Environmental Impact Assessment
Professor Harshit Sosan Lakra
Department of Architecture and Planning
Indian Institute of Technology, Roorkee
Lecture 4
State of Global Environment (Land and Soil)

Welcome to the course Environmental Impact Assessment. Today we will cover land and soil environment in our effort to understand the environmental status before we place EIA, you may note that for this module, we are referring report by the United Nations environment program titled Global Environment Outlook 6, Healthy Planet, healthy people, which was published in 2019.

For this session, we will particularly look at, and will walk through chapter 8 to understand land and soil environment the link to the report is also provided to you. Why are we looking at the land resource in particular? We see that land as a resource is very important, you may see that initiatives related to land resources necessarily help us to achieve many like 10 out of 17 Sustainable Development Goals with the land many concerns are connected. So, if you can think of food security, we get food from their resources for energy, fuel, and also ecosystem services.

One of the key and largest resources we draw from land is food. So, you look at this, the important significance of land as a resource. We use nearly 50 percent of the habitable land for food production. Further, as we all know, land has economic value and land rights have, has a lot of significance, because of the development opportunities, that come along with it.

And it is established there is unequal tenure of land meaning there is uneven holding of land, if you can think of how women in your family hold land compared to men. So, you can think about like how this, this variation of the ownership of the land in the society you see.

So, also we see that there is a clear and critical role of property rights in land resource management, and also, we can reflect on the role of rural inhabitants' people who live in the village, how they have an important role in conserving the land. And because of this, there, we are facing like this problem still exists. So, we are facing problems in attaining Sustainable Development Goals.

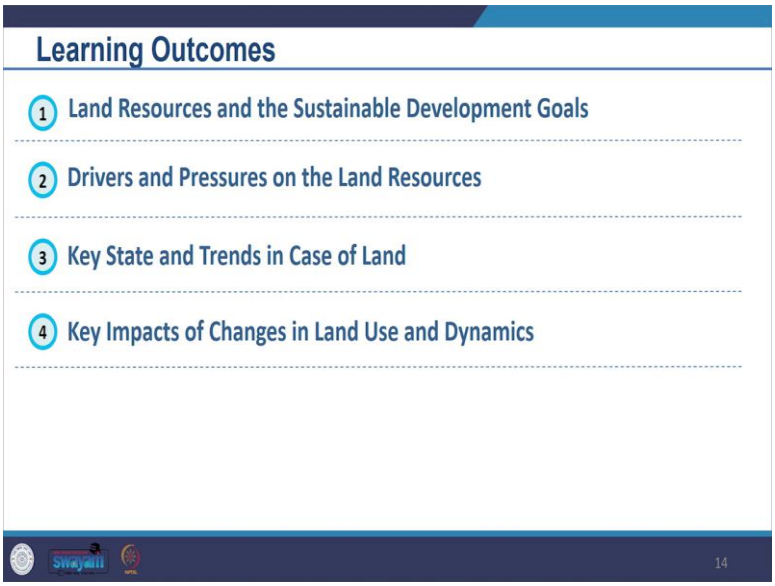
I think, if we do not have those protections, how we are going to protect against land displacements by powerful actors such as multinationals, and governments, so, how if people are not protected by land ownership, then how are we going to handle that also think of land resource degradation.

So, there is also degradation happening, we are witnessing, which is also leading to widespread migration and even conflict in many places. So, further, we see that as we all know, land has economic value, and the right to land has significance because of the development opportunities, there is massive deforestation with varying rates across regions. So, we see cases of deforestation as well.

There is also improvement in the forest cover in many regions, people are doing forestation. We also see builds of barriers, like you have been seeing in urban areas, all the infrastructure, what kind of constructions are coming up, they all are there which occupy the land.

We see that these built-up areas are relatively smaller, they cover lesser areas of land, but their impact is extensive like its footprint is much larger than how much energy we draw and how much resources we drive for the same area. There is also concern about food waste and loss at many levels. So, these are the concerns that we see when we talk about land as a resource.

(Refer Slide Time: 04:53)



So, therefore, the coverage will include we will look at linkages between land resources and the Sustainable Development Goals, and looking at drivers and pressures on land resources, you might see how we are going on looking at drivers and pressures for every individual resource we are discussing. Then, we will look at key states and trends in the case of land, like what is the scenario across the globe, and we will also parallelly look at the Indian context.

Then we look at the key impacts of these changes, what kind of changes are happening, how they impact us, how we are using the land, and then the dynamics involved. So, we look at food security, human health, land management, the tenure system, gender inequality, land, health and food, and so on. So, we will be looking at all these aspects today.

So, the expected learning outcomes. So, once you finish once you go through, the expected learning outcomes include that you should be able to review the land as a resource and then compare it and look at, it, from the perspective of Sustainable Development Goals. Further, you should be able to identify different drivers and pressures that are there are the land and you may see the complexity involved. And how do we use land as a resource?

Further, you should be able to list or state some of the problems and the trends when we talk in terms of land, and you should be able to review the impacts you should be able to identify the impacts, you should be able to review the impacts, what is happening with the land as a resource and then also look at the various other things which are connected with that.

(Refer Slide Time: 06:43)

So, starting with looking at the linkages between land resources and the Sustainable Development Goals, think of land and all the things it provides to us and also think of many things that are connected with land. So, think of, you have been in touch, you have been seeing around. So, you think about various things, what you get from the land and what opportunities you have.

So, the land provides us with many resources and services shelters us, makes our houses there, acts as property, and also gives us a cultural identity. So, from very basic needs to even social needs, which we see. So, the land provides us with food, fodder, fiber, and forest products. So, all these we get from the land.

(Refer Slide Time: 07:36)

We see land is closely connected with Sustainable Development Goals. So, we did talk about it. So, we see that it is connected, very much connected with sustainable development goals to where we intend to end hunger, achieve food security improve nutrition, and promote sustainable agriculture.

So, that is the target we are looking at and the very specific target for this school includes ensuring access to sufficient healthy and nutritious foods, especially for the most vulnerable groups. So, to achieve this, it will be very important to work on land resources to improve the conditions improve the status of land as a resource.

The main message, if you look at, the global environment outlook report, is that one thing major identification, which we have done is identifying that climate change has become an independent driver, which itself is bringing change to all the resources. So, that you may keep this in mind while we see many other resources as well.

So, furthermore, through SDG 2, we are trying to increase food productivity which makes our process more sustainable and resilient because of climate change. And we are also looking at improving the land quality

for future generations we are also looking at working on gender equality and then also working with other forms of inequality. And, which you see is linked with SDG 10

You must be also thinking of the terrestrial biodiversity land holds. So, you must have traveled a lot you must have seen most of the diversity or at least around you. So, it contains it holds a lot of terrestrial biodiversity. And so, it has a lot of value because that is the richness we have.

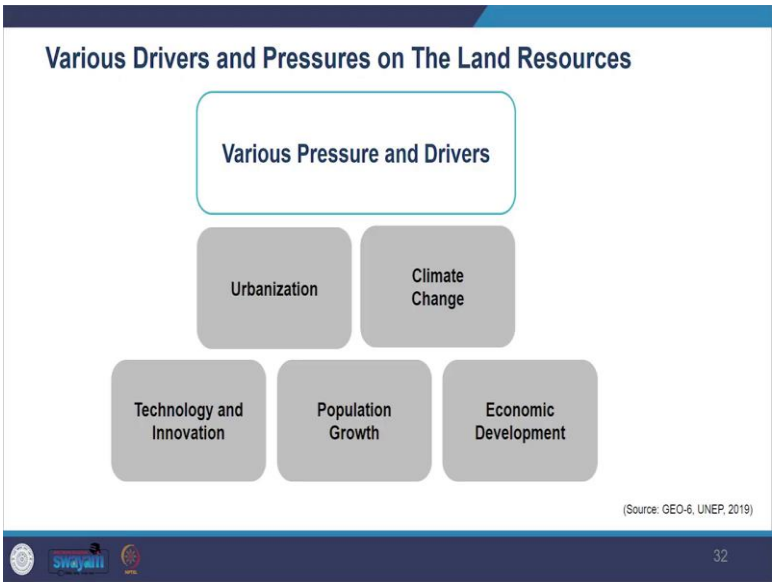
Also, you must be noticing rapid urbanization that is taking place with a much larger footprint and footprint of impact which you see, which you can conceptualize here or visualize here, you may also think of pollution on land. So, what kind of pollution is happening the garbage and waste, you see around the soil pollution you see around the waste, so, pollution of all kinds, which is impacting, impacting the physical health of the land, as well as our health, and then it is also influencing the functioning of the ecosystem.

