CHAPTER III

BIOTIC AND MINERAL RESOURCES
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Biotic and mineral resources have always secured their due importance in the pursuits of socio-economic activities of the people. India is a rich country abounding in natural resources, and the ancients, though highly spiritual in their outlook, were never indifferent to economic progress. They knew well the importance of biotic and mineral resources and devoted themselves to the promotion of national prosperity. The present chapter is an attempt to deal with the biotic and mineral resources, their classification, distribution and utilization.

(a) Natural Vegetation

Forests are one of the most striking feature of the land surface. Forests were dominant natural vegetal cover in ancient India. Their distribution mainly depends upon the topography and climate of the region. They have direct and indirect utilities. They render the climate more uniform and contribute to increase the fertility of the soil and provide scope for grazing of cattle. They are the main source of revenue of the state.

The chief characteristic of the Aryans' Civilization was the scientific preservation of the forests. The history shows that forests played an important role in the life of the Aryans. The philosophy of the Āranyakas and Upaniṣads must have been developed in the dense and plentiful forests. During the Rāmāyaṇic age, there were dense forests e.g. Citrakūṭavana,
classification of natural vegetation

According to the references contained in the Rāmāyaṇa, natural vegetation can be classified in the following groups:

(a) forests and
(b) grasses.

(a) forests: types and distribution

Generally, the distribution of forest types follows the rainfall features, physical and chemical properties of soils and meteorological conditions controlling and determining the distribution and types of forest. Besides, elevation exerts a greater influence on vegetation.

The diversity of Indian climate must have been responsible for the growth of different types of trees all over the country. Major forests of the Rāmāyanic India as mentioned in the Rāmāyaṇa are given below (Fig. 3.1). They are as follows:

(1) Caitrarath vana

It was located north of Yamunā source and west of BhāgIrathI around Dehradun and Mussoorrie. It was a very thick forest belonging to Kuberā.1
(2) *Nandana vana*

It was also thick forest in the Himalayas belonging to Kubera and was noted for scenic beauty\(^2\). Lochra, Padmaaka (a species of sandal wood) and Deodara were the main trees found in the Himalayas during the Kāśyapīc age\(^3\). Deodara is one of the most important timbers of India.

(3) *Sāla vana*

Sālavana, in west of Ayodhya, was stretched between the Gomati and Sarayū rivers. It was huge forest during the Kāśyapīc age\(^4\).

(4) *Kurujaṅgala*

A forest stretched between the upper portions of the rivers Sarasvatī and Drisadvatī in north west of Hastināpura was known as Kurujangala\(^5\). It was forest tract of Kuru janapada during the epic age and identified with the present Eastern Punjab.

(5) *Bhūrunda vana and Varūtha vana*

These forests were located in northern India\(^6\) but it is very difficult to identify them.

(6) *Naimisāranya*

It was very famous forest tract noted for sacrifices and abode of ascetics. It was stretched on the left bank of the Gomati\(^7\) and is identified by the same name or Nimsār forty-five miles to the north-west of Lucknow.
(7) Saravana

According to the Rāmāyana, the Saravana (forest of reeds) was stretched in the Himalayan region.8

(8) Tātakāvana

The district of Shahabad (Bihar) was peopled by Maladas and Kārūsas in the epic age. In these two principalities, there was a dense forest inhabited by lions, tigers, wild boars and elephants and thickly set with Dhavas, Aśvakarnas, Kakubhas (Arjunas), Bilvas (Aegle marmelos), Tindukas, Pātalas and jujubes. The forest region was occupied by Tātakā (a Yakṣa women), who was a sovereign ruler of the forest region, therefore, the forest was named after her.9 The Tātakāvana also included some parts of Chotanagpur plateau.

(9) Citrakūṭa vana

The Citrakūṭa forest was stretched between the Shankargarh hills to the present Citrakūṭa which is identified with the modern Kamatnathgiri, sixty miles south-west from Prayāga. The forest was thickly set with umbrageous trees belonging to deciduous group such as Āmra (mangoes), Jaṁbū (rose apples), Aśanas, Lodhras, Priyāls, Panāsas (bread-fruit trees), Dhavas, Ankolas, Bhavyas, Tiniśas, Bilvas, Tindukas, Venus (bamboos), Kāśmarīs, Arista (Azadirachta Indica i.e. margosas), Varnas, Madhūkas, Tilakas, Badarīs (jujube trees), Āmalaka (emblic myrobalan), Kadambas, Vetra (cane), Dhanvanas and Bījakas (pomegranates). The dense forest was inhabited by tigers, leopards, bears, deer and elephants and was crowded with numerous birds.10
(10) **Alaksitavana**

Alaksitavana in Saurastra covered the area between Alech hills to Girnar hills. It seems that during the Rāmāyanic age this region was caused with thick mantle of forest hardly allowing sunlight to pass the ground and hence justifying the name Alaksita\(^{11}\) (not visible).

