

Major Vegetational Belts of India
Floristic (Botanical) Regions of India

The Indian sub-continent is characterised with a variety of climate types, flora of the country is also correspondingly of different types in different parts. For the study of flora, the country has been divided into following nine floristic regions (Fig. 2). (i) Western Himalayas, (ii) Eastern Himalayas, (iii) West Indian

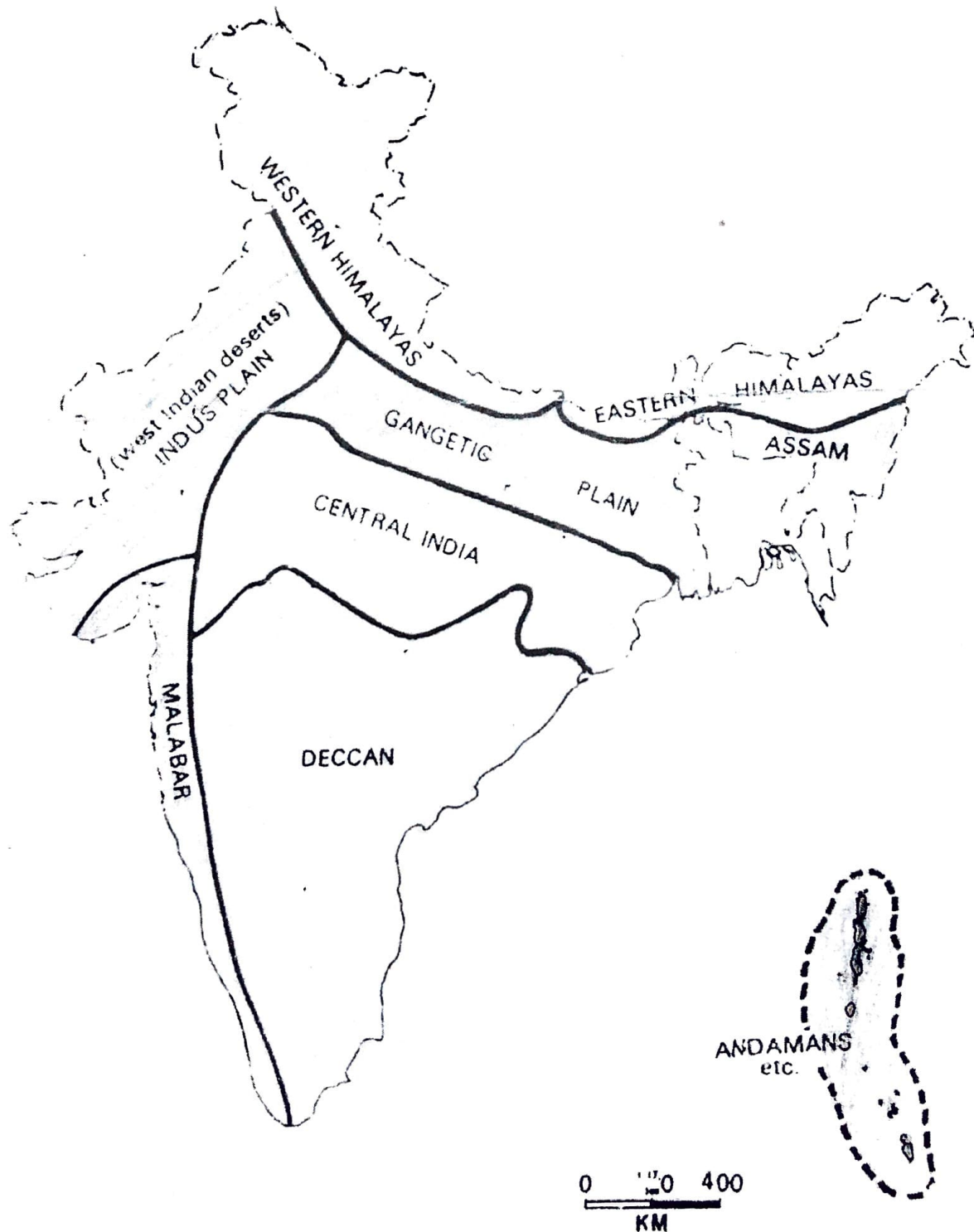


Fig. 2. Map showing different floristic regions of India.

