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## **UNIT 3 ENVIRONMENT AND EARLY SOCIETIES II**

### **– RIVER VALLEY CIVILIZATIONS**

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### **3.0 OBJECTIVES**

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In this Unit you will learn how:

- humans adapted themselves to changing environmental conditions corresponding to different regions;
- humans gradually acquired more and more information about their environs and ecosystems;
- domestication and dissemination of plants and animals facilitated greater communication among early human societies; and
- human intervention transformed physical environment.

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### 3.1 INTRODUCTION

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Human advancement in ancient period was dependent on exploitation of natural resources. In prehistoric times human communities were heavily dependent on nature for food and shelter. Their settlements were located on river valleys or near lakes or streams since dense forests could not be cleared due to lack of required tools. In Neolithic period they started to domesticate plants and animals and adopted a sedentary lifestyle. With advent of Chalcolithic age technology of smelting metal ore and crafting metal artifacts was discovered. Copper became first metal to be used. This was an important development in evolution of human societies. On river plains of Indus and Ghaggar-Hakra region in c. 2600 BCE many sites of first urban civilization of Indian subcontinent came into existence with characteristic features of:

- 1) town planning (fortified and classified cities),
- 2) brick structures,
- 3) public buildings,
- 4) road planning,
- 5) drainage system,
- 6) house planning,
- 7) weights and measures system,
- 8) pictographic writing system on seals,
- 9) diversified crafts,
- 10) long-distance trade and commerce, and
- 11) use of bronze.

By c. 1500 BCE urban settlements gave way to rural and tribal communities in Gangetic plains. Migration of Aryans caused agricultural colonization of wetter river valleys. From 6th century BCE North India witnessed formation of 16 major territorial states called mahajanapadas which was marked by advent of second urbanization, introduction of metallic currency and more complex society. Out of these mahajanapadas in middle Gangetic plains Magadha metamorphosed itself into an empire under leadership of Bimbisara of Haryanka dynasty. This transformation can be credited to its rulers' ability to tap water, forest and mineral resources to their advantage. As societies transitioned from pre-state to state the interface between humans and environment became increasingly more and more dynamic. In following sections you will gain historical understanding of interaction between environment and humans and how this affected historical processes.

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## 3.2 CLIMATE CHANGE AND HUMAN MIGRATION

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To begin with, you will now look at how there was a correlation between climate change and human migration in evolution of human settlements and decline and so, human activities were dependent on environmental factors. Significant deterioration in Indus valley civilization was seen after c. 1900 BCE. The decline has been explained by various archaeologists and historians, proposing a number of rationales behind the downfall.

- ☐ Aryan invasion by Mortimer Wheeler (debunked now)
- ☐ Earthquake (Robert L. Raines and Dales)
- ☐ Flood (Mackay and S. R. Rao)
- ☐ Change in river course (H. T. Lambrick, M. S. Vatsa and George Dales)
- ☐ Ecological disturbance (owing to deforestation)
- ☐ Climate change (As per recent paleoclimatic studies)

Climate change has been accepted as the reason for decline in other early societies too –Mesopotamia, Egypt and northern China. Evidence of drying climate is strong during middle Holocene in South Asia. From Mature to Late Harappan period, sophisticated urban centres in floodplains of Indus were abandoned and people migrated from west to Ghaggar-Hakra in east. By 1900 BCE major sites of Indus valley such as Harappa, Mohenjodaro, Chanhudaro, Kot Diji etc. were entirely abandoned. Around 1800 BCE there was an increasing number of smaller village settlements in foothills of Himalayas and Ganga-Yamuna doab (interfluvium). Recent studies by IIT Kharagpur, Woods Hole Oceanographic Institution (WHOI), Massachusetts, and other such institutions explain this gradual shift in terms of gradual southward shift of Intertropical Convergence Zone (ITCZ) over last 7,000 years which resulted into monsoon failure, affecting agriculture adversely. Indus valley civilization had developed water conservation techniques to deal with scarcity of water but continuous shift of ITCZ compelled them to migrate gradually as aridification of the region persisted. Increase in grasslands and vegetations that flourished in arid regions along with decreased monsoon and drying up of rivers made cultivation difficult. Altering regional ecology was no longer in a state to sustain economy of the civilization. Consequently, people started to disperse. This territorial shift made them one of first climate migrants or climate refugees. Change in physical environment persisted and so were migratory movements. During 1st millennium BCE Indo-Aryans who were small groups of nomadic pastoralists migrated from northwest regions of South Asia into Gangetic plains, took on farming techniques of existing communities and interacted with land and environment there. Thus, recent studies reveal that climate has been playing critical role in progress of human societies since beginning. Now let us understand how humans began to manage natural resources, what kind of innovations and institutions were introduced for their exploitation etc.