(11) **Dandakāranya**

The Daksīna desā during the Rāmāyanic age was largely a forest tract with few inhabited regions. The most reputed of all the forests was Dāndaka forest which stretched out from the Citrakūṭa hill and comprised of the region between the modern Bundelkhand and the river Krisnā\(^{12}\). Some authorities\(^{13}\) hold that the Dāndaka forest extended right across the peninsula from the hills of Orissa to the source of the Godāvari. Perhaps, it stretched well up to the territory of the Tamil Kingdoms.

Dāndaka appears to have been a general name which comprised of all the forests from Bundelkhand down to the river Krisnā. According to the epic it was situated between the Vindhya and the Saival mountains and a part of it was called Janasthāna\(^{14}\). Agastya narrated to Rāma the details of this forest which was once conquered by Dāndaka an ancestor of Rāma and brought under the authority of the imperial power reigning from Ayodhyā. During the Rāmāyanic age, the Āśramas formed the establishment in the forest regions and there were some routes through thick forests. The different forests of Dandakāranya were known by different names. They are as follows:
(a) **Pippalīvana**

According to the Rāmāyaṇa, from the Sūtikāna Āśrama, the Āśrama of Agastya was 16 Krosās (32 miles) southwards where pippalī trees grew widely and due to the scent of the ripe pippalī fruits wafted by the breeze, it was known as Pippalīvana. This forest covered the region south of Narmada i.e. the surrounding region of Mahadeo hills.

(b) **Madhūka and Nyagrodha vana**

The great Madhūka and Nyagrodha forests were stretched between Agastyaśrama and Pancavatī. These forests covered the Sahyadri Parvata or Ajanta range and the wide tract watered by the Wardha and Punganga rivers.

(c) **Pancavatīvana**

It was a charming forest and was close to the river Godāvari, where metallic ores seem to have been abundant. Pancavatī of the Rāmāyaṇa corresponded with the present Nasik and Pancavatīvana covered the region of Satmala hills. The trees like Sala (Boragas flabellifer), Tāla, Tamāla, Kharjūra, Panasa (Artocarpus Integrifolia), Nīvāra, Tinisā, Punnāga, Cūta (mango-Mangifera indica), Aśoka (Sarca indica), Tilaka, Ketaka, Caṃpaka, Syandana, Sandal wood, Nīpa, Parnāsa, Lākuca, Dhava, Aśvakarna, Khadira, Samī, Kīṁsuka, Pātala, Kadamba, Bilva, Arjuna, Kakubha, Jambū, Karnikāra, Kurava, Dādima, and Bakula had widely grown in that region. The above named trees predominate even at present around Nasik and the present Pancavatī. It was such a beautiful forest that Rāma and his party resolved to spend a portion of the period of their exile here.
(d) **Krauncāranya**

Krauncāranya was a dense forest at a distance of three Krosās from Janasthāna. The hilly forest region known as Krauncālaya covered the region of Balaghat hills.

(e) **Mataṅgāranya**

The charming great forest abounding in flowers and fruits with all sorts of deer and birds, was six miles from the Krauncāranya in the east. This forest would have covered the region between the river Manjra and Bhima south of Balaghat range and up to Rīṣamūka mountain and Paṃpā region. Paṃpā has been identified with the Hampi region near Roichur. The forest was studded with the trees of Jambū, Priyāla, Panesā (Jack-fruit trees), Nyagrodha (Ficus bengalensis), Plakṣa, Tindukas, Āsvattha (Ficus religiosa), Karnīkāra, Cūta (mango), Dīva, Nāgakesara, Tilaka, Naktamālaka, blue Asōka, Kadamba, Karavīra, Agnimukhya, red Sandalwood tree, (Raktā Pāribhadraka), Punnāga, Bakula, Uddālaka, Ṣukla, Karavīra, Bhāndīra, Nicula, Saptaparna, Ketaka, Atimukta etc. The trees of Mataṅgāranya belong to the deciduous group.

