Environmental Science
Lecture 27

Wasteland Reclamation

What exactly is a wasteland? The National Wasteland Development Board (NWDB) has defined wasteland as degraded land which can be brought under vegetative cover with reasonable effort and which is currently underutilised and land which is deteriorating for lack of appropriate water and soil management or on an account of natural causes. In a particular country like India or anywhere in the world for that matter, as the population is increasing, there is a dirth for land. Only with land can people have houses, workplaces, everything. Inspite of having multi-storey buildings, skyscrapers, land has become a prized commodity. So, any land that is available on Earth which is considered a wasteland for a number of reasons or because of man-made causes like dumping of garbage in the image you see, typical of any urban city having hectares and acres of land just for using as a landfill or a dumping land. Over the years, it becomes a huge pile of garbage. Inspite of frequent clearance, this land is considered wasted and it actually becomes toxic in a while, if we do not intervene in between. All of this land is considered wasteland and if it can be brought be back with minimal effort relatively, it can be reclaimed into usable land which will be useful not only for the community but in the world as such, there will be more arable land where there will be more plants, trees, that will contribute to the environment. This is the wasteland map of India in 2011, you can see from the total land area, around 328 million hectares about 162 million hectares i.e 51% is agricultural land, 4% is pasture land, 21% is forest land and 24% is wasteland. When we are talking about dirth of land, 24% is a great percentage. We have to ensure that this 24% can be reclaimed to the maximum possible but it should not hamper the well being of the people who are going to use the reclaimed land.

Typical categories of wasteland in India - Gallis, Ravines, Upland with or without scrub, waterlogged and marshy land; land affected by salinity/ alkalinity in coastal and inland areas, Land under shifting cultivation, under utilized/ degraded notified forest land, Degraded pasture or grazing land, Degraded land under plantation crops, Shifting sands - inland/ coastal, Mining/ Industrial wastelands, Barren rocky/ stony waste/ sheet rock areas, steep sloping area, Snow covered and/or glacial areas. In all of these types that are available , only a few cannot be worked with and cannot be reclaimed. Many others can be utilized, all of the degraded and underutilized land can be with minimum effort, can be brought in to utilized arable land which will contribute to the community for usage of man as well as the environment in the longer run.

Causes of land degradation : use and abuse of our land resource

Over cultivation - more and more we think we can cultivate without giving the land a break, its going to become barren in a while. The fertility in the soil has to be restored, it cannot constantly be having crops, the land has to be allowed to rest for a while, so it can revamp on its nutrients. Deforestation is the main cause, used as fuel wood, shifting cultivation, Commercial timber exploitation, Clearing forests permanently for non forestry activities like human settlement, setting up industries, etc, Overgrazing, Improper irrigation practices.

Wasteland Reclamation - Reclamation of wasteland means reclaiming it or using it for any productive purpose. This process involves turning barren, sterile wasteland into something that is fertile and suitable for habitation and cultivation. India has shown an alarming rate of decline in the man-land ratio from 1.25 hectare per capita in 1921 to 0.48 hectare per capita in 1986 to 0.31 hectare per capita in 2011. We have to ensure that wasteland is reclaimed in the best way possible.

What is the need for reclamation of wasteland? It provides a source of income for the rural poor. It ensures a constant supply of fuel, fodder and timber for local use. It makes the soil fertile by preventing soil erosion as well as conserving moisture. The program also helps maintain an ecological balance in the area. The increasing forest cover helps in maintaining local climatic conditions.

Wastelands can be classified into three forms - Easily reclaimable, Reclaimable with some difficulty and Reclaimable with extreme difficulty. The easily reclaimable wastelands can be used for agricultural purposes. Wastelands can be reclaimed for agriculture by reducing the salt content which can be done by leaching etc. Gypsum, urea, potash and compost are added planting crops in such areas.

This is a very easy way of ensuring that the particular land is being put to use. With some difficulty certain wastelands can be reclaimed. They can be used for agro forestry. Agroforestry involves putting land to multiple uses. Its main purpose is to have trees and crops inter or underplanted to form an integrated system of biological production within a certain area. Thus, agro forestry implies integration of trees with agricultural crops or livestock management simultaneously.