So, land pollution is becoming an important pressure. So, that is increasing a lot. And it is a, it is like really creating pressure, we see all these are important concerns for SDG 3 and 15. So, you see, land is connected with many of the SDGs, which we are trying to attain. Also, reflect on our activities and how much pressure we exert on the land resources. So, our activities and the gain from it mostly give us short-term gain. So, when we do certain activities, for economic gains, or other gains, we see that those are short-term gains.

However, the impact is often long-term on ecosystem services. So, accordingly, according to the Millennium Ecosystem Assessment, we see that we are living beyond our means, meaning we are consuming resources at an unsustainable rate. So, we are consuming more, more water, more energy, more, more of all kinds of resources, which the environment offers to us.

So, we will be learning about this Millennium Ecosystem Assessment later in the methods part of the course. So, this is about linking with the SDG. Now, think of various drivers and pressures of land resources. So, you are familiar with this, but then we look at what these drivers are, and how they are influencing the land resource.

(Refer Slide Time: 12:16)



So, the first one you can think of, and it is very evident, and as seen in other cases, too is population growth. Population growth is majorly causing land use change and is a threat. Land use change has a major environmental impact, you think of the rate of urbanization in Asia, in African countries. It is, we are witnessing, rapid urbanization, and it is projected by the UN studies that by 2050 will be much more urbanized than any other place the rate of urbanization ours will be the highest.

So, think of the potential impact we might have on the environment, because of urbanization and think of the footprint of the impact. So, it also depends on the nature of the economy we choose. The impact depends on that. So, if for example, economic drivers can be resource intensive, like if you go for manufacturing and agriculture-intensive activity, then what we extract from the environment would be massive, as suggested, or it can be ter-tertiary, which is less resource oriented.

So, you may refer to the case of Ethiopia, because of the population growth and the aligned policy of the subsidy in northwestern Ethiopia, 62 percent of the woodland conversion was witnessed into cropland. So, see the range of conversion that is taking place, the land is a conversion that is taking place with high environmental costs, like all, like this dust, storm droughts, and severe soil erosion, what is happening there.

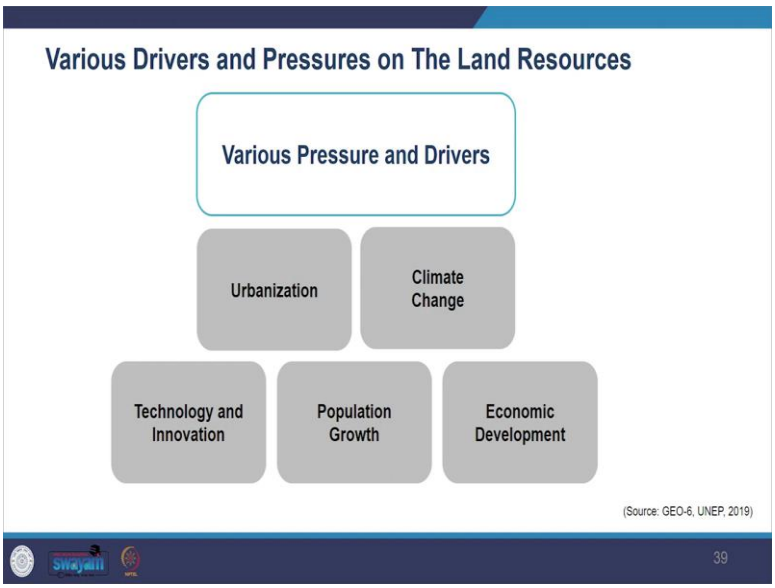
So, that was about the population because the population is increasing, and then how we have to change the land to accommodate that and to meet their requirements. Another key driver of land changes is urbanization, you see how much our cities are consuming in terms of water, food, and other resources.

Urbanization can have both positive and negative impacts on the flow of resources. How do we consume resources? So, it is not necessarily negative, but it can be positive depending on what ways we adopt to consume those resources. We also see rural-to-urban migration. Migration has multifaceted impacts, so on land use, so when people migrate this change in their diets, and that, and then we need more infrastructure to cater to those immigrant populations, we need more housing, we need more resources. So, that has an

impact on, how we decide to use our land, we also see that much of the increase in population in built-up areas has taken place in disaster-prone areas.

So, we see that people are more and more in terms of identifying places they have moved into the disaster-prone area regions, such as within moving very, very close to 10 meters above this sea level of low elevation coastal zones. So, people are moving and living there for their livelihood and other sake, and they are migrating to these places. So, that is another multifaced impact, which we see.

(Refer Slide Time: 16:13)



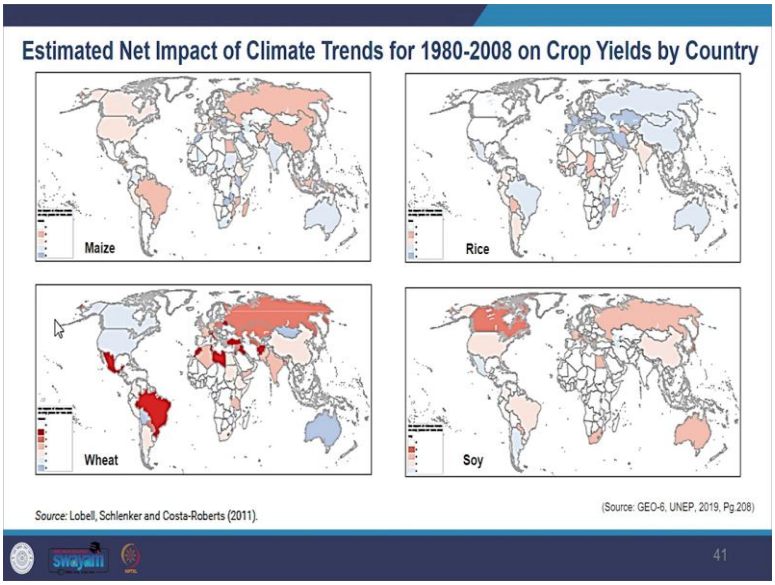
So, now moving on to another driver, we see that economic development also has influenced how we use the land. And due to globalization, we see increasing pressure on land systems and their functions. And because of this, there is landscape change. So, the way we are using or the way the landscape is is all that is changing. Also, because of global trends and money flows, we see a change in land use. So, what is more encouraged is being demanded by the global market, we tend to change the land use accordingly to fit the demand. So, that is about the economic driver.

We see another driver that is technology and innovation. So, technology has also brought a lot of change. It is both positive and negative. Technology changes the way, and the rate at which production takes place, the way we consume things. So, and because of it, the land use changes. So, we can consume things faster, we can access things faster, we can draw things faster, we are changing the use of land, and there is change in the terrestrial ecosystem at various scales.

So, technology, also, in a positive way helps us to keep track of environmental changes and manage our resources better, both in the urban as well as in the rural areas, such as you can think of the big data, big data, drones, the mobile technology, that is all help us to track and monitor what kind of environmental change is happening. It is also helping us to allow larger public participation and engagement in the process of dealing with our environment. So, moving on, we see another like the major one of the major findings, which we said is climate change.

So, the other driver is climate change. And we are witnessing an increase in the global temperature. We are also seeing changes in the rainfall pattern changes may benefit some regions, because of these changing patterns, some regions may get benefited, but much of the change in precipitation like or because of the change in the precipitation like you might have frequent droughts or frequent floods, where and because of such kind of variations you see much influence negative impact happens on the areas which are much more dependent like, agriculture areas are at much risk because of such kind of variations in the precipitation. And because of this, we are also already witnessing a reduction in the harvest and how much yield we are gaining from agriculture.