(f) **Velāvana**

The magnificent forest might have expanded between Mahendra mountain (southern spur of Travancore hills) and the sea. Velāvana was studded with the trees of Nārikela, Sāla, Tāla, Tamāla, Agura, Asvakarna, Dhava, Bahsa, Kuṭaja, Arjuna, Tilaka, Tiniśa, Bilva, Saptaparna, Karnīkāra, Cūta, Asōka, Dādima, Vibhitaka, Karīra, Bakula, Nimba etc.
Besides these forests, the Rāmāyana mentions various dense forests, i.e., Milavana south of the Yamunā, Prayāga vana encircling Prayāga, Madhuvana near Mathura and an unnamed forest between Sahya and Malaya mountains. Moreover, various dense forests of the Dandaka region are also referred to the epic but their names are not mentioned.

(b) Grasses

Grasslands must have been extensive all over the country specially the alluvial plains of the northern India. In addition to the use of grass as fodder, it was of high value in the ritual performances. Invariably in all religious and social activities grass formed an essential accessory. In many religious and social observances of the Hindus, in present day, grass is still used as a sacred item.

It is remarkable that the grasses mentioned in the Rāmāyana pertain to the subtropical type. The main grasses referred to the text are Darbhā, (desmostachya bipinnata) also called Kusa, (Poa cyno suroides), Mūnja (Saccharum Munja Roxb), Kāśa (Gnarled Shrubs), Sādvals and Sāra (reed).

(ii) Utilization of the Forests and Grasses

Since pre-historic times, the forest has supplied some fundamental needs of men such as fuel, shelter, clothing and food. In the Rāmāyanic age, forests were economically very advantageous to men. They were governed by the kings and provided a great source of economic prosperity to the society.
The utility of the forests was generally realised and the Rāmāyaṇa has attached great importance to afforestation\textsuperscript{34}. The following advantages from the forests are enumerated in the epic:

(a) Forests were used as pasturelands\textsuperscript{35}.

(b) They were a great source of fuel and the forest dwellers used to cut them\textsuperscript{36}.

(c) Houses, carts, chariots, cots, wooden seat, wooden sandals, combs, umbrellas, palanquins, boats, ships and various musical instruments such as Vīnā, Vipancī, Vallaki, Mrīḍaṅga, Muraja, Pataha, Panava, Dundubhī, Dindima, Aḍambara, etc. were made of wood\textsuperscript{37}. Sāla, Audumbara, Bamboo, Tāla, Deodāra and Sandal were very important trees on account of their economic utility.

(d) The trees like Bilva, Khadira, Palāsa, Śleṣmātaka, Deodāra, Plakṣa etc. were very important from the religious point of view because their wood was used in the sacrifices\textsuperscript{38}.

(e) Various powders, scents (gandha), cosmetics (āṅgarāga) and unguents (anuleps)\textsuperscript{39} were prepared from forest resources and among them the sandal paste\textsuperscript{40} was the most common.

(f) Medicinal herbs obtained from the forests were very common for besmearing the body\textsuperscript{41}.

(g) Honey formed the principal item of food and people were in the habit of drinking it during the Rāmāyaṇic age. It was easily available in the forests\textsuperscript{42} and was a principal ingredient of various sweet preparations and liquors\textsuperscript{43} (mādhvīka).
(h) Fruits and roots formed an important item of the food and diet of the ascetics consisted essentially of fruits, esculent roots and tubers that could be easily procured from the neighbouring forests. It may be noted that fruits were also used for making condiments and drinks.

(i) Hermits used to put on Valkalavastra made of the barks of the trees.

(j) Grasses were equally important. Primarily they served as fodder and litter at the altar. Besides, mats used in ritual performances were also prepared from the kus's grass.

The foregoing discussion on the natural vegetation of the Rāmāyanic age reveals that most of the plants belong to tropical and subtropical monsoon vegetation. It is noteworthy that the life of the people of the epic age was greatly influenced by vegetation. It contributed much to the necessities of life. Agriculture, stock-raising and industries were directly or indirectly related with vegetation. As regards the industries related to vegetation we can gauge the various aspects of the economic life of the Rāmāyanic people and this can be taken as an ample proof of the developed state of industries. The Rāmāyana also mentions a long list of artisans and craftsmen from which we can deduce the high proficiency achieved by the people of that age.
(1) **Animals and Animal Based Economy**

The welfare of the people is associated with the welfare of the cattle. The cattle wealth of our country in the Rāmāyānic age had an intimate bearing on agricultural development, health and economic prosperity. Animal husbandry was an important occupation of the Aryans, therefore, animals and their products had an important impact on human beings. The Rāmāyāṇa mentions the origin of different kinds of animals and birds in a mythological way.