Biogeography

Deserts, (iv) Gangetic plain, (v) Assam, (vi) Central India, (vii) Malabar, (viii) The Deccan, and (ix) Andamans.

[I] Western Himalayas

It extends from central region of Kumaon to north west region of Kashmir. Altitudinally there are three zones of vegetation corresponding to three climatic belts.

1. Submontane or lower region (tropical and subtropical). From about 1,000 to 5,000 ft. above sea level in regions of Siwaliks and adjacent areas. The forest is dominated by timber trees of *Shorea robusta*. In riverain regions trees of *Dalbergia sissoo* are dominant, while in more moist soils, dominants are *Cedrela toona*, *Ficus glomerata* and *Eugenia jambolana*. In isolated patches of grasses, there are present trees of *Acacia catechu* and *Butea monosperma*. In dry belts towards west, *Shorea robusta* is replaced by such xerophytes as *Zizyphus*, *Carissa*, *Acacia*, etc. with thorny succulent euphorbias on slopes. *Pinus roxburghii* begins to appear at 3,000 to 5,000 ft. Ground vegetation is poor.

2. Temperate or montane zone. From 5,000 to 11,675 ft. above sea level. At about 5,500 ft. *Pinus longifolia* is generally replaced by *P. excelsa*. From 5,500 ft. to 6,000 ft. *Cedrus deodara* is quite abundant forming pure forest stands. At these altitudes *Quercus incana* also grows as separate patches. In the inner Himalayas in Kashmir, *Betula* (birch), *Salix* (cane) and *Populus* (poplar) are abundant on certain soil types. At higher altitudes, *Aesculus indica* (horse chestnut), *Quercus semecarpifolia*, *Q. dilatata* along with the conifers such as *Abies pindrow*, *Picea morinda*, *Cupressus torulosa*, *Taxus baccata* etc. are most common components of vegetation. *Rhododendron campanulatum* grows at higher altitudes. In inner valleys on dry mountains, *Pinus gerardiana* is also found. In dry areas of Punjab, wheat and barely are cultivated, while in wet valley of Kashmir, rice is the common crop. Other common plants grown in Kashmir are, saffron (*Crocus sativus*), apples, peaches, walnuts, almonds etc.

3. Alpine zone. It is the limit of tree growth at about 12,000 ft. known as timber or tree line, where the plants' height is considerably reduced. Plants are mostly dwarfed and cushionshaped shrubs and grasses. At about 15,000 ft. and above-snow line, plant growth is almost nil. On lower levels of this zone, some rhododendrons, *Betula utilis* and small junipers are present. Above this zone there are present many types of herbs, with short period of vegetative growth and flowering. These include *Primula*, *Potentilla*, *Polygonum*, *Geranium*, *Saxifraga*, *Aster* etc.

[II] Eastern Himalayas

It consists of regions of Sikkim and extends in the east upto NEFA. In its vegetational zones, it is similar to the western Himalayas. On the whole, the eastern Himalayas have more tropical elements, greater variety of oaks and rhododendrons and less of conifers than the western Himalayas. The chief differences are the higher rainfall and warmer conditions in this part of Himalayas. The tree and snow lines are higher by about 1,000 ft. than the corresponding lines on

western Himalayas. Species diversity and vegetation density are higher in the east. This region is also divided into three zones.

1. Submontane zone. Due to warm and humid weather, it is typically tropical with dense forests of *Shorea robusta*. It extends from the plain foot of the hill upto 6,000 ft. altitude. In riverain area there are forests of *Dalbergia sissoo* and *Acacia catechu*. Mixed forests of deciduous trees like *Sterospermum*, *Cedrela toona*, *Bauhinia*, *Anthocephalus cadamba*, *Lagerstroemia pavariflora* are predominant. Tall trees like *Albizia procera*, *Salmalia*, *Artocarpus chaplasha*, bamboo (*Dendrocalamus*) are important.

2. Temperate zone. It ranges between 6,000 to 12,000 ft. altitude above sea level. The lower region has several species of oaks, such as *Quercus lemelloso* and *Q. lineata*, *Michelia*, *Cedrela* and *Eugenia*. The upper region which is cooler, has such conifers as *Juniperus*, *Cryptomeria*, *Picea*, *Abies*, and *Tsuga*. One bamboo, *Arundinaria* sp. is also common. Some rhododendrons are also common at higher elevations.