(Refer Slide Time: 19:30)



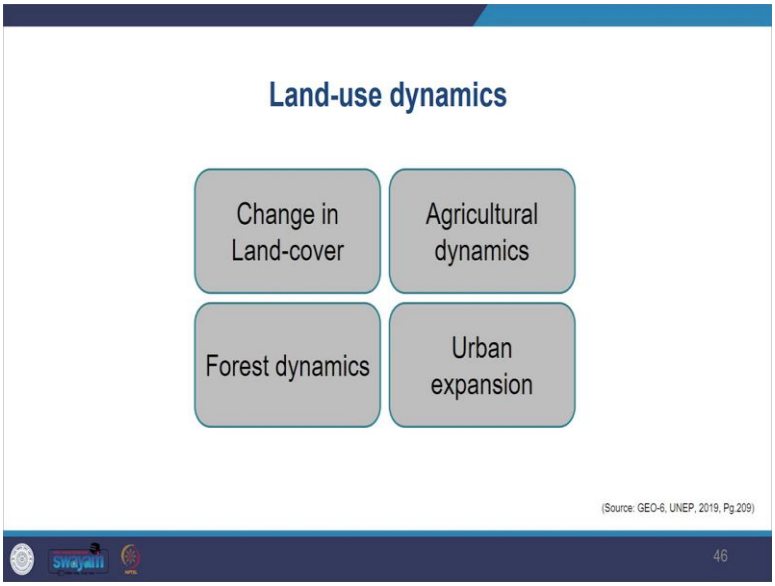
So, in the image, the image here you can see the impact on the harvest across the world with a higher impact shown in the blue color. In the left quadrant you can, in the left top quadrants, you can see the high impact of the production of maize. You can see how the impact is high in India, Australia, and African countries among many other areas. Likewise, in the right top quadrant, you can see the impact and rise in Production

and look out for the color blue. Likewise, you can see wheat and soy in the bottom two quadrants. So, have a look at that and see how the yield is changing.

Further, we see that because of the rising sea level caused by climate change, there are major risks to the coastal areas and people living there also increase in temperature is causing the growth of certain weeds and pests which is further reducing our yield. However, there have been developments and climate-smart agriculture practices, such as minimum tillage and energy-efficient crops and practices, such developments provide chances for increasing the atmospheric carbon sink in the soil.

So, there are certain positive moves as well increase in carbon sink help to mitigate and mitigate the impact of climate change. So, that was about the drivers. So, now let us go through some of the key states and trends in the case of land. So, we see there is a change in the land you cover. So, we, there, that is a very significant one.

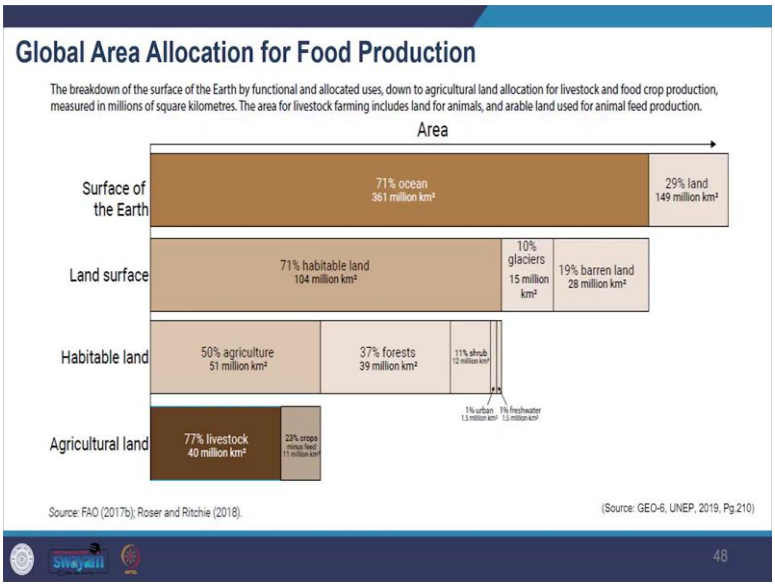
(Refer Slide Time: 21:16)



So, due to climate and geological ecological processes, that is happening, most of the timeline covers changes, but the most responsible activity is agriculture. So, because of agriculture, the land use most of the most of the land changes because of the agriculture for there, it is going to increase more to facilitate the growing population's need for food. So, that is going to be, it is going to increase further.

So, that pressure is not going to reduce but go on increasing. So, we have limitations to what extent we can expand to their land, but that would cost us the ecosystem services. Further, the economic activities at the global level are also changing the land use pattern, so just not the agriculture of it, but also the economic activities. For example, we can look at the mining, we are doing to meet the global demand and we also see a reduction in the ores. So, the resources are reducing and the scale in which we are really mining is also increasing. And mining has a huge and cumulative environmental impact.

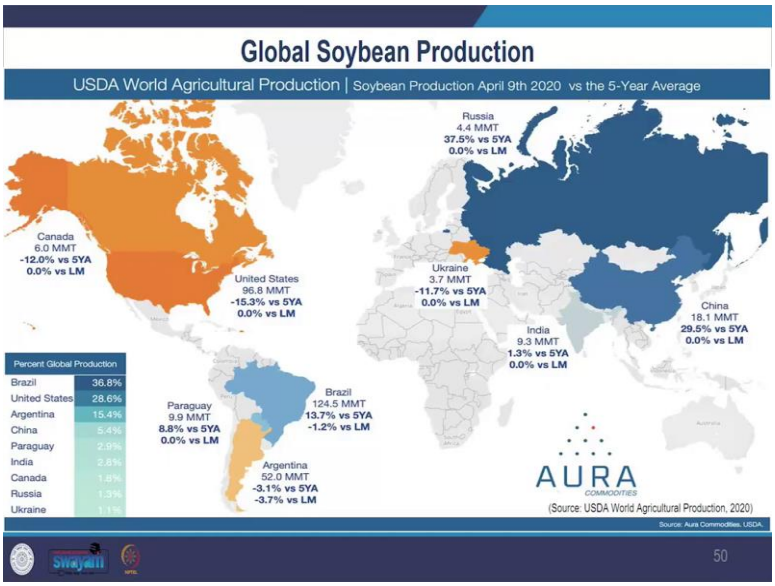
(Refer Slide Time: 22:36)

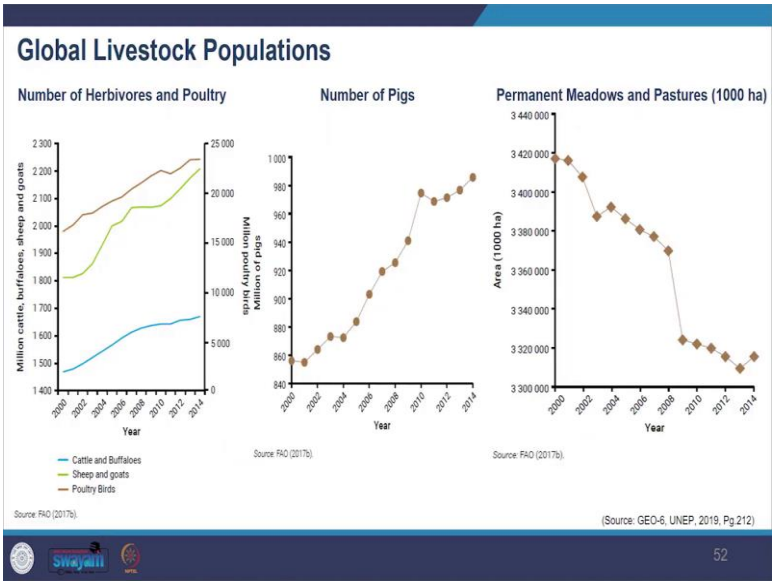


Further, we see that agriculture we already talked about agriculture, is another area for land use change, we use habitable land in the range of 38 to 50 percent of the purpose, for food production for us and the livestock as you can see in the image here. Now, we have also started growing crops for biofuel production. So, we have started using land more and more. So, you can see here how, what percentage of the land surface, the habitable land surface we have been using for agriculture.

There has been a minor reduction in the land and agriculture. So, we are seeing a certain decrease in the agricultural land. However, the per capita daily food supply in the world has increased considerably in past decades. So, we are consuming more. Because of this many areas have been converted to cropland, so we are using more and more of the land for crop purposes. For example, you can look at the grasslands in Argentina, Bolivia, Brazil, Paraguay, and Arugula and huge land has been converted for soybean fields, and they are mostly used for export purposes.