History shows that cows and bullocks were the most valuable possessions of the people in ancient India. In fact, the three higher classes (Varṇas) of the society were engaged in preservation and rearing of the cattle in their own way but it was the main occupation of the Vaiśyas. Animal husbandry, is clearly indicated by the references of the several pastoral villages (Ghosas) Animals were offered as Daksīṇā and presents and constituted an important form of wealth. The science of cattle-breeding was well developed in the Rāmāyānic age. The cow for the Brāhmaṇa and horse for Kshatriya were indispensable. Bullocks formed an important means of transport and their services were available for various agricultural operations. Keeping in the view the necessities of the army, great emphasis was laid upon the improvement of scientific breeding of horses, elephants, camels and mules. The Rāmāyāṇa mentions that animals of improved breed mainly elephants and horses were imported from neighbouring janapadas.
(1) **Classification of Animals**

The animals of the epic age can be classified under two heads:

(a) Domestic animals and

(b) Wild animals and birds

**Domestic Animals**

The relation between man and animal had been very close in ancient period. The Vedic texts present before us a primitive form of man and animal relationship. Domestication of animals had been exclusive of any other economy in the earliest stages of human society when man led a nomadic life. Their wealth and prosperity depended upon the possessions of a large number of cows, bullocks, horses, elephants, sheep, goats, dogs, asses and mules. In the Rāmāyanic period large cities had sprung into existence and people enjoyed a more settled form of life than those of Vedic age.

The position occupied by the cows was unique in the society. In the epic, the cow along with Brāhmaṇa is the symbol of Aryan culture. The cows were given to the brāhmaṇas as well as on marriage occasions as gifts and were considered extremely meritorious forming an important part in the religious performances of the society.

Bullocks were the main draught animals, yoked to carts and ploughs and some times were given as gifts. Horses were also kept for riding, pulling chariots and were given as gifts. They were sacrificed and offered in the Asvamedha Yajña.
Rāmāyāna mentions that the horses of Kāmboja, Vāhlīka and Vanāyu region were of good-breed and it is said that Ayodhyā was crowded with horses of excellent breed. The camels were used in riding, pulling chariots and were the beasts of burden. In the Rāmāyanic age, asses and mules were harnessed in chariots and were given as presents.

Elephant was known to the Vedic Aryans and was tamed and domesticated in later Vedic period, but in the Vedic texts, there are no clear evidences to prove that an elephant was used in war. The Rāmāyana is the first book in this context. Elephants were used for riding, for being offered as gifts and were regularly trained for the purpose of war. The Rāmāyana also mentions the species of elephants of excellent breed i.e. Airāvata, Mahāpadma, Anjana, Vāmana, Bhadra, Mandara and Mrīga (born on Himalayas and Sahya ranges). Besides, crossbreeds like-Bhadra-Mandara-Mrīga, Bhadra-Mandara, Bhadra-Mrīga and Mrīga-Mandara have been also referred to the epic.

Goats and sheep were freely given as gifts in the epic age. The Rāmāyana mentions a species of goats termed as Pravena. The kings of the Rāmāyanic age were very fond of keeping pet birds and animals.

Wild Animals and Birds
Nature has endowed India with a magnificent asset of wild animals of different variety and beauty. The wild animals which are mentioned in the Rāmāyana are - lion, tiger, elephant, bear, pig, deer, jackal, hare, leopard, wild buffalo, antelope,
yak, gayal and porcupine. The epic\textsuperscript{71} also mentions the four principal species of deer i.e. Varāna, Kīgya, Prīṣta and Madhurā. Among birds crow, swan, peacock, ruddy geese, wild duck, water-fowl, crane, vulture, osprey, locust, parrot, woodpecker, buzzard, heron, howl, pigeon, mina, eagle and owl are referred to the Rāmāyana\textsuperscript{72}.

The aquatic creatures such as fish, turtle, alligator, shark, crocodile, giant fish, frog, serpent and conche are mentioned in the Rāmāyana\textsuperscript{73}. Fishing was practised in the Rāmāyanic age. The fish was either hooked or killed with arrows and fishermen are said to use the nets to trap the fish\textsuperscript{74}. The epic\textsuperscript{75} also mentions the different kinds of fish namely Kohita, Vakratūndā and Nālāmīna.