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### 3.3 WATER MANAGEMENT

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Water is source of life in our ecosystem. Many earliest settlements were established near rivers because they were source of steady supply of drinking water, easy transportation and fertile soil for cultivation of crops. Thus, water was one of crucial factors in rise of early societies. Studies on water management system in proto-historic India highlight hydraulic knowledge of people. Harappan civilization, as a riverine civilization, developed and flourished in Indus valley which was a fertile tract of land owing to biannual inundations of Indus, the longest Himalayan river. Its floodplains provided easy access to clays which are found in abundance in such areas. Clays were used for making bricks to construct structures. In Mature Harappan period at sites like Mohenjodaro trapezoid bricks were used to line wells (some of which were as deep as 15 m.) to prevent inward collapse. This was a remarkable feat. Harappans had developed sophisticated drainage and waste water management systems. Great Bath of Mohenjodaro is regarded as one of earliest public water tanks of ancient world. At Mohenjodaro houses had baths and toilets, elaborate sewage system and water in over 700 wells. At sites like Lothal and Inamgao small bunds were built to harvest rainwater. Lothal, situated along Bhogava river (a tributary of Sabarmati), was Harappan port-town with a tidal dockyard which promoted maritime trade.

On the other hand, situation in Rann of Kachchh, with no major river and fertile cultivable land, was different. Several geological studies reveal that different environmental conditions were prevalent here in the past and climate was little more congenial than it is in present. However, it is interesting to note that Harappans created very big settlement in this arid zone in order to exploit raw materials such as semi-precious stones and other mineral products that they were extracting from Gujarat. Archaeologists are of the opinion that it was to control movement of such products that Dholavira was established in Rann of Kachchh. It appears that the area was probably a navigational channel, facilitating safe harbours for maritime trade with Gulf region as well as internal trade through riverine route. Harappans at Dholavira had developed complex water management system on large scale in order to make it sustainable. It was bracketed by two seasonal streams:

- 1) Mandasar
- 2) Manhar

Dams were built on these rivulets which caused water to flow into the city, filling the reservoirs. It also had several inter-connected huge tanks in order to collect and store rainwater. Additional rock-cut reservoirs with stepped wells have been found too. Nearly about 15-25 % of Dholavira was allocated water storage. However, there are historians who believe that water management system of

Harappans may have contributed to downfall of the civilization. Shereen Ratnagar postulates that Indus alluvium was hardly suitable for intensive farming and lift-irrigation possibly led to over-reaching of its ecological limits.

Museum Exhibit Plaque with Images of Water Management System such as Water Reservoir, Well, Underground Drain etc. at Dholavira. Source: Sulabh International Museum of Toilets, New Delhi. Image Courtesy: Dr. Richa Singh.

Like Indus valley civilization in Vedic age too rivers were important and it thrived in western Gangetic basin. Aryans considered water as a symbol of spiritual purification. There are Vedic hymns addressed to Varuna, god of water. Rig Veda describes geography of early Vedic period, providing valuable information with respect to five major sources of water e.g. rivers, lakes etc. It mentions names of about 30 rivers. Indus (Sindhu) is most mentioned river with its tributaries (Shutudri, Vipasa, Purushini, Askini, Vitasa etc.). Rig Veda makes mention of water-lifting devices such as *asmachakra*, probably a wheel made of stone used for drawing water from deep wells. *Ghatayantra* or *Udghatana* was another type of water-lifting device in which a drum-shaped wheel attached to a number of *ghatas* (earthen pots) was used to lift water. *Atharvaveda* refers to hydromodification and how to make new channels from rivers. By 5th century BCE we have references to mechanical devices worked by animals such as bullocks. *Ashtadhyayi* of Panini refers to *Yugavaratra* i.e. “yoke and rope by which bullocks were driven for raising water”.

Settlements located at confluence of rivers gave boost to economy. Magadha ruler Udayin shifted capital from Rajgriha to another strategic location Pataliputra which was located at confluence of three rivers viz. Ganga, Son and Punpun while a fourth river Ghaghra joined Ganga near Pataliputra. Ganga and Son surrounded the capital on north and west and Punpun on south and east. Thus, the capital came to be regarded as *jaldurga* (water fort). Rivers also facilitated natural means of irrigation and fertile alluvial soil of the region contributed to agricultural surplus production. Plateau soils of south Bihar were not as productive as *bhangar* and *khaddar* soils of the north rich in silt and sand. It also resulted into growth of trade and commerce as the use of rivers for transportation was cheap and fast. Thus, rivers became important for commerce and communications. Since there were not enough roads built, therefore, men and material were moved by boat. This enabled Magadha rulers to establish commanding communications on all sides.

