alder, white pellets, Lerk, Shemshad, maple, ash, Kelho, Lilki, Shabkhosb, elm and cypress. Of course, cypress trees normally grow only in coats of Sefidrood in Roudbar and Dailaman in Iran. (Dobakhshri, 2006: 80)

Olive trees within Roudbar city, citrus trees like orange, tangerine, lemon and so on
especially in the cities of Roodsar and Langeroud and spruce and poplar trees particularly in Somea Sara and Astaneh area are of a common sight in Gilan province. At the present time, most of mountainous humid areas of Gilan are forested wetlands, but this situation cannot be seen on the plains of Gilan.

2.7.2 Rangelands: Geographically, the main distribution of rangelands has generally been established at heights more than 1800 meters above MSL in Gilan that it is not possible to use it due to extreme cold and glacial conditions in winter except in regions like Sefidrood Valley and Shahrood in Roudbar city.

Mountainous forest regions and grasslands do not encroach on rangeland coverage because tall trees do not let shrubs and small plants to grow in these regions. Furthermore, other factors like rainfall and temperature are so much that grasslands never have a chance to grow as much as jungle in the history of the plain regions. If grasslands appeared in the plains, they had been in the form of rangeland under trees or they had grown when people have cleared existing forests. Otherwise, they had grown where the forest could not grow at the margin of the rivers having high water level and floodplains of the rivers.

Overall, rangelands of Gilan province have occupied nearly 18 percent of the total area of Gilan. The most plant coverage of Gilan include: weed species, Astragals, Coma, Vaieh, Ghiagh, Dorboneh and shrubs (Bor) Tanges, wild plums, blackberries, hawthorn, hackberry, Wark, Jarooob and hawthorn.

2.8 Animals in Gilan:

The mild and moist climate, abundant water and vegetations have provided good conditions for the flourishing of animal life in Gilan. Most animals are present in all regions of Gilan or migrate in these areas in certain seasons of the year. However, there are animals that live only in one of these geographic areas. For example, wild animals
such as bear and deer and domestic animals such as donkey and goat in mountainous forests of Gilan that cannot be found in the coastal plains. Furthermore, jackals are present only in the plains and do not extend the scope of their lives to the forested mountains. Generally, population and diversity of wildlife of Gilan is higher and numerous than other parts of Iran and perhaps only Mazandaran province; its eastern neighbor has the similar condition.

Gilan has benefited from two groups of domestic and wild animals. Dog, cat, goat, sheep, donkey and horse, cattle, buffalo and a variety of birds are domestic animals, while tiger, leopard, bear, deer, wolf, fox, wild boar, jackal, rabbit and a variety of birds, reptile, amphibian, fishes and insects are the major wild fauna.

Gilan province in terms of abundance and diversity of fauna can be divided into three fairly prominent distinctions: 1) Mountainous grassy regions, 2) Mountainous forested regions and foothills near mountains, 3) Basin lowland plains and ponds near Caspian Sea.

The animals that live in semi-arid mountainous areas and grasslands include dog, goat, sheep, horse, donkey, cattle, fox, wild cat, rabbit, hedgehog, and reptile including snake, turtle, otter in mountains and coastal regions, as well as birds including crow, raven, Siro, dove, quail, woodpecker, bat, owl, partridge, eagles, vulture, pigeon, duck, lapwing, nightingale, stork and swallow.

Those animals living in mountainous regions and moist forested hills and mountain include leopard, cheetah (critically endangered), tiger (now extinct), bear (now extinct), deer, wild boar, wolf, fox, marten, rabbit, dog, cat, horse, donkey, cattle, goat, hedgehog, mice, hedgehog, turtle, snake, crow, partridge, pheasant, eagle, starling, woodpeckers, raven, owl, quail, all domestic fowls of different kinds, butterfly, insects and fishes like salmon.
Finally, in the regions near the Caspian Sea basin plains of Gilan, most of animals are those birds that migrate only in certain seasons from the northern regions of Siberia to these regions that include all kinds of ducks, swans, storks, herons, pelicans, Kakae birds, flamingo, Khodka birds, plover and black chicken. Of course, the native groups of birds of these regions include sandpiper (Gilan Shah), pheasants, eagles, crows, crow, quail, *Sabzghia* (a kind of green bird), red partridge, Dory partridge, owls and a variety of domestic fowl besides migratory birds.

Many insects including moths, butterflies and beetles are present in these regions. Reptiles and amphibians are numerous in these regions due to the large variety of water and suitable substrates including a variety of muskrat, otters, snakes, frogs and lizards. In Caspian Sea near the coasts and into the swamps and rivers leading to the sea, all kinds of fish can be found. The fish unique to the Caspian Sea are "white fish" and "ozone-boron". In addition, Kapor, salmon, Kilka, *Sebileh* are major sea fishes in these regions as well as rivers and swamps.

Despite high abundance and diversity of birds, reptiles and fishes, the abundance and diversity of wild animals and livestock is relatively less in low plains and basin areas near the coast of Caspian Sea. The animals of these regions mostly include domestic animals such as dog, cat, cow, buffalo and horse as well as wild animals such as fox, wild boar and jackals.

Nowadays, natural habitats of animals have been destroyed and the number of animals has been reduced severely or in some cases where they have become extinct due to human intervention such as extension of fields, formation of towns and cities, and pollution of water sources in Gillan. According to Alexander Khodzekov’s opinion in his book entitled *Land of Gilan*, the "Tiger of Gilan" has lived in Gilan about two centuries ago quite comparable to “Bengal Tiger” that is not there anymore (Khodzekov, 1969). In addition, bear yet other animals have lived in Gilan that is extinct now. Almost of all the population of animals of Gilan from livestock to birds especially migrated aquatic birds
such as ducks, swan and Coot has declined in number sharply in recent years. Some of these animals are endangered or extinct like “Shoka”; the most important one.

"Shoka" is a spotted miniature deer in Gilan. This kind of deer is usually of 65 cm height, 30 kilograms weight and brown color. These deer have white spots in chin and muzzle parts. Mainly, these animals feed at night when the moon is not full. (Rohi et al. 2009)

Regarding a notable aspect of the fauna of the Gilan province, highly toxic and dangerous snakes can be found in mountainous grasslands and forests in Gilan. On the other hand, no toxic and dangerous snake or reptile can be found in the plains of Gilan despite the abundance of all kinds of snakes due to high humidity. Mosquitoes are very annoying element for human life, especially in summer in the plains.

Large number of birds including migratory birds and fishes in the swamps and rivers in the plains of Gilan provide many opportunities for hunting and fishing part-time employment for lots of people in these regions depending upon the presence and abundance of the birds and fishes.