\textbf{(ii) Distribution of Animals}

The distributional pattern of animals are mainly determined by topography and climate of the region but human factor also played an important part. The river valleys and plains of northern India best suited to pastures, were the main regions of cow-ox raising specially the banks of Tamesā and Somatī rivers\textsuperscript{76}. Horses were found in Kāmoja, Vānirka and Indus valley\textsuperscript{77}. The Himālaya, Vindhya, Sahya mountains, citrakūṭa and Dandakāraṇyā region were rich for elephants of superior breed\textsuperscript{78}. Rugged topography and dense vegetal cover were the fundamental factor for the growth of elephants in the above mentioned regions. The references clearly indicate that donkeys and mules were found in every janapada\textsuperscript{79}. Camels were found in sandy and dry
region of the country. The river valleys were equally recognised for sheep and goat raising but it is not mentioned clearly.

Lion, tiger, bear, wild pig, jackal, wild buffalow and deer were found in the forests specially citrakūṭavana, Pancavatīvana, Dāndakāranya, Vindhyan forests, Himalayan forest and in the forests surrounding Ayodhyā.

Birds and aquatic creatures were mainly found in the vicinity of the lakes, ponds and river banks. The banks of Mandākinī, Narmadā, Pancasara and Pampā lake were crowded with different birds.

Animal Products and Utilization

It is clear throughout the world that milk and milk products are the best diet for human beings. During the epic age, milk and its products, chiefly clarified butter (ghrita) formed the principal ingredient of food. Cow's milk was considered undoubtedly the most important drink and processes of curdling and churning were well known to the people of that age. Milk, dadhi and ghrita were extremely enjoyed by the people of that age.

In the Rāmāyanic age, meat was very common in the society. The Rāksasas were very fond of meat and they are described as 'Pisitāsanas'. They did not hesitate to eat raw meat and even cannibalism prevailed among them. Besides, the Aryans had developed the notion of clean and unclean meat, therefore, the flesh of deer and ram was held extremely
meritorious\textsuperscript{87}. Moreover, eating of fish and birds was very popular in the epic age\textsuperscript{88}. In an Asvamedha sacrifice, numbers of animals were slaughtered and their meat was consumed by Ksatriyas as well as the Brāhmaṇas\textsuperscript{89}. Thus, it is evident that meat of animals as well as, of aquatic creatures was usually eaten by the Aryans and the non-Aryans.

During the Rāmāyanaic age, people used the skin of animals as Uttarīya, therefore, skin clothes were considered auspicious and holy. The sages of that age wore the skin of deer and antelopes\textsuperscript{90}. The Rāmāyaṇa also indicates the progress of leather industry\textsuperscript{91}.

The woolen cloth was prepared from the fleece of sheep\textsuperscript{92}. The whiskers made of a yak's tail were regarded as essential for the installation ceremony\textsuperscript{93}. It is remarkable that census of royal cattle was taken and the kings were very interested in such a census\textsuperscript{94}.

A detailed study of the Rāmāyaṇa, thus, reveals, that the people of the epic age were fully aware of the animal husbandry and had well developed livestock based economy. In the field of agriculture, warfare and in daily use, the animals played an important role, therefore, great emphasis was laid on the improvement of their breed and training.

(c) **Minerals and Mineral Based Economy**

The earth contains all the minerals and precious stones, therefore, termed as 'Ratnagarbhā Vasundharā'. Minerals have a
great bearing on human life as man has been using a number of minerals for his socio-economic development throughout human history. The present day human society owes much to minerals which form a valuable resource of a country. Minerals and metals form the life-blood of the industrial civilization. A careful husbanding of mineral resources and the rate at which mineral development takes place are among the principal indications of a country's economic development. The Aryans recognised the importance of minerals and gave them due place in their economic pursuits. During the Rāmāyanic age mining activity was carried on by the miners termed as 'Khanaka'. The engineers known as Bhumipradēsajñā, were engaged in exploring new quarries and exploitation of mineral resource.

(i) Minerals

The minerals mentioned in the Rāmāyanā reveal that people of that age were well acquainted with numerous minerals and their utilization. Jambūnada or Svarna (gold), Rajata (silver), Ayasa (iron), Tāmra (copper), Trapu (Tin) and śīśā or śīśaka (lead) are the principal minerals of the epic age. Among precious stones the Rāmāyanā refers to Vajra (diamond), Pravāla (ruby), Vaidūrya (Cat's eye gem), Vidruma (Coral), Sphatika (Crystal), Muktā (pearl), Indranīla and Mahānīla (Sapphires).