Further developments were seen in water management system by time of Mauryan empire. *Arthashastra* of Kautilya mentions techniques for measuring rainfall in different regions. Crops were sown in these areas depending upon amount of rainfall they received. It also describes water divining, water-lifting devices and several irrigation techniques. From Indus valley civilization we do not gather much information about water-lifting devices, barring a very crude and

plain device of leather pouch which was pulled by a pair of bullocks out of a well. Mauryans introduced much sophisticated ones. Kautilya informs that cultivators had to pay tax in kind for using water. This irrigation cess was called *udakabhaga*. If they used irrigation facilities provided by state the tax imposed on them was high and if they used water structures built either by themselves or by local communities the tax was relatively low. Remission of taxes for five years was granted to those who undertook irrigation works like digging of lakes, building of tanks, etc. Pushyagupta, governor during reign of Chandragupta Maurya, built Sudarshan lake in present-day Gujarat. Later, Junagadh inscription of Rudradaman, inscribed in 150 CE, informs that it was repaired by Rudradaman, the Shaka ruler, because due to severe floods a breach was caused in the embankment. In 455 CE the embankment was breached again because of floods. Chakrapalit restored it by order of Samudragupta. Under Guptas large-scale irrigation works were carried out.

As the state was able to exercise greater control over water bodies more and more diverse water management techniques proliferated. It was because of irrigation works encouraged by state, Karl August Wittfogel (influenced by Karl Marx) in his book *Oriental Despotism* came up with hypothesis of hydraulic empire or water monopoly empire, according to which a hydraulic society maintained power through control over water resources by providing irrigation facilities. As per Wittfogel this could be accomplished only by despotic state and this was one of the characteristic features of Asiatic mode of production. However, validity of this theory has been questioned by a number of historians like R. S. Sharma, Romila Thapar, Irfan Habib etc.

In south India Sangam literature throws light on irrigation technology in Tamilaham and location and construction of tanks, water-lifting devices, sluices and channels. Early Chola rulers attempted to harness natural sources of water. Karikala Chola, first and most famous early Chola ruler, built Kallanai (the Grand Anicut) dam in order to control overflow of banks of Kaveri river which was major river of Chola kingdom. The river water was utilized for irrigation purpose. The dam was built with stones. Afterwards, Kalabhras, Pallavas, Pandyas and Cheras and imperial Cholas (in Kaveri basin) too promoted construction of several reservoirs and tanks. Mahendravarman Pallava I (600-630 CE) built several irrigation tanks e.g. Mahendra tatakam at Mahendravadi. Pallava engineers who were skilled in construction of tanks and dams were known as *jala sutradas*. State also encouraged involvement of local people (individually or collectively) in hydraulic works. Thus, human interaction with nature gradually led to human intervention, impacting physical environment.

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### 3.4 FORESTS

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Forests formed one of essential sources that supported human societies which made them vulnerable to exploitation. Historians like Shereen Ratnagar point out that Bronze Age Culture of Harappans may have caused ecological destruction.

To make copper and bronze large quantities of timber are required which possibly caused destruction of surrounding forests. Besides, Harappans were extensively engaged in production of jewellery made of glazed faience. They also made baked bricks, pottery, stoneware, boats, furniture etc. and were involved in trade – both inland and maritime trade. All these activities required wood consumption on large scale. Instances of deliberate deforestation are evident in Vedic age too. It was the result of torching of forests by Aryan settlers as they began to shift from nomadism to sedentary agriculture that their agrarian settlements expanded in Gangetic plain. The expansion helped in transformation of janas (units of tribal people) of the early Vedic Age into janapadas (small territorial units under janas) of later Vedic age and then into mahajanapadas (large territorial units) in 600 BCE. Shatapatha Brahmana narrates the story of an Aryan chieftain named Videgha Madhava who with assistance of Agni (god of fire) moved from Saraswati to Sadanira river (modern Gandak) and the region was named after him (first Aryan colonizer) which later evolved as one of important republican state of Vajji i.e. Videhas of Mithila during mahajanapada period.

During Vedic period forests were viewed as abode of spiritual solace and of ascetics and sages where they could immerse themselves in deep meditation and gain spiritual wisdom and insight. It was the time when concept of vanaprastha ashrama came up as part of Vedic chaturashrama system i.e. four stages of life:

- 1) brahmacharya (celibacy),
- 2) grihastha (married life),
- 3) vanaprastha (when a householder retires to forest for contemplation), and
- 4) sanyaas (ascetic life).