3. Alpine zone. It is above 12,000 ft. where vegetation is devoid of trees. Shrubby growth of *Juniperus* and *Rhododendron* is found in grassy areas.

[III] West Indian deserts (Indus plain)

This region consists of parts of Rajasthan, Kutch, Delhi and part of Gujarat. The climate is characterised by very hot and dry summer, and cold winter. Rainfall is less than 70 cm. The plants are mostly xerophytic, such as *Acacia nelotica*, *Prosopis spicifera*, *P. juliflora*, *Salvadora oleoides*, *S. persica*, *Tecomella*, *Capparis aphylla*, *Tamarix dioica*, and *Zizyphus nummularia*. The ground vegetation is mostly represented by small *Calotropis* sp., *Panicum antidotale*, *Eleusine* sp., *Tribulus terrestris* etc. Some common species used in plantations are *Saccharum munja*, *Panicum antidotale*, *Cenchrus ciliaris*, *Capparis aphylla*, *Tamarix articulata*, *Prosopis spicifera*, *P. juliflora*, *Acacia leucophloea* and *A. senegal*.

[IV] Gangetic plain

This region comprising Uttar Pradesh, Bihar and Bengal is most fertile region. The chief climatic factors, the temperature and rainfall together are responsible for distinct type of vegetation. Rainfall is less than 70 cm in west U.P., being more than 150 cm in Bengal. Vegetation is chiefly of tropical moist and dry deciduous forest type. In north-western U.P., near foothills of the Himalayas, *Dalbergia sissoo* and *Acacia nelotica* are most common. In south-west U.P., there are desert areas, where characteristic species are *Capparis aphylla*, *Saccharum munja*, *Acacia nelotica* etc. In eastern U.P., *Butea monosperma* (dhak), *Madhuca indica* (mahua), *Terminalia arjuna* (arjun), *Buchanania lanzan* (chiraunji), *Diospyros melanoxylon* (tendu), *Cordia myxa* (lisora), *Sterculia urens*, *Boswellia serrata* (salai), *Acacia catechu* (Khair), *Azadirachta indica* (neem), *Mangifera indica* (mango), *Ficus bengalensis* (bargad), *F. religiosa* (pipal) are most dominant trees. Besides them, some weeds and grasses like *Xanthium strumarium*, *Cassia tora*, *Argemone mexicana*, *Amaranthus* sp., *Peristrophe bicalyculata*,

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Nowyasan
Indus plain
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Biogeography

Dichanthium annulatum, *Bothriochloa pertusa* etc. are also present. In Gangetic delta region extreme swampy and halophytic vegetation is common, where dominant species are *Rhizophora mucronata*, *R. conjugata*, *Acanthus ilicifolius*, *Kandelia rheedii*, *Bruguiera gymnorhiza*, *Ceriops roxburghiana* etc.

[V] Assam

This region receives the heaviest rainfall, with Cherrapunji as much as more than 1000 cm. The temperature and wetness are very high, which are responsible for dense tropical evergreen forests. Some of the important trees are *Dipterocarpus macrocarpus*, *Mesua ferrea*, *Michelia champaca*, *Shorea robusta*, *Artocarpus chaplasha*, *Alstonia scholaris*, *Sterculia alata*, *Lagerstroemia flos-regina*, *Ficus elastica* etc. Some bamboos, as *Bambusa pallida*, *Dendrocalamus hamiltonii*, *Calamus* sp. grasses as *Imperata cylindrica*, *Saccharum arundinaceum*, *Themeda* sp., *Phragmites* sp., and insectivorous plants like *Nepenthes* sp. are also present. In northern cooler regions, *Alnus nepalensis*, *Rhododendron arboreum*, *Betula* sp. are also found. In hilly tracts, some conifers like *Pinus khasiya* and *P. insularis* are also present.

[VI] Central India

It comprises Madhya Pradesh, parts of Orissa, and Gujarat. Depending upon the amount of rainfall, forests have developed into thorny, mixed deciduous and sal types. The forest vegetation is chiefly constituted by *Tectona grandis*, *Diospyros melanoxylon*, *Butea monosperma*, *Terminalia tomentosa* and *Dalbergia latifolia*. The thorny vegetation consists of *Carissa spinarum*, *Zizyphus rotundifolia*, *Acacia leucophloea*, *A. catechu*, *Butea frondosa* etc.