(ii) Distribution of Minerals

On the basis of the study of the Rāmāyanā, the modern geologists can ascertain the regions of deposits of gold, silver
and other valuable minerals. During the Rāmāyanaic age, systematic investigation of mineral deposits and proper mining operations were essentially made. There had to be probably a scientific survey of mineral deposits and suggestive measures were given for their exploitation. In the epic, the mountains such as Himālaya, Kailāsa, Citrakūta and Rūṣyamūka are said to be storehouse of minerals of different shades and qualities.39 The Pancavaśī region is said to be enriched with gold, silver and copper100 (Fig. 3.2). The Rāmāyana also mentions the mountain ranges of seashore full of gold and silver101. There are references to minerals in the mountainous regions of white, rudy and ash colours102. The epic mentions clearly that cascades running in serpentine courses are having water of different colours due to its contact with mountainous minerals103.

Forested areas are also said as having the reserves of gold and precious stones104. Jambūnanda (gold) was taken out from the river beds105. Kosala janapada has been mentioned to be rich in mines106 though at present no evidences are available.

It would be relevant to relate the areas of mineral deposits mentioned in the Rāmāyana with those of the present. In the Rāmāyana, the Himālaya is said to be rich in minerals and even today lead ore deposits are reported in Jammu and Kashmir, Himachal Pradesh, Almora and Tehri Garhwal districts of Uttar Pradesh. Silver is found in the Sutlej valley in Himachal Pradesh and copper ore is found in Shumahar area (Anantnag district), Kangan area (Srinagar district), Sikkim, Nepal and
in some parts of Kumaon. The presence of small quantities of gold in the sands of Himalayan river is well-known. Besides minerals, the Himalayan region is also rich in precious stones. Kashmir and Pabar regions are noted for pale rubies and sapphires respectively. In Citrakūṭa region, there are only bauxite reserves in Manikpur, bermiquite near Karwi and silica sand in Mau tansil of Banda district of Uttar Pradesh. Quartz and dolomite are also found in the vicinity of Citrakūṭa mountain. In the region of Kisyamūka mountain, copper ore in Kurnool district of Andhra Pradesh, gold in Anantpur district and at Bellary in Karnataka, manganese and iron ores in the Sandur hill range of Bellary district are available.

(iii) Utilization of Minerals

A nation's progress and power potential are largely measured in terms of its mineral wealth and its ability systematically to explore, process and use it to the best advantage. During the Rāmāyanic age, India had a fairly developed metallurgical industry. References to minerals obtained from the mountains and the complex military equipment which included large numbers of metallic weapons testify on the one hand to the knowledge of the refining of metals and on the other to the manufacturing skill of the people. The weapons such as Pattisa (a kind of sharp edge sword), Śūla (dart), Parigha (club), Khaṅga (sword), cakra (discus), Bāṇa (an arrow), Sakti (javelin), Kunta (spear), Tomar (lance), Bhindipāla (sling for throwing stones), Danda (Staff), Dhanu (bow), Parasu (an axe),
and Šataghñīs (rocket or iron pikes) were made of iron. Besides, an axle of bullock cart, pestle, needle and various agricultural implements\textsuperscript{111} were also made of iron.

Non-ferrous metals were used for preparing ornaments and articles of daily use. In the Rāmāyanic age, soldiers and kings decorated their weapons\textsuperscript{112}, chariots\textsuperscript{113} and animals\textsuperscript{114} with gold, silver and precious stones. During the epic age, 'both males and females delighted in wearing ornaments and richness of India in precious stones and metals and in pearls enabled them, perhaps engendered in them the desire to wear ornaments in profusion'\textsuperscript{115}. The skilled artisans of the Rāmāyanic age made beautiful articles of decoration with metals and jewels to enhance the beauty of the person and place. The epic refers to various ornaments made of gold and silver studded with precious stones such as Mukūta, Kirīta, Cūdāmaṇī, Kuṇḍala, Hāra, Hemaśūtra, Hastābharaṇa, Valaya, Śrōṇīśūtra (girdle), Nūpura (anklet)\textsuperscript{116} etc. Besides ornaments, vessels, plates, disks, jugs, coins and idols were also made of gold and silver\textsuperscript{117}. The Rāmāyanā presents a very luxurious lay-out of royal palaces containing seats and couches made of ivory, gold and silver\textsuperscript{118}.