(Refer Slide Time: 24:00)

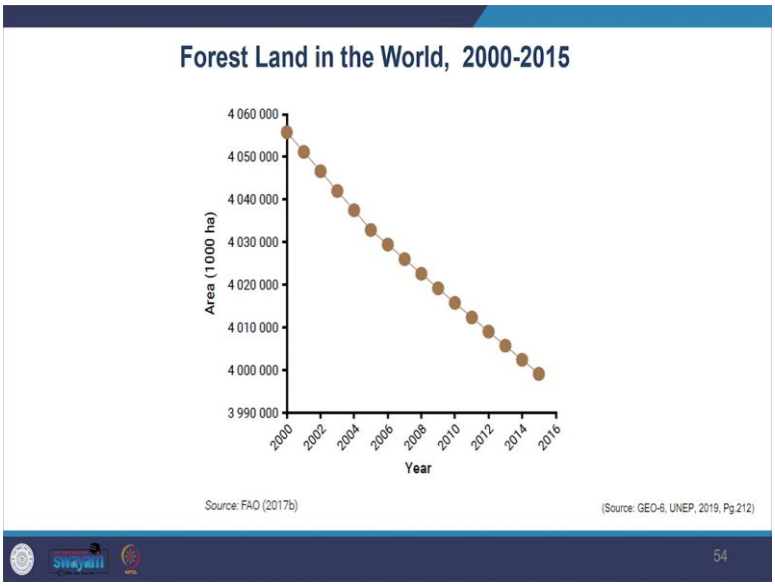




So, likewise, you see in many other places here, there is an increasing global livestock population also. While the human population grew as per the reports, you will see that it grew by 19 percent. However, the number of cattle, buffalo, goats, sheep, and all in increased in much higher percentage.

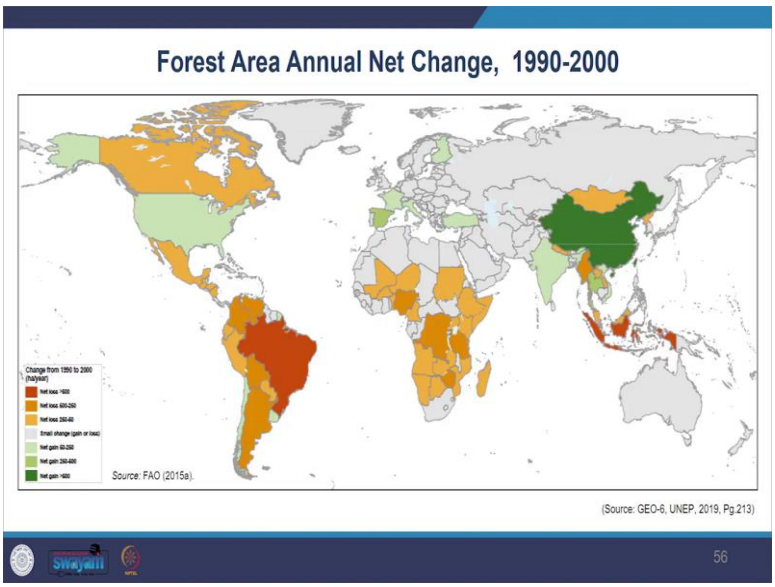
This increase is connected to more intensive livestock production systems so we consume more energy. We use more land to feed these livestock. So, in the graph, you can see an increase in herbivores poultry, and pigs. In the graph, you can see here and in the last one, you can see the decrease in the meadows and the pasture land. So, look at the steep increase in the decrease in the land here. While you see this, review this and contemplate it.

(Refer Slide Time: 25:02)



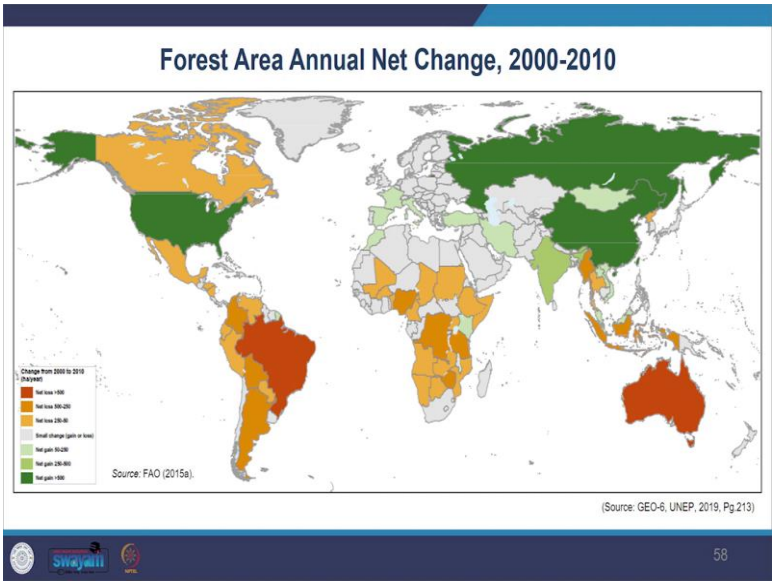
So, further moving on, we see that there is a change in the forest area as well. So, the percentage of land and the forest is getting lesser and lesser, as you can see in the graph here. So, see how the forest area is declining and you can think of the services that the forest provides to us.

(Refer Slide Time: 25:27)



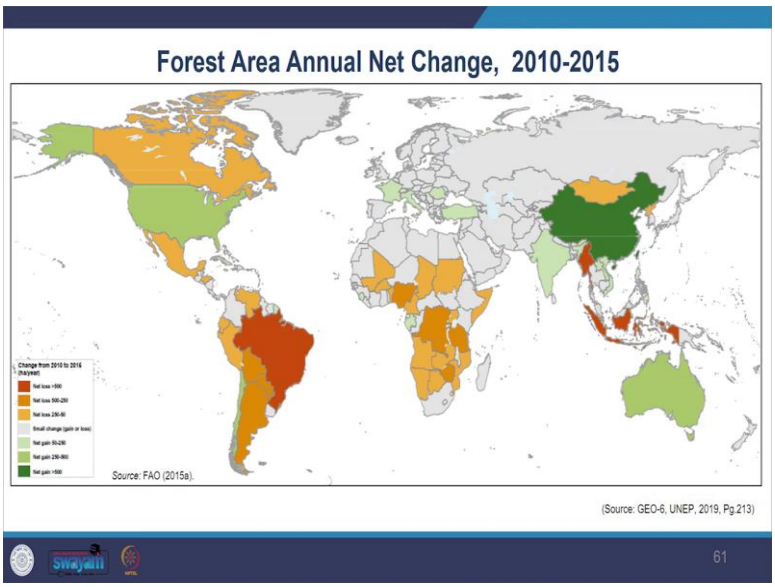
The rate of forest area differs from region to region and there is some gain in the forest area due to an increase in a plantation in the mid you can see the changes from 1990 to 2000. Look for the loss of forest area shown in red color and the forest area gained in green color you can see that how the forestation is helping. Note the color in our country and other countries take note of the USA as well as Russia and Australia. So, how the colors are changing there? So, you can note here.

(Refer Slide Time: 26:01)



And the following image you can see the changes from 2000 to 2010 then, keep looking at the changing colors here.

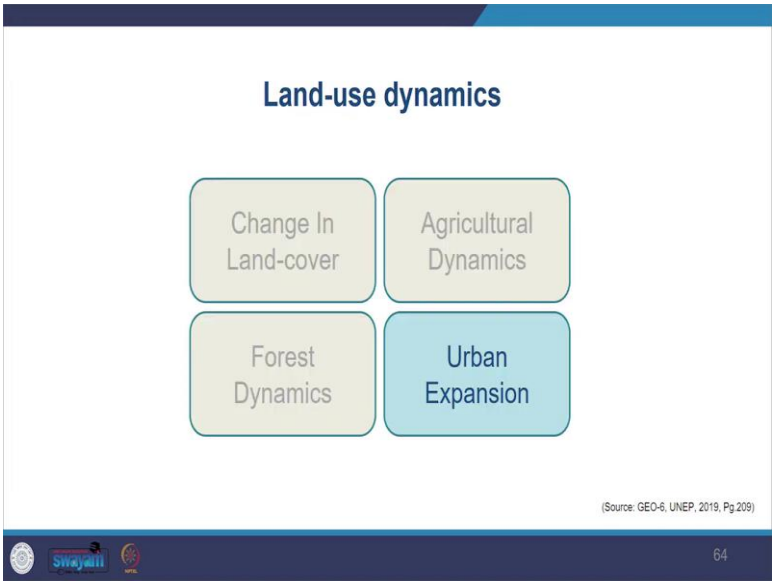
(Refer Slide Time: 26:13)



In the following image, you can see the changes from 2010 to 2015, as per the study. So, note, note, take note of the color changing here and see how much forest area is changing the red color and the green color shown here. So, a loss of natural forests continues to happen in most areas of the world. If we lose these forests, we will struggle for basic essential supplies.