Sages contemplated deeply in forests and it was in forests that Aranyakas were composed. Sages built ashramas there which led to proliferation of aranya sanskriti (forest culture). In age of mahajanapadas Buddha attained enlightenment while meditating under a bodhi tree in Uruvela forest. He delivered his first sermon at a deer park in Sarnath. Likewise, Mahavira meditated under a sal tree and attained kaivalya. In fact, in Jainism it is believed that all tirthankaras gained kaivalya under a tree and this way trees became associated with them. These trees are called dikshavriksha (tree of awakening).

However, forest dwellers who were dependent on forest for their survival were projected differently. Vedas while making distinction between grama (village) and aranya (forest) describe grama as orderly and known space whereas forest is portrayed as disorderly and unknown. Inhabitants of these regions differ too. Forest dwellers were called wild and strange. This conception persisted and as process of urbanization propelled they were more and more depicted as culturally and socially backward. According to Romila Thapar forests as peripheral regions were often seen as buffer zones by Mauryan empire. They did not come under direct administration of the empire. Resources of forestlands were obtained by

state through atavikas (forest-dwellers). Their practices differed from those of settlers. The latter viewed atavikas as unpredictable while atavikas considered settlers as invasive. Arthashastra advises that atavikas were to be dealt with diplomatically and if required, appeased.

Forests also provided game, forage, timber, fuel, elephants, semi-precious stones and other such wealth. Elephants were crucial in formation of strong army. They were used in storming fortresses, in marshy regions and other areas where roads and means of communication were lacking. Magadha army employed use of chariots made of woods. Before use of burnt bricks, houses and palisades were built of timber and stones. In Mauryan period too principal building material was wood. Ashoka in his edicts declared, “forests must not be set on fire either wantonly or for destruction of life”. Fines were imposed for destroying trees, sacred groves and forests. Therefore, attempts were made to protect forests but simultaneously, their exploitation was evident too for advancement of human societies.

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### **3.5 ANIMALS AND PLANTS: DOMESTICATION, DIFFUSION, DEVOTION AND DEFENCE**

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Apart from forests, animals and plants and their domestication, dispersal and control constituted important elements to understand human-environment relationship. In this section you will look at how biota in early societies was managed by human agency. Let us first examine how animals contributed in formation of social structure of human societies and structuring human relations with environment.

#### **3.5.1 Animals and Social Structure**

Harappans domesticated a number of animals such as:

- 1) oxen (both humped and unhumped zebus),
- 2) buffaloes,
- 3) goats,
- 4) sheep,
- 5) pigs etc.

Wild animals like tigers, elephants, rhinoceros and deer were known to them. They were illustrated on their seals. Vedic people were cattle herders. They needed fresh pastureland for their cattle and especially for their horses because unlike cattle, horses while grazing pull up roots of grass as a result of which it does not grow back quickly. Also, because agriculture was not mainstay of the economy they did not grow fodder crop. Therefore, they had to keep moving from one place to another in search of pastureland and had no sedentary lifestyle. They were nomadic tribes. Chieftain was called gopajanasya which implied that

he was protector of the tribe and its cattle and not defender of any territory. The term for war in Rig Veda is gavishti which means to search for cows. They fought mainly for possession of more and more cattle and for pastureland. In early Vedic culture prosperous men, called gomath, were those who possessed several cattle. Thus, utmost significance was given to cattle as they formed backbone of the economy. In Rig Vedic age Aryans had a god called Pushan who looked after cattle and was worshipped by his followers to find their lost livestock and rich pastures. But in later Vedic period Pushan became god of Shudras. This change happened because agricultural land became more important than cattle rearing.

Later Vedic phase also saw rise of elaborate sacrifices for kings such as:

- 1) rajasuya,
- 2) vajpaya,
- 3) ashwamedha etc.

In ashwamedha (horse sacrifice) a king with intention of expanding his territory set free a consecrated horse for period of one year to roam at will, accompanied by a group of king's soldiers. If the horse entered domain of other rulers and stopped they had to defend their respective territories. If the horse passed through a kingdom without any opposition ruler of the kingdom was to accept his subordination. Hence, through ashwamedha the horse became one of the means to exert political power. At end of the year the horse was escorted back to the capital where he was sacrificed along with 600 bulls. At conclusion of the ceremony 21 freemartins (sterile cattle) were sacrificed. Growing cult of sacrifices enormously enhanced position of Brahmins in society as many sacrifices were performed under supervision of Brahmana priest. Domestic rites with small sacrifices and ceremonial were also carried out. Taittiriya Brahmana which belongs to Yajurveda mentions 180 domestic animals for sacrifice. Ritual sacrifice of cattle caused destruction to cattle wealth and decline in per capita cattle holdings. Against such cults and rituals in mahajanapada period we find rise of Buddhism and Jainism which emphasized on ahimsa (non-violence).