This actually ensures that forestry means it's going to require less looking after. If it's going to be completely agriculture, the land has to be fertilized throughout, it needs to be monitored completely. It has to be reclaimed with a little more difficulty. It's better to combine forestry with agriculture because the part that's a forest will help restore the environment automatically, gradually. At the same time, agriculture and livestock will give an immediate relief as well. This is a typical example of agroforestry.

Reclaimed with extreme difficulty - Wastelands that are reclaimed with extreme difficulty can be used for forestry or to recreate natural ecosystems. Attempts to go trees in highly non alkaline saline soils have been largely unsuccessful. Field experiments have shown that species like Eucalyptus, Prosopis and Acacia nilotica could not be grown in highly alkaline soil. What happens with species like Eucalyptus is, it absorbs a lot of water. So, if there is a lot of salinity already in the soil, with water absorption, the salinity actually increases further and that in turn does not help in restoring or reclaiming the land. Studies have shown that if tree seedlings are planted with a mixture of original soil, gypsum, manure, better growth can actually be achieved. But it is very important to use indigenous species of trees so that the program recreates the local ecosystem with all its species. That is the main runner in this case. It has to be local indigenous species.

Method of wasteland reclamation - there are various methods by which wastelands can be reclaimed. Aforestation is growing the forest over culturable wasteland. For instance, a particular land can be completely arid and barren now because of series of deforestation, just be reclaiming it, plowing it through and planting trees there, simple step of aforestation can ensure that forest cover is restored. Deforestation is growing the forest again over the lands where they were existing and was destroyed due to fires, overgrazing, and excessive cutting. Reforestation checks waterlogging, floods, soil erosion and increased productivity of land. Reforestation is a better option because any place where the land is going to be used for agriculture, it needs a little more looking after as well. But here, when there is a vast area of land which are not approachable, it could be on slopes or hills, where agriculture might not be the best option but Reforestation suits best. Providing Surface cover, the easiest way to protect the land surface from soil erosion is to ensure that it leaves a crop residue on the land after harvesting. This actually means that if there is a rainfall or any other natural calamity, the top soil does not get washed away. Just before the next planting season, all of the residue can be removed.

Mulching - Mulch is basically a layer of material applied to the surface of an area or soil. In this protective cover of organic matter and plants like stalks, cotton stalk, tobacco stalks etc, which actually reduce evaporation, help retain soil moisture and also reduce soil erosion. You get mulch in different colours, even sawdust can be used for Mulch. All of these also act as beautifying aesthetic agents. Changing ground topography on down hills. Running water erodes the hill soil and carries the soil well along with it. This can be minimized by following alternation in ground topography. Strip farming is exactly what it is in the image. Different kinds of crops are planted in alternate strips along the different contour. Depending on the contour of the land, you can have different crops which will actually enable in holding the soil together. Here you have hay, oats and corn. It can be any three crops but it has to involve certain amount of

study that is involved to decide which two or three crops can be alternated. In this arrangement the Earth is arranged in the form of leveled terraces to hold soil as well as water. The terrace edges you see are planted with such plant species which anchor the soil. Contour ploughing in this arrangement. the ploughing of land is done across the hill and not in up and down style which is usually done. Rather than going up and down, it goes round and round around the hilly slope. Leaching, in a salt affected land, the salinity can be minimized by leaching them with more water or adding materials like gypsum. Changing Agricultural Practices like mixed cropping, crop rotation and cropping of plants are adopted to improve soil fertility.

Ecological succession, this refers to natural development or redevelopment of an ecosystem which helps in reclaiming the minerally deficient soil of wasteland.

What is the role of authorities in Wasteland reclamation? A massive campaign for increasing the land under productive use for fuel and fodder species needs to be launched. Voluntary efforts by farmers' cooperatives, NGO's and organizations should be fully recognized and assisted. Mining of land for house building material such as bricks can be reduced by developing alternative building materials. Use mad bricks as an alternative. Mud bricks have an advantage of low manufacturing cost, provides insulation and has good sound absorption characteristics. More than giving back, it is our responsibility to find out alternative materials or methods that we can develop in our everyday life that will reduce the impact or usage of natural resources.