For example, in the Amazon rainforest deforestation is massive and it is causing a reduction in the rainfall. And this will lead us to a critical tipping point like we cannot get back to the original position for the hydrological cycle in the region if the forest cover is drastically reduced. So, if we further keep on reducing the forest cover, then we will reach a point where we lose the hydrological cycles, the current cycle.

(Refer Slide Time: 27:17)



Moving on we further have been noticing, noticing urban expansion, even though built-up areas take relatively less land, however urban expansion, and their impact is massive. We are also seeing landscape breakup. So, we see a lot of fragmentation happening and then urban sprawl happening, cities are also taking up the agricultural lands.

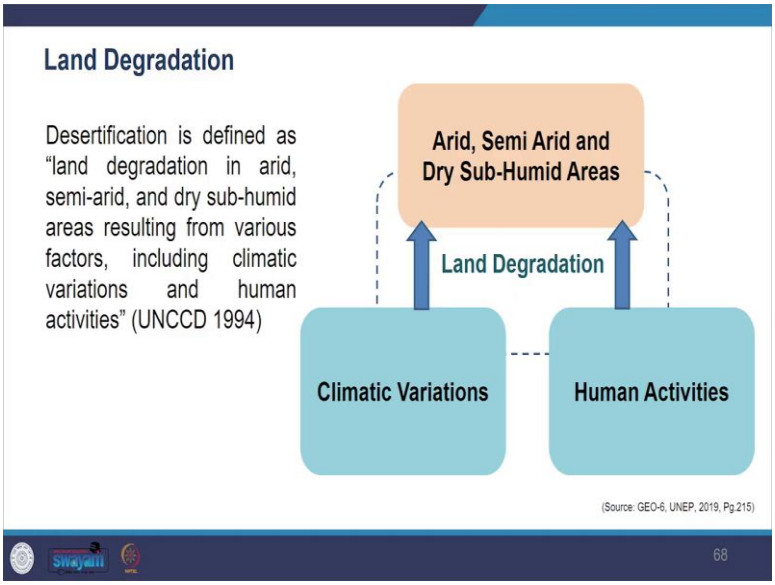
So, we are going on consuming more of the agricultural land converting it further. So, it is because the increased built-up area affects the hydrological cycle and the soil function. So, not only that, we are changing the land use but we are also changing the hydrological cycle and soil function. However, we also see that cities are important because they provide us with many of the services like education, housing, clean water, and electricity just because we live the way, we live in cities.

Moving on, we further see land degradation and crop production, we see that land is deteriorating and land degradation is connected with decline and ecosystem services. So, when the land quality declines, then the ecosystem services also decline including the primary productions, what kind of production we are getting that declines. So, land has been exposed to soil erosion, salinization, compaction, and contamination.

So, you see that soil is getting eroded, there is salinization of the soil as well as there is compaction, it is getting tighter, and then there is contamination, the pollution is entering and then there is organic matter decline. We also see forest fires and overgrazing and so on. So, there is a lot of degradation that is taking place which has other implications, we also see a reduction in microbiological activity and water retention capacity.

And we also see lowering hydro, like conductivity and decreasing soil resistance among other problems here. So, degradation also leads to economic and social problems. And then it is said that by improving the land we can improve many of the services and we can take care of ourselves by improving the land.

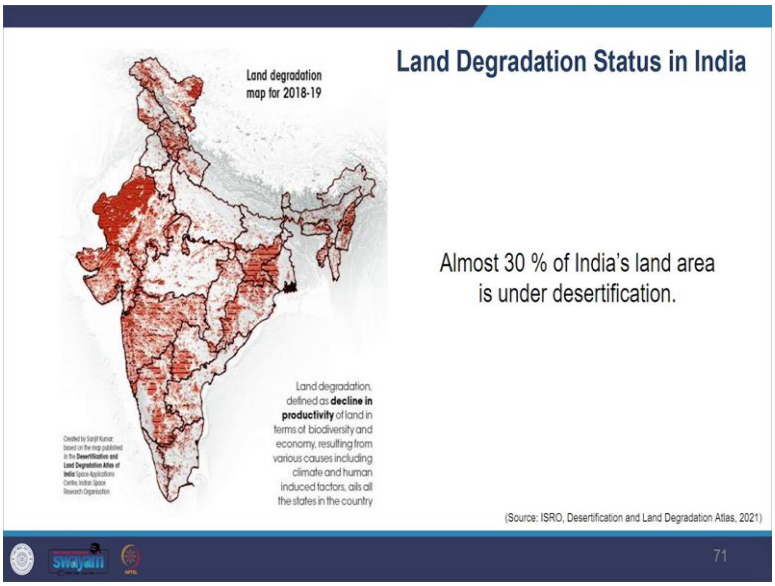
(Refer Slide Time: 29:56)



And, in the range of problems, we also see desertification, desertification, if you look at the definition, is defined as land degradation in Arid, Semi-Arid, and Dry Sub-Humid areas resulting from various factors, including climatic variations and human activities. So, both by the variations and our activities, we see this kind of degradation in the land and the range of desertification as, is happening and the range is from 15 percent to 63 percent globally, and then there are also variations within the region where they are experiencing it.

We have been also witnessing a positive trend. For example, Semi-Arid areas of China are now getting better. You may also refer to the World Atlas of desert desertification, which provides numerous global data sets on the subject. So, you can look at that as well.

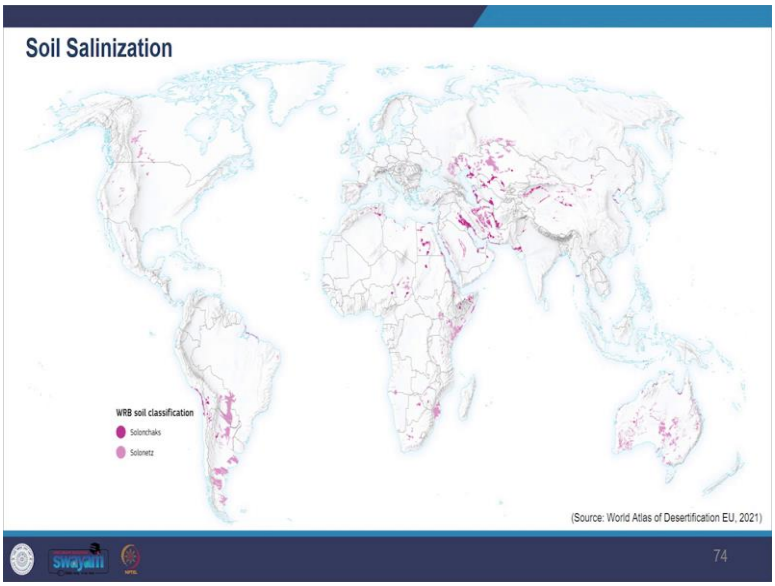
(Refer Slide Time: 30:56)



If you see land degradation status in India, India faces a severe problem of land degradation or soil becoming unfit for cultivation. So, we are also facing those problems. land degradation is definitely among India's most pressing environmental problems and you can think that we are still a lot dependent on agriculture.

So, there is a lot of change many of our states have recorded an increase in degraded land in the past 15 years, with the most rapid increase being noted in biodiversity-rich northeastern states and India has committed to restore 26 million hectares by 2030. So, you can see here the range of land which we are losing.