Nevertheless, exploitation of animal resource persisted. However, we also come across instances where efforts were made to procure them in such a way that their natural habitats were not harmed in order to ensure their survival. Elephants were known to all early river valley civilizations of the world. However, population of wild elephants decreased drastically by 850 BCE in Mesopotamia and by 500 BCE in China while north African elephants became extinct by c. 300 CE. But elephant is still found in forests of India. As per Thomas R. Trautmann the reason why they could be preserved from extinction is because of elephant-king relation that existed in ancient India which helped in preservation of forest and environment. Rulers became dependent on employment of war-elephants in battles for defending and expanding their respective territories. But it was economically not feasible to raise them from birth since they require massive

quantities of food. Therefore, in a unique form of domestication they were encouraged to attain adulthood in their natural habitat which meant that forests were to be protected too so that elephants could multiply in large numbers. Besides, catching them was difficult and it needed great manpower. Hence, only kings could procure them. Much earlier, Atharva Veda refers to capturing of wild animals and training them. According to Charles Sintiapillai and S. Wijeyamohan the Dravidians of south India discovered the art of capturing and taming wild elephants much before Aryans in north.

Ashokan edicts also demonstrate attempts by the Mauryan ruler in preservation of animals. The edicts prohibited hunting and animal slaughter for religious sacrifice. Fifth pillar edict of Ashoka is considered one of earliest records of measures taken for conservation of wildlife in India. It contains a list of animals and birds which were not to be slaughtered on certain days. It also had another list of animals and birds such as pigeons, doves, ducks, lizards, tortoises, deer, rhinoceroses etc. which forbade slaughtering of certain animals and birds on any occasion. It also prohibited castration and branding of horses. Ashoka also ordered that chaff in agricultural fields were not to be burnt in order to protect insects and animals that may be living in it. He is said to have opened veterinary hospitals. Probably it was in times of Mauryas that Shalihotra Sambita was written by Shalihotra who is regarded as father of veterinary sciences in India. The Sanskrit text gives a description of anatomy, physiology, diseases, surgery and treatments of horses and elephants.

Nandas had 3,000 war-elephants. Chandragupta Maurya had 9,000 of them. Kautilya believed that destruction of an enemy army was dependent on elephants. Mauryan art of warfare influenced Greek art of combat. Each war-elephant in Mauryan army carried a mahout and three archers on its back. Chandragupta Maurya gifted 500 elephants to Seleucus Nicator, the Greek general, which he used against his Greek opponents in west Asia. He had each elephant carry four archers. Subsequently, his rivals too started using it as war-animal.

Likewise, for armies of dynasties in present-day Odisha – Kharavela and Eastern Ganga – elephants were very crucial. Cosmas, a 5th century Greek merchant in his account Cosmas Indicopleustes writes that Ceylon procured elephants through trade with Kalinga. Dantapura in Kalinga situated in maritime zone was famous for ivory. Archaeological excavations show that ancient Odisha had thriving ivory industry. In Tel river valley of southwest Odisha settlements were built along major and minor tributaries of Mahanadi river during late Iron age-early Historic period. Panini makes some indirect references to the region and its commercial activities. Recent archaeological findings of rhinoceros pendant, punch-marked coins with rhinoceros motif embossed on them show that the animal was found in the valley. Thus, animals and animal products were traded and location of settlements near water bodies made their movement much easier and profitable.

### 3.5.2 Botanical Exchanges

Between c. 2500 BCE and 100 CE plant transfers by means of human agency took place which transformed host societies and physical environment of these regions. Dissemination of domesticated plants across Indian Ocean between crucial territorial zones – eastern Africa, Arabia, southern Asia and Southeast Asia – may have reshaped agricultural landscapes of these areas. Long-term and continuous maritime interactions up to 18th century have been termed as ‘monsoon exchange’ or ‘empires of the monsoon’. Even though Periplus of the Erythrean Sea accredits Hippalus, a Greek navigator, for discovery of monsoon, we have adequate evidence from different regions of Indian Ocean World to show that before the advent of Greek and Roman navigators in Indian Ocean early sailors in the region were familiar with seasonally changing wind pattern because of which they could embark on long-distance voyages.