NWDB has initiated a lot of new schemes that include; Grants-in-aid to voluntary agencies. Aerial seeding programme. Decentralizing People's nurseries, Silvi Pasture farms, Area oriented fuel and fodder projects, Rural employment schemes. In the silvi-pastoral system, improved pasture species have been introduced with tree species. In this system, grass or either grass legume mixture is grown along with the woody perennial simultaneously of the same unit of land. This is the best management marginal fertility. Along with this, grazing can also be started which ensures that over grazing doesn't happen because there are perennials and trees in between which act as blockades and the fertility of the soil can also be restored. Erosion of soil is removed, no longer a problem, topsoil will be restored and the general area, the air everything is going to thrive in that particular area.

Consumerism and Waste Products

One who consumes especially one who acquires goods or services for direct use or ownership, the most highest consumers are human beings. All animals and plants are also consumers, we aren't the only consumers but the maximum impact is felt only by human beings because species across the globe and in the ecology take only how much they need. The problem lies with us humans because of our greed, we end up taking more than what's necessary and that's the root cause of the imbalance in nature. For instance, plants cannot consume more sunlight

that what's required for photosynthesis. They can only do that much. Similarly, just because there is so much grass, a goat will not go eat everything, its going to eat only what fill its stomach. Similarly, any thing consumed, be it goods or services or things directly from nature, they are called consumers.

Moving on to the next step pertaining to human beings is Consumerism. Consumerism is related to the habit of constant purchasing of new goods with little attention to their true need, durability, product origin, or the environmental consequences of their manufacture and disposal. This is where the human beings sets in. It's no longer about what do we need, we have to get it either to make a fashion statement or play with, anything, this is something beyond our need sector and how do we go about controlling it. Anything that's unused or rejected, worthless or unwanted is classified as a waste product. Its basically means to an end, habitual consumerism, emotional regulation, emotional instability, early years , pleasure and pain. These sales, all of these marketing strategies, consumerism, all of these have a vicious circle in place. It will lead to habitual consumerism, it doesn't have a beginning, it will not have an end directly.

There are two types of consumerism that we have; Over population and People over population. Excessive population pressure causes degradation of the limited resources, and there is absolute poverty, undernourishment and premature deaths. This occurs in less developed countries (LDCs). Consumption over population, this occurs in more developed countries (MDCs). More the consumption of resources, more is the waste generation and greater is the degradation of the environment.

What are the typical problems created by consumerism? Today's many products produced are luxurious and are non-degradable which takes years to be decomposed. A high rate of consumption leads to pollution as well as a waste product.

How to calculate the impact? The typical equation we have is I = P*A*T. Where P is the population, A is the affluence and T is the technology. All of this gets multiplied to give us the final impact. Affluence of the Population times the technology that's available to the population. Statistics in India - consumer spending in India has increased to 15338.82 INR Billion in the fourth quarter of 2014 and this is just between the fourth quarter and the third quarter and it is a steep increase. Consumers spending in India averaged 8818.26 INR Billion from 2004 until 2014, reaching an all time high of 15338.82 INR Billion in the fourth quarter of 2014 and a record low of 4469.88 INR Billion in the third quarter of 2004. Even inspite of something called recession that happened, expenditure does not stop because of other economic related activities. When you think of consumerism, you might wonder how does it actually hamper the environment. It's good, people are spending money, the economy is thriving, people are gaining things. But in this process of gaining things, we are losing a whole lot. We are creating a lot of

waste right from packaging material. Even if you look at the manufacturing process, the more we buy irrespective of whether we require it or not, things are going to get manufactured and manufacturing takes places on a large scale, there is a lot of wastage of every product that is manufactured. There is so much energy that goes into manufacturing, let it be water, electricity, all of that gets consumed. When you think of a consumer spending money, its not his money or about him getting his product, the equation goes way beyond that one on one relationship. The environment is definitely intrinsically involved. Even though US comprises of only 5% of the world's population, it consumes 30% of the world's resources. In the past three decades, nearly one third of the Earth's resources have been consumed.