(Refer Slide Time: 31:44)

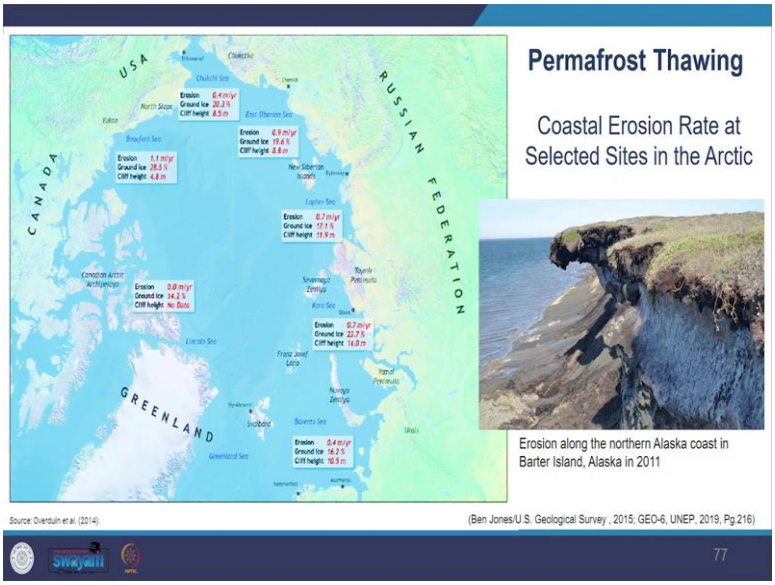


Then looking into the soil salinization in the Arid and Semi-Arid regions, because of the inadequate drainage, wherever the drainage is inadequate, there is less irrigation or there is less irrigation, and salt accumulation happens in the root zone. So, that is why soil salinization happens and this negatively affects crop production and soil properties.

In some countries, this problem is to a large extent large scale and we see that it can as per the report 33 percent of the global irrigated areas have declining productivity because of insufficient irrigation, which is causing waterlogging as salinization. So, look at this scale, we are talking about 33 percent of the globally irrigated areas. So, action has to be taken in this regard as these losses can be very expensive to us., and there can be other impacts as well on animal health property values, and so on.

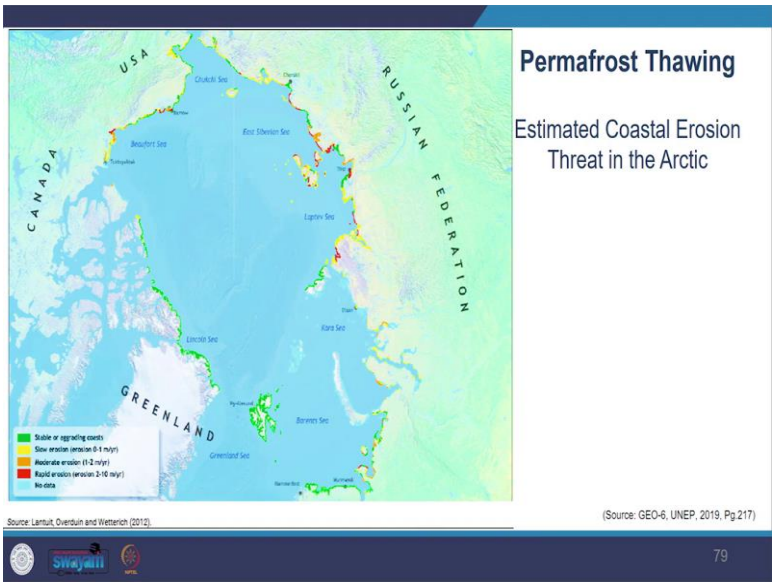
Another issue we see is the permafrost thawing, so because of the cumulative impact the Arctic areas are getting warmer, causing the melting of sea ice, we have longer ice-free seasons now. So, and melting of ice releases green, greenhouse gases and alters the landscape. Melting also reduces soil and land stability increases erosion and affects the Arctic habitat of the dough and hydrology.

(Refer Slide Time: 33:25)



So, if you see all these image you can see the coastal erosion rate, look at the erosion rate, ground ice, and cliff height at different stations here. You can look at this here.

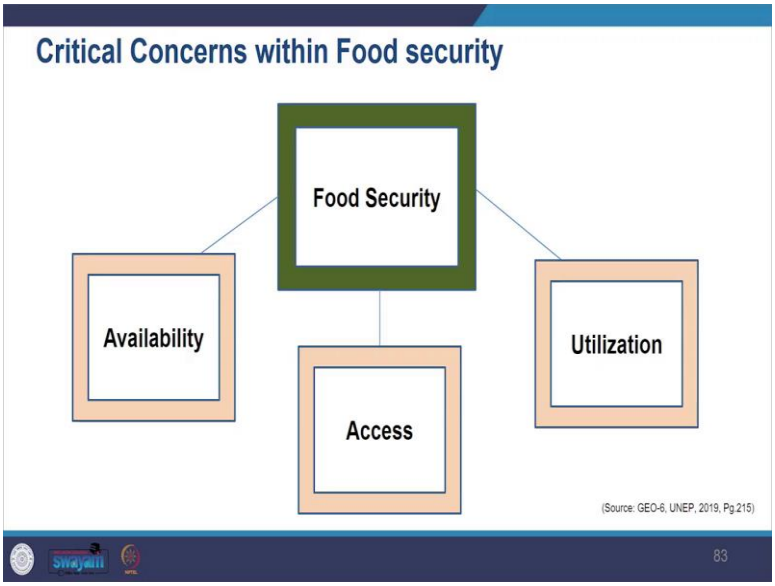
(Refer Slide Time: 33:39)



Likewise, in the following image, you can see erosion threats in red-brown color here you can see what kind of threat erosion threats are there. We have seen states and trends now let us look at some of the key impacts of changes in land use and the dynamics we can see that there is an issue about food security by now you have gathered as a direct problem connected with food security.

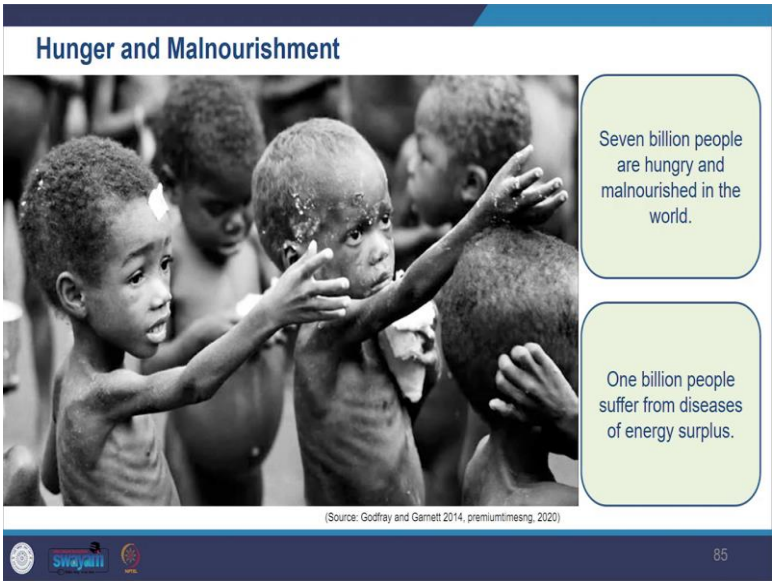
And then let us try to understand what food security means, people are considered food secure when they always have availability of adequate access to sufficient safe, nutritious foods to maintain a healthy and active life. So, that is what we mean by food security.

(Refer Slide Time: 34:28)



And, there are main three critical concerns with food security, like first food availability, it should be available. Second, it should, one should have access to food, and third the food should be utilized, food utilization.