Below is the list of food plants introduced from Africa to Indian subcontinent:

| Food Plant | Introduced into Indian Subcontinent |
|------------|-------------------------------------|
|------------|-------------------------------------|

|         |                                                          |
|---------|----------------------------------------------------------|
| Sorghum | Indus valley in mature Harappan phase (c. 2500-2000 BCE) |
|---------|----------------------------------------------------------|

|              |                                                                                                                                                                                     |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pearl Millet | First domesticated in Tilemsi Valley (in modern Mali) and then dispersed to other regions including Saurashtra, Kachchh and Rajasthan in the late Harappan phase (c. 2000-1700 BCE) |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|               |                     |
|---------------|---------------------|
| Hyacinth Bean | Late Harappan Phase |
|---------------|---------------------|

|        |                                                                             |
|--------|-----------------------------------------------------------------------------|
| Cowpea | By end of the late Harappan phase in eastern Indus and upper Ganges regions |
|--------|-----------------------------------------------------------------------------|

|               |                  |
|---------------|------------------|
| Finger Millet | c. 1500-1000 BCE |
|---------------|------------------|

|          |                                                                                      |
|----------|--------------------------------------------------------------------------------------|
| Tamarind | Native to Sudan region. Its reference is found in Vedic literature from c. 1600 BCE. |
|----------|--------------------------------------------------------------------------------------|

Other food crops which were also brought to the subcontinent from Africa:

- ☐ Jumbie bead
- ☐ Horsegram
- ☐ Bitter melon
- ☐ Balsam apple
- ☐ Okra
- ☐ Niger noog
- ☐ Watermelon
- ☐ Cluster bean (it was possibly introduced to south India from Africa via Arab traders.)

Following are some of the food crops which dispersed from southeast Asia and Indian subcontinent to Africa:

- ☐ Banana
- ☐ Coconut
- ☐ Taro
- ☐ Water yam

By the time maritime trade with Greco-Roman world began in Indian Ocean exchange of precious commodities such as rhinoceros' horn, tortoise shell, spices, frankincense, sugar etc. brought different regions closer and Old World became more familiar with various combinations of native as well as introduced flora and fauna, bringing ecological transformations of various regions.

#### Check Your Progress Exercise 1

- 1) Assess the role of water resources in early societies and how human activities affected them.

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- 2) Write short notes on the following:

- i) Botanical exchanges before advent of Greek and Roman sailors in Indian Ocean
- ii) Videgha Madhava
- iii) Atavikas
- iv) Edicts of Ashoka and animal conservation

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### 3.6 AGRARIAN SOCIETIES AND URBANIZATION

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In this section you will read about process of expansion of human settlements and agricultural lands. Urbanization in ancient India occurred in two distinct stages:

- ☐ First Urbanization
- ☐ Second urbanization

Indus valley civilization with its planned and fortified cities introduced first urbanization in Indian subcontinent. Its agricultural technology was well developed too. Harappans grew lentils, mustard, bajra, wheat, cotton, millets and barley in floodplains of Indus. Rabi crops were sown after recession of annual floods. They were earliest to grow cotton for woven cloth. Furrows of ploughed fields at Kalibangan have been discovered which is believed to have belonged to Pre-Harappan level, indicating that fields were ploughed and possibly they used wooden plough drawn by animals such as:

- 1) oxen, and
- 2) camels.

Terracotta models of plough from Mohenjodaro, Banawali and Bhawalpur have been unearthed. From existence of brick-built granaries at Harappa and Mohenjodaro it can be said that they produced agricultural crops in surplus. It seems taxes were collected in grain. Food surpluses supported increasing urban population. However, civilization collapsed without any traces of continuity in urbanization process. No urban centres survived.

Vedic economy was predominantly based on pastoralism and animal husbandry in which cattle were synonymous with wealth. Social organization was structured accordingly. People were engaged in:

- 1) undeveloped agriculture,
- 2) shifting agriculture, and
- 3) slash-and-burn agriculture.

In later Vedic period the nature of society was evidently changing. Agriculture became important and value of land was enhanced. But pastoralism was not shunned. We also come across use of iron during this period and there is evidence of iron-plough but iron agricultural tools were rare. Use of iron implements in agriculture became common during age of mahajanapadas.

From c. 600 BCE large urban settlements were built in Gangetic plains. This was first time since disappearance of urban cities of Harappan civilization that urban centres appeared; though this time they surfaced in different geographical setting. Eventually, second urbanization extended far beyond north India from c. 200 BCE to 300 CE. Older cities in Ganga valley viz. Taxila, Mathura, Kausambi, Varanasi, Ujjaini etc. continued to flourish while new urban centres in Bengal, Odisha, deccan and Tamilaham came into existence. Thus, unlike first urbanization second urbanization supported growth of many new cities and older ones continue to exist till today. However, it is to be noted that though several significant cities with diverse population and complex systems came into prominence yet non-agrarian urban regions continued to have links with agrarian milieu, since surplus produce from fertile agrarian lands was one of the important sources of revenue for state.