India occupied a leading position in the industrial world of the past. Although direct informations for mineral based industries are meagre in the Rāmāyanā. It is obvious from the study that industrial activities were carried on as small scale industries in those days. The blacksmiths supplied various articles needed in human life from the fine needles
and razors to the sickles, plough shares and weapons. Goldsmiths worked in gold and jewels and ministered to the needs and fashions of the gay and rich. The epic mentions a long list of different types of artisans and cottage workers from which we can deduce a developed state of the small scale industry and high craftsmanship\(^{119}\).

The above study of the biotic and mineral resources indicates that people of the Rāmāyāṇic age were progressive and their achievements were quite scientific that give us a clue to their ancient technology.
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20. Ἐμ. III.69.8-9.
21. Ἐμ. III.73.31-32.
22. Ἐμ. III.73.3-5; III.75.16-25; IV.1.75-83.
24. Ἐμ. III.35.13, 21-22; VI.4, 105; VI.22.56-59.
25. Vide Ἐμ. II.50.22; II.55.8, 32; II.89.21; II.92.39;
    VI.4.71-81; VII.62.3; VII.64.7; VII.67.13.
26. Ἐμ. I.30.9; I.46.10; I.48.25; I.73.23; II.4.23; II.14.35;
    II.15.7; II.104.8.
27. Ἐμ. I.73.23; II.4.23; II.14.35; II.15.7; II.103.29;
    II.104.8; III.11.50.
28. Ἐμ. I.3.2; I.30.9; I.46.10; I.48.25; II.6.3; II.27.7;
    II.23.22; II.30.12; II.38.3; II.50.44; II.52.93; II.61.17;
    II.67.20; II.94.24; II.99.6; I.28; II.111.13.15; III.11.21;
    III.68.32; VI.89.73; VII.32.6; VII.42.13; VII.56.6-7;
    VII.109.4.
29. Ἐμ. I.4.22; I.36.18.
30. Ἐμ. II.28.22; II.30.12.
31. Ἐμ. II.30.14; II.91.29; III.16.20; III.42.21; III.44.9;
    III.68.33; IV.1.8; V.1.3; V.2.6; VI.43.17; VII.42.14.
32. Ἐμ. II.30.12; VII.16.1-2; VII.35.22.
33. Ἐμ. IV.18.6.
34. Ἐμ. V.14.43; V.15.1-15; V.61.8; VII.42.1 ff.
35. Cf. Ἐμ. II.91.29-31, 65.
36. Ἐμ. II.20.32.
37. Vide Rām. I.4.25; II.14.34; II.39.41; II.52.6.9; II.71.29; II.76.14,19; II.91.75,77; V.10.39.41,43-44; V.17.23; V.27.33.


40. Rām. II.7.3; V.5.13; V.10.8.

41. Rām. II.91.74-75; VI.74.33; VI.101.32.

42. Rām. II.56.8; V.Cantos 61-62.

43. Rām. V.11.23.

44. Cf. Rām. II.63.27; II.64.34; II.119.21; III.1.5,7,17,22; IV.1.116. N.B. The various fruits (or fruit trees) mentioned in the Rāmāyāna are: Amra II.91.30, Kadali - III.42.13, Badari - II.55.8, Bilva - II.56.7, Jambu - II.91.51, Nārikela - III.35.13, Kharjūra - III.15.16, Panasa - II.91.30; Āmalaka or Āmalakī - II.94.9; Tāla - II.91.50; Tinduka - III.11.74; Priyāla - II.94.8; Kapittha - II.91.30; Bijapūraka - III.60.21; Kesārī - II.94.9; Madnūka - III.11.74.