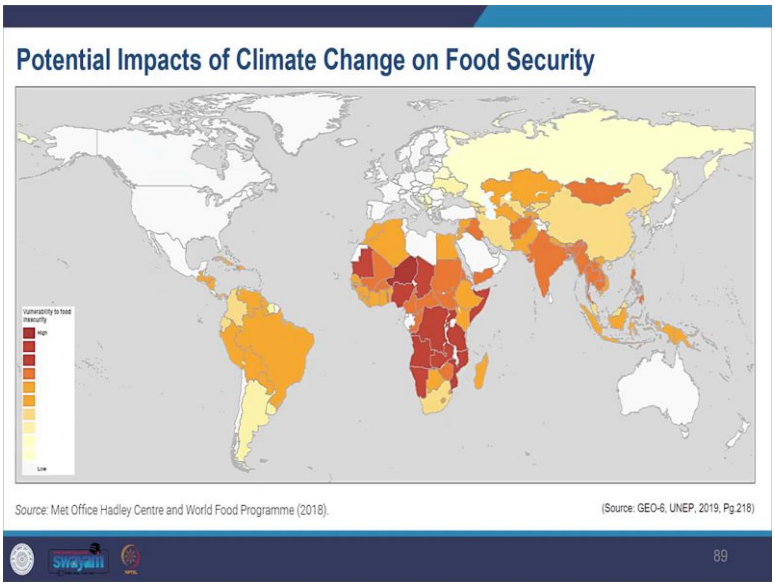
(Refer Slide Time: 34:42)



So, hunger and malnutrition are one of the major problems and there is a huge number like you look at 7 billion people who are hungry and malnutrition across the globe. We are seeing a decline in such numbers but still, we are facing these issues of stunted growth in Saharan African and South Asian countries.

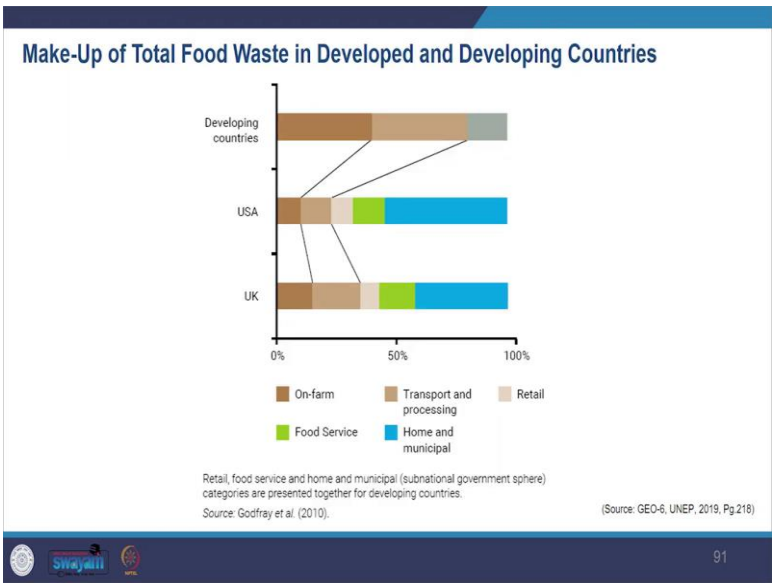
On the other hand, we also have the problem of overnutrition, overweight and obese population. So, this is about lifestyle choices, we make the consumption pattern and this pressure we exert on land resources, and the kind of land use changes we make because of that.

(Refer Slide Time: 35:25)



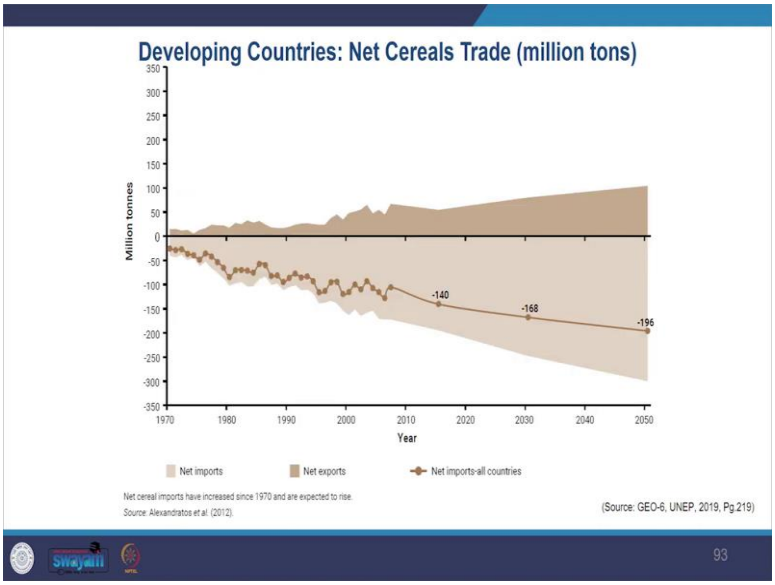
And the figure you can see vulnerability to food security using metrological data from 1981 to 2010. And so on, you can see here look at the darker shades here. So, look at the potential impact of climate change on food security and pay attention to the darker shades here.

(Refer Slide Time: 35:52)



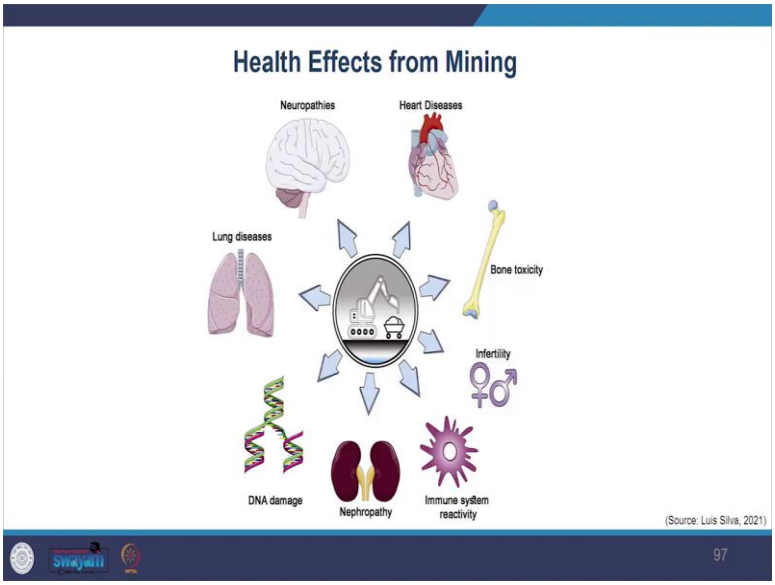
There is also a need to look into curtailing food loss with larger loss and storage and transportation and with the, why we are talking about it, because food waste also generates greenhouse gases, and most of the waste is generated from developed countries. Therefore, it is required to have a sustainable intensification. And in the graph, you can see the range of food waste here and you look at the countries.

(Refer Slide Time: 36:17)



Now, looking at food security and food trade, we see that international trade is gaining significance to meet the global demand, there is population growth, urbanization, and shifting dietary. So, our choices are changing. So, that also causes changes in how we use the land. And because of the global demand, how the demand is and many of the countries do not produce their food. There is a change in the patterns, there can be a geographic concentration of production. This also has system and systemic risk. And this can lead to a price hike with and such kind of price hike, which can be, become severe with climate change.

(Refer Slide Time: 37:09)

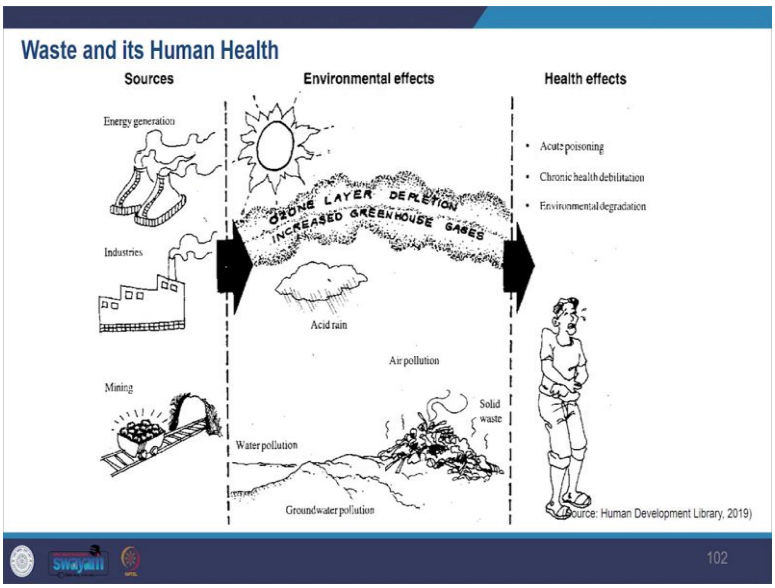


Further, we see that there are health effects from the mining, and we will be studying these impacts more when there are a lot of health impacts and mining has a severe impact. There are concerns about mining waste as well. And then you can also look at the Global Waste Management Outlook, which estimates mining waste to be in the order of 20 billion tons per year. And these are serious concerns.