During Mauryan period the state attempted to restructure economy of agricultural lands whereas in peripheral areas. It did not establish its direct administration and so, in forestlands it restricted its affairs to tapping available resources through forest-dwellers. Large tract of fertile agricultural land was under direct control of king and it was called sita. Revenue from such state-owned lands constituted an important source of royal income. And to look after them a separate department of agriculture was created whose head was Sitadhyaksha. In pre-Mauryan period we find scanty references to state-owned big farms. Sitadhyaksha was responsible for procurement of quality seeds, their preservation and distribution. Kautilya classifies different crops into three:

- ☐ wet crops (kedara)
- ☐ winter crops (haimana)
- ☐ summer crops (graishmika)

He recommends Sitadhyaksha to grow them depending on availability of water and man-power and no delay in agricultural operations was to be tolerated. Thus, state through its officials was actively engaged in acquiring detailed information regarding agricultural activities and its applications. We observe greater control of state over natural resources. Kautilya mentions that gopas (village accountants or revenue officers) were allotted the task of maintaining accounts of five or ten villages and register:

- 1) cultivated (krishta) and uncultivated (akrishta) lands,
- 2) plains,
- 3) wet lands,
- 4) gardens,
- 5) vegetable gardens,
- 6) fences,
- 7) forests,
- 8) irrigation works (setubandhas),
- 9) pasture grounds,
- 10) roads etc.

Such records kept the state informed about resources in its territory. In post-Mauryan period middle-Gangetic plain was cleared of forests with use of iron so that rich fertile alluvial soil of the region could be cultivated. Since expansion of agricultural lands meant more state revenue, therefore, it received much support from the state. Expansion of human settlements and agricultural fields occurred at the cost of encroachment on forests because as we read earlier, forests were the source of timber for house construction, for smelting metallic minerals etc.,

leading to deforestation. Some historians believe that such anthropogenic activities caused ecological imbalance.

Concerning urbanization in south India it seems that Kaveri valley was settled by agricultural communities only in beginning of Iron age. In early historic period there was significant rise in settlements and advent of Sangam age. From Tamil Sangam literature we come to know that Tamilaham was divided into five physiographical divisions. These were called aindu tinai. Each tinai had its own characteristic climate, flora and fauna based on which was the occupation of settlers of a tinai. Their occupations, deities etc. were outcome of the environment they were dwelling in. Marutam (river valley) was most important regional ecology. It constituted agricultural lands in riverine delta zone. With means of natural and artificial irrigation paddy cultivation was encouraged. Both neytal and marutam tinais experienced rise of urban settlements. Neytal came into prominence in 1st century CE with rise of maritime trade in coastal region. Predominant feature of Sangam age was maritime trade which gave impetus to urban growth. As a result of this higher degree of urbanization was noticeable in neytal than in marutam in early phase. Thus, social structure in Tamilaham in Sangam era was impacted by its physical surroundings.

With formation of states we find rulers taking interest in deforestation for increasing state revenue and broadening its power base. For instance, in 2nd century CE Karikala Chola cleared forests for expansion of agricultural lands. He also provided irrigation facilities by harnessing waters of Kaveri. Hence, state managed natural resources and also expanded its bureaucracy for their management to exert its control and extend its influence.

| Tinai   | Description of geographical landscape             | Deity                                   | Occupation of inhabitants                                                   |
|---------|---------------------------------------------------|-----------------------------------------|-----------------------------------------------------------------------------|
| Kurinji | Mountains                                         | Murugan (god of war)                    | Hunting, honey collection                                                   |
| Mullai  | Forests                                           | Mayon (Vishnu)                          | Pastoralism and shifting agriculture                                        |
| Marutam | Agricultural land (very fertile) in river valleys | Indra (rain god)                        | Agriculture                                                                 |
| Neytal  | Coastal region                                    | Varunan (god of waters, a marine deity) | Fishing and salt manufacturing                                              |
| Palai   | Wasteland/desert (Sandy and arid)                 | Korravai (goddess of war)               | Robbery, loot and plunder (fought to recover stolen cattle or steal cattle) |

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### 3.7 MINERAL RESOURCES

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Discovery and tapping of mineral resources, especially metallic resources, proved crucial in evolution of early societies. Harappans developed new techniques of metallurgy and started using bronze and thus, the civilization is also called Bronze Age Civilization. But availability of tin was scarce. It was procured from

present-day Rajasthan, south Madhya Pradesh and Bihar and also from Afghanistan. And since bronze is an alloy of copper and tin, therefore, we do not find tools and implements which were mostly made of bronze. It was from early centuries of the Common era when trading relations with Myanmar and Malay Peninsula were established that bronze was being used on a large scale.