[VII] Malabar

This region comprises the western coast of India extending from Gujarat in the north to the Cape Camorin in the south. Rainfall is heavy. The vegetation is of four types-tropical moist evergreen forests, mixed deciduous forests, subtropical or temperate evergreen forests and the mangrove forests. The tropical wet evergreen forests are very luxuriant and multistoreyed, with such tall trees as *Dipterocarpus indicus*, *Sterculia alata*, *Cedrela toona*, *Tectona grandis* and *Dalbergia latifolia*. Bamboos, like *Dendrocalamus strictus* and *Bambusa arundinacea* are also present.

In the Nilgiri hills, there are temperate evergreen forests of such trees as *Eurya japonica*, *Michelia nilagirica* and *Gordonia obtusa* known as the sholas.

[VIII] The Deccan

This region is drier with rainfall of about 10 cm. It includes Andhra Pradesh, Tamilnadu and Karnataka. It has a central hilly plateau with forests of *Boswellia serrata*, *Tectona grandis* and *Hardwickia pinnata*, and the low eastern dry Coromandal coast, with tropical dry evergreen forests of *Santalum album* (chandan), *Cedrela toona* and plants like *Capparis*, *Phyllanthus*, *Euphorbia* sp.

[IX] Andamans

It has a wide range of spreading coastal vegetation like mangroves, beech forests and in the interior evergreen forests of tall trees. There are some pockets of dry areas also. Important species of the island are of *Rhizophora*, *Mimusops*, *Callophyllum*, *Dipterocarpus*, *Lagerstroemia* and *Terminalia*. Most of the area is now cleared for paddy and sugarcane cultivations.

Paper XV

B.Sc
Sem VI

Man And the Biosphere (MAB) Programme



Man and the Biosphere (MAB) Programme was launched in 1971 by UNESCO to promote an interdisciplinary approach within the natural and social sciences; for the rational and sustainable use and conservation of the resources of the biosphere; and for the improvement of overall relationship between people and their environment. It predicts the consequences of today's action on tomorrow's world and thereby increases people's ability to efficiently manage natural resources for the well-being of both human population and the environment.

The programme's primary output comes in the form of establishment of the World's Network of Biosphere Reserves (WNBR) – a listing of local conservation units known as Biosphere Reserves, found in different countries across all the regions of the world. The biosphere reserves are the protected areas that are meant to demonstrate a balanced relationship between man and nature, in which genetic resources could be protected and research and monitoring could be carried out in a sustainable way. Today, MAB programme is a set of related scientific research projects which focuses on:

- Minimizing the loss of biological diversity;
- Making people aware of how cultural diversity and biological diversity affects each other; and
- Promoting environmental sustainability through the World Network of Biosphere Reserves.

Man and the Biosphere (MAB) Programme launched in 1971, initiated work on 14 project areas covering different ecosystem types from mountain to sea, from rural to urban systems, as well as more social aspects such as environment perception. MAB currently operates through 158 National Committees established among the 195 Member States and nine Associate Members States of UNESCO. The governing body of Man and the Biosphere Programme is the International Co-ordinating Council usually referred to as the MAB Council or ICC, consists of 34 Member States (countries) elected by UNESCO's biennial General Conference. The ICC normally meets once every two years. Among other things the Council decides upon establishment of new biosphere reserves and takes note of the recommendation on periodic review reports of the existing biosphere reserves. There are also MAB National Committees that oversee MAB programme in their countries and report to the MAB Council.

The role of the ICC is to:

- Guide and supervise the MAB programme;

- Review the progress made in the implementation of the programme (cf. Secretariat report and reports of National MAB Committees);
- Recommend research projects to countries and to make proposals on the organization of regional or international cooperation;
- Assess priorities among projects and MAB activities in general;
- Co-ordinate the international cooperation of Member States participating in the MAB Programme;
- Co-ordinate activities with other international scientific programmes; and
- Consult with international non-governmental organizations on scientific or technical questions.

At present, there are 701 sites in 124 countries listed in the World Network of Biosphere Reserves.