45. Rām. III.1.7.

46. Rām. II.91.29,79.

47. Rām. I.4.22; II.103.29; III.43.20; VI.126.4; VII.1.15.


49. Rām. III.14.6-33.

50. Rām. II.100.41,47.

51. Rām. II.83.15.

52. Rām. I.14.50; VII.53.8.

57. Rēm. I.25.15.
58. Rēm. VI.123.44 and I.14.30 respectively.
60. Rēm. VI.129.74.
61. Rēm. VI.83.3; II.70.29 and I.74.4 respectively.
63. Rēm. I.6.22.
64. Rēm. II.70.29; II.82.32; VI.10.18; VII.25.36.
65. Rēm. II.69.15,16 and II.70.23 respectively.
67. Rēm. VI.73.11; II.70.23 and VI.57.31 respectively.
69. Rēm. II.72.2.
70. Rēm. III.43.36.
71. Rēm. II.15.34; II.70.20; V.9.25; V.13.15; V.14.6; VI.35.32.
72. Rēm. I.5.21; I.8.24-25; II.25.19; II.29.3; II.93.1-2;
    II.95.5; III.4.3; III.11.4; III.43.11-12; III.46.29-30;
    III.57.2-3; III.73.35,39; V.68.26; VI.10.11-12.
73. Rēm. II.52.102.
74. Rēm. II.15.34; II.95.3; II.103.43; III.11.3; III.47.47;
    III.73.12; III.75.12; VI.10.19-20; VI.17.28; VI.73.12;
    VI.89.37; VI.95.44.47; VI.103.20-22; VI.106.22; VI.108.11;
    VI.110.26; VII.6.55-58.
75. Rēm. V.36.8; V.37.47; V.56.41; VI.4.93; VI.7.20; VI.21.
    17-19; VI.22.28-29; VI.59.35; VI.69.66; VII.7.3,7.
76. Rēm. III.51.27; III.68.13; III.73.14-15.
75. Ṛēm. III.73.14.
76. Ṛēm. II.46.17; II.49.11.
77. Ṛēm. I.6.22.
78. Ṛēm. I.6.23,25; II.36.8; III.4.3; III.11.4.
79. Ṛēm. II.39.15,18; II.70.23,29; II.82.32; III.31.34;
    III.35.4; VI.10.18; VI.51.30; VII.25.33.
80. Saxena, D.P. (1976), op.cit., p.84.
81. Ṛēm. I.5.21; II.93.2.17; II.95.5; II.96.6,30; II.103.41-42;
    III.73.35-39; VII.31.20.
82. Ṛēm. II.95.3; II.103.43; III.11.3,6; III.73.12-14;
    III.75.30; IV.1.7,22 ff.; VII.31.21.
83. Ṛēm. II.14.35; II.15.7 and III.47.43 respectively.
84. Ṛēm. III.21.2; III.36.3; VI.47.18; VI.61.10.
85. Ṛēm. II.119.19; III.10.6.
86. Ṛēm. II.56.28; II.96.1-2.
87. Ṛēm. II.56.28; III.11.57 ff.
88. Ṛēm. III.73.13-14; IV.40.28.
    Study of the Vālmīki Rāmāyana, p. 236.
90. Ṛēm. II.3.11; II.15.5; III.1.7; III.74.32.
91. Ṛēm. II.91.76; III.46.3; VI.19.12.
92. Ṛēm. VI.75.9.
93. Ṛēm. II.3.10.
94. Ṛēm. I.14.50 and VI.95.27-28 respectively.
95. Ṛēm. II.80.1.
96. Ṛēm. II.80.1.
97. Ṛēm. I.14.54; I.37.19; II.20.51; III.64.72; I.37.20 and
    III.47.46 respectively.
98. ād. 11.61.9; 11.91.44; 11.32.9; VI.77.3; VII.13.4; 
III.35.23 and III.42.16 respectively.
99. ād. 11.35.13; 1.37.10,18; II.94.4-5; II.103.4; III.75.25.
100. ād. III.15.15.
102. ād. VI.69.84.
103. ād. II.63.19.
104. ād. III.43.32.
N.E.B.I., p.114.
106. ād. II.100.45.
108. Regional Plan for Bandra-Hanuman Region, Town and Country 
110. ād. 11.28.3-19; 1.27.12; 1.56.5-12; III.29.15; III.22.
13-19; VI.6.16-17; VI.31.22-23; VI.79.4-5; VI.86.21-23;
VI.55.23-26.
111. ād. I.4.23; II.14.12; II.20.32; II.32.29,31; II.36.25;
II.103.3; III.4.27; III.47.41.
112. ād. II.31.30; II.99.20; III.20.6; III.25.8; III.26.10-11;
III.44.1; III.51.10.
113. ād. V.6.4,6; VI.95.30-31; VI.102.10-11.
114. ād. V.72.23; VI.106.2.
115. Vaidya, C.V. (1933) Epic India, p.133.
116. ād. I.6.10; I.14.18,34; II.32.5; II.43.14; II.60.19;
III.5.15; V.10.33; V.58.103-104; V.66.1-5; VI.65.29;
VI.128.10.
117. Rēm. IV.50.34; I.16.21; II.9.49; VI.112.12; II.72.22 and VII.31.42 respectively.

118. Rēm. II.10.14; II.16.8; II.19.17; II.32.5; II.72.2.11; IV.30.33; VI.10.11.