Use of iron transformed landscape of Gangetic valley. Iron has been seen by D. D. Kosambi, R. S. Sharma and other historians as one of causative agents and a technical determinant for agricultural expansion. Indus region comparatively received lower annual rainfall than the region in Gangetic valley. Western Gangetic valley received lesser annual rainfall than mid-Gangetic valley. Therefore, clearing of forest with thick vegetation required sturdier metal such as iron. Use of iron axe enabled Aryans advance further into mid-Ganga region where economy based on iron ploughshare and wet paddy cultivation promoted urbanization and eventual incorporation of janapadas into mahajanapadas. However, this proposition has been contested by historians who opine that agricultural surplus was a politico-administrative demand of the power structure. As per recent findings use of iron tools is datable to c. 1700-1100 BCE but their use did not cause any immediate development of urban settlements. It was only in c. 600 BCE that witnessed emergence of mahajanapadas. In beginning of Iron age important sites such as Atranjikhhera and Noh produced iron tools but mostly those were weapons and fewer agricultural implements. Nevertheless, use of iron impacted early human societies in major way.

Access to rich mineral ore deposits was essentially important, for it helped in making sophisticated tools used in fighting and agriculture. Magadha empire enjoyed advantageous geographical setting. In iron age the empire had an access to rich iron deposits near their first capital Rajgriha in Chota Nagpur region. Ready availability of iron ores aided in manufacturing iron tools especially for warfare which was not easily accessible to their rival kingdoms. Kautilya in Arthashastra mentions that Mauryan kingdom had complete control over mineral resources. This gave state its exclusive control over metallurgy works viz. manufacturing weapons and coins, salt and mines industry. Akaradhyaksha was superintendent of mines and had sound knowledge of mines, metallurgy, precious stones and gems. His major task was to reopen old and disused mines and open new ones. Arthashastra cites number of imposts and levies from urban regions as well as from mining operations (khani) apart from taxes collected from agrarian lands. In Tamilaham many iron-smelting sites have been found in Vallam tableland which is an important source of laterite iron. From iron Age probably, it was a source for entire Kaveri delta. Spread of iron technology helped in formation of chiefdoms which eventually evolved into states.

### Check Your Progress Exercise 2

- 1) How did the process of agrarianization and urbanization affect ecology of early societies in ancient India?

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 .....  
 .....  
 .....  
 .....  
 .....  
 .....

2) Match the following columns:

Column A      Column B

- |                                       |                                                      |
|---------------------------------------|------------------------------------------------------|
| a. Atharvaveda                        | i. River channelization                              |
| b. Aranya sanskriti                   | ii. Gives information on horses and elephants        |
| c. Shalihotra Sambita                 | iii. A gradual shift                                 |
| d. Territorial migration of Harappans | iv. Sages built ashramas in forests and lived there. |

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### 3.8 SUMMARY

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In early societies the location of settlements and subsistence-pattern were primarily determined by natural physical surroundings. River valleys or rich fertile plains created by a river and its tributaries were suitable regions for emergence of human settlements. Thus, role of rivers in diffusion of early societies can be seen considerable. Humans' struggle against nature in beginning was primarily towards understanding diverse natural forces and biota. With domestication of animals and plants efforts were made to propagate them so that they could be exploited for advantage of humans. Process of agrarianization and urbanization in early societies in north India were achieved in different phases through means of exploitation of natural resources. In Ganga-Yamuna doab semi-nomadic Aryan society was transitioned to agrarian economy during later Vedic period. Between c. 600-200 BCE a large-scale colonization of Ganga valley was evident. Expansion of iron-aided plough cultivation resulted into destruction of forestland and changes in existing pattern of resource use. Post-Vedic culture prospered in mid-Gangetic basin. Lower Gangetic valley and north Bengal came into prominence during Gupta period. Political entities fought over possession of these fertile river-valleys and plains. In south during Sangam age coasts and river-valleys prospered and contrasting geography impacted process of state formation here. Human activities transformed the topography. As environmental determinism played significant role in evolution of early societies human agency too had a role to play in transformation of natural surroundings. In struggle for existence anthropogenic activities were certainly influenced by environmental factors but also human activities began to affect physical environment.

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### 3.9 KEY WORDS

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**Hydromodification:** Through hydromodification human intervention is made in natural course and characteristics of rivers in order to manage water resources with objective of obtaining some defined advantages.

**Aridification:** Process of gradual alteration in the climate of a region from humid to increasingly drier climate.

**Environmental Determinism:** Study of environmental factors determining human activities and development of human societies. It does not take into consideration other factors such as human actions in evolution of societies.

**Physical Environment:** Physical factors such as land, water, climate, flora and fauna etc. that support human environment.

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### 3.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

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Check Your Progress Exercise 1

1. See Section 3.3
2. See Sections 3.4, 3.5 and 3.6

Check Your Progress Exercise 2

1. See Sections 3.2, 3.3 and 3.6
2. (a) - (i), (b) - (iv), (c) - (ii), (d) - (iii)

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