How to control this consumerism and redundant waste products? 1. Population, we need to control population growth. 2. Consumption - once we control population growth, the consumption rate would fall down on its own. 3. Technology - we should stop at this stage some of the irrelevant and unimportant products, in order to stabilize the environment. Population even though its easy to say rather than do it, its very difficult to curtail population growth as its constantly increasing. The only thing we can control is consumption and even consumption can only be controlled to a certain extent because certain things have to not be manufactured for people who stop consuming them. For instance, it was recently done for a particular touristic city where they decided no more plastic bottles are going to be permitted. You can use steel bottles and there will be RO purifiers and water available where you can refill it but marketable plastic bottles meant for use and throw purposes are prohibited completely. It only when such a measure comes into existence can water bottles be bought less. But if we just decide and tell people as a principle to not buy water and just refill their bottles, there isn't going to be much of a change. People will continue buying bottles according to their convenience. So there has to be a constant movement between consumption and manufacturing industries as well as governmental and non-governmental agencies should step up to keep a check on this.

Minimisation of waste - this is basically a process of elimination that helps reduce the amount of waste produced in society and helps eliminate the generation of harmful and persistent wastes, supporting the efforts to promote a more sustainable society. Waste minimisation involves; redesigning products or changing societal patterns, concerning consumption and production of waste generation, prevent the creation of waste, efforts to minimize resource and energy used during manufacture.

For the same commercial output, usually less materials are used and less waste is produced. Waste minimisation usually requires knowledge of the production process, cradle-to-grave analysis. This is where you have a sustainably management team attached to industries. This is basically where a management team comes into place in most industries as well as

manufacturing units and should actually keep a track on how the wastes can be minimized. They have to study the product analysis, it is not sufficient that products can be churned out by millions by trillions and used by everyone. Every product that's manufactured consumes energy and has to be kept on a minimal level. If it all the product is obviously useful and is going to be used, how can it be minimized in terms of wastage at a later point. If it is recycled, how do we go about recycling it, how do we educate people about using the product in the optimal level such that nothing will be wasted. Measures to control - Resource optimization, Reuse of scrap material, Waste exchanges, Durability.

Resource Optimization is minimizing the amount of waste produced by organizations or individuals, that goes hand-in-hand with optimizing their use of raw materials. For example, a dressmaker may arrange pattern pieces on a length of fabric in a particular way to enable the garment to be cut out from the smallest area of fabric. All this might seem trivial like who cares as long as we make money but overall as less fabric is going to be thrown away, that's going to be a lesser amount of wastage that's going to go the landfill even though cloth to the most extent is degradable it does take at least 20 to 25 years for cotton and other synthetic fabrics to completely disintegrate.

Reusing scrap material - scraps can be immediately re-incorporated at the beginning of the manufacturing line so that they do not become a waste product. Many industries do tend to do this, but more than an environmental point of view it is more budget friendly for them. For example, paper mills return any damaged rolls to the beginning of the production line, and in the manufacture of plastic items, off-cuts and scrap are re-incorporated into new products.

Waste exchanges - this is where the waste product of one process becomes the raw material for a second process. Waste exchanges represent another way of reducing waste disposal volumes for waste that cannot be eliminated. In this way waste exchange practices are high on the waste hierarchy. This is the most preferred method because certain items and products have to be manufactured. Certain byproducts from the petroleum industry like ash, fly ash, are being incorporated when making bricks and cement as polyzoic cement and concrete. All of these are typical examples of how it can be done.

Durability - Durability means your product needs long term needs resisting damage and stays relevant to users. Improving product durability can reduce waste and usually much improves resource optimisation. But in some cases it has a negative environmental impact. Older vehicles consume more fuel and produce more emissions than their modern counterparts. Even things like computers, cameras, the newer versions may consume lesser battery charge and need to be recharged less frequently as well as may consume less power. As and when technology

improves, we ought to keep ourselves updated. But at the same time, it doesn't mean every six months we keep changing things because each time a computer part, a camera part or anything related to technological part, is thrown out, all of that goes into a separate kind of landfill that's related to plastic, semi hazardous like batteries have mercury, heavy metals and things like that. Durability is a thing we need to think about and then work on.

Any other way to solve this problem is the 3Rs. Reduce consumption, recycle where possible and reuse where possible and recycle the materials that are getting consumed and wasted. Wherever possible, let's try to recycle.