(Refer Slide Time: 37:41)

So, mining activities have an impact on ecosystems and lead to soil contamination as well. So, you also look at the toxic and radioactive dust emissions, and also water pollution results from mining, so all kinds of impacts you can think of. We will be further seeing it when we do the methods when we will be looking into the land. How do we do the impact assessment?

(Refer Slide Time: 38:07)

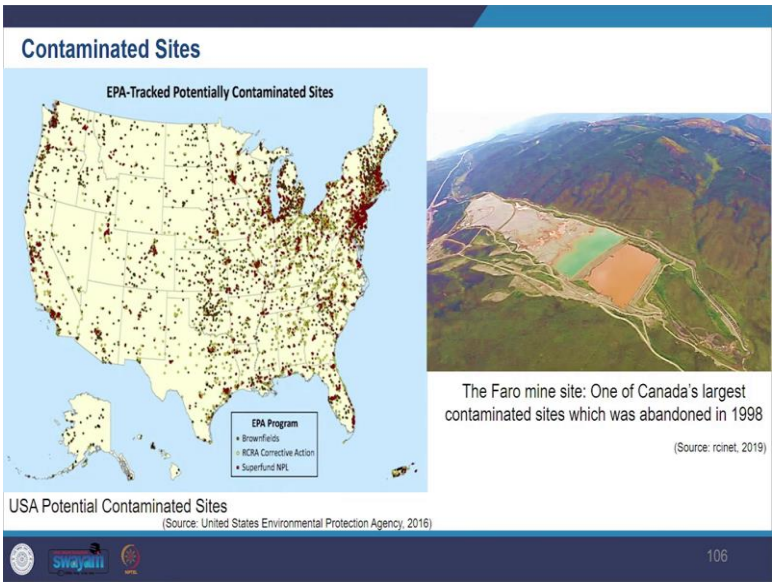


Looking at waste and its human health, waste generated like this huge waste generated by cities people do not have access to adequate waste disposal systems which has health implications such as infections, exposure to chemicals, and dust, and then also it the waste generates environmental impacts, soil and water pollution and grease and greenhouse gas emissions. Also, millions of people are operating globally as informal recyclers. So, you see the rack pickers and all, so that and many of them live around in and around the dumping sites.

(Refer Slide Time: 38:50)

So, we further see soil contamination, soil health is important majorly for food security, another we see that it has soil contamination has direct health implications and soil contamination happens because of industrial and commercial activity. And we see that governments in developed countries maintain an inventory of the contaminated and remediated sites.

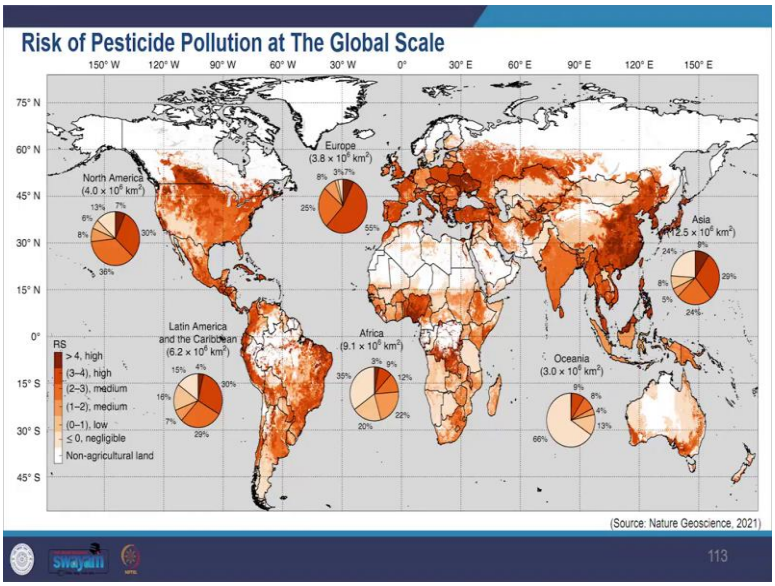
(Refer Slide Time: 39:16)



So, you can see the United States of America maintains the Superfund national priority list. So, which includes the sites contaminated. Likewise, you can see the list is maintained, and sites are identified by Canada as well. And then further, we, the soil also have human health consequences like the health consequences of a wide range of parasitic worms, such as you, hookworms, and so on, which can get transmitted from the contaminated soil, so that all needs to be taken care of.

Further, we also see the impact on food chemicals and human health, like pesticide exposures, have increased. However, there is certain scientific clarity that needs to come there is a certain level of uncertainty about which level of exposure has an impact.

(Refer Slide Time: 40:15)

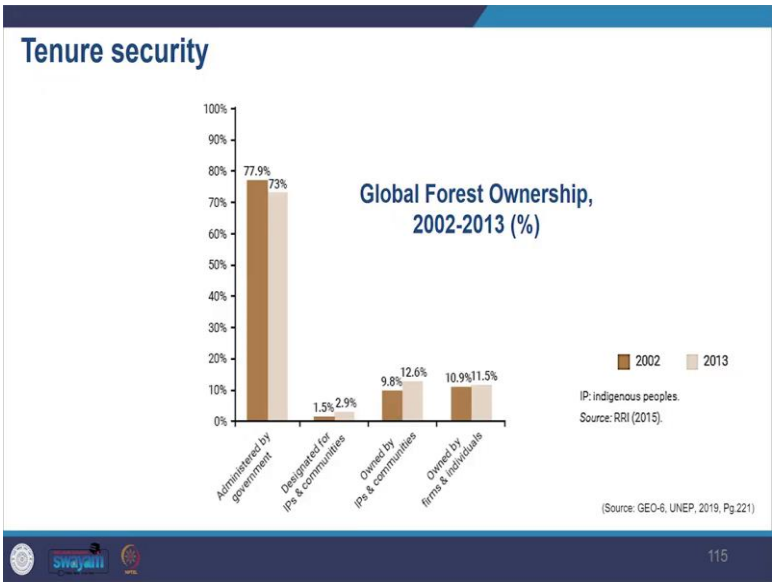


In 1990, the WHO estimated an annual of 7 lakh cases of specific chronic effects linked with pesticides globally. So, there have been regulations to control pesticides in countries. So, we see other chronic pesticide exposures have, the health effects of chronic pesticide exposures vary considerably in women and

men might have to also take care of those aspects. And there are chances of breast cancer because of the strong connection, and concentration of pesticides.

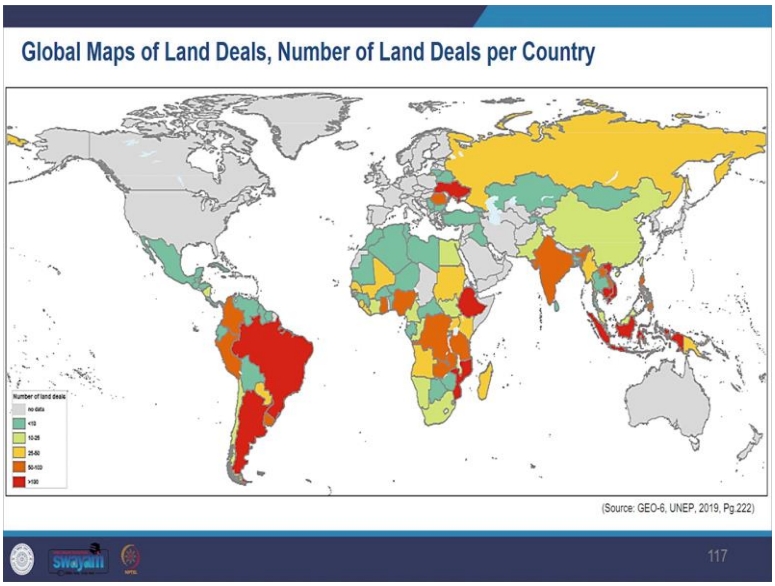
Further, we see the issue, issue about land tenures, and land deals, see that there is a lack of ownership of land, even though they are dependent on land there is a lack of ownership of commonly held land. So, because of the lack of ownership of turned communities lose access to land, livelihood, shelter institutions, and food in particular indigenous communities.

(Refer Slide Time: 41:24)



And the graph here you can see the ownership type and pay attention to a small portion of indigenous people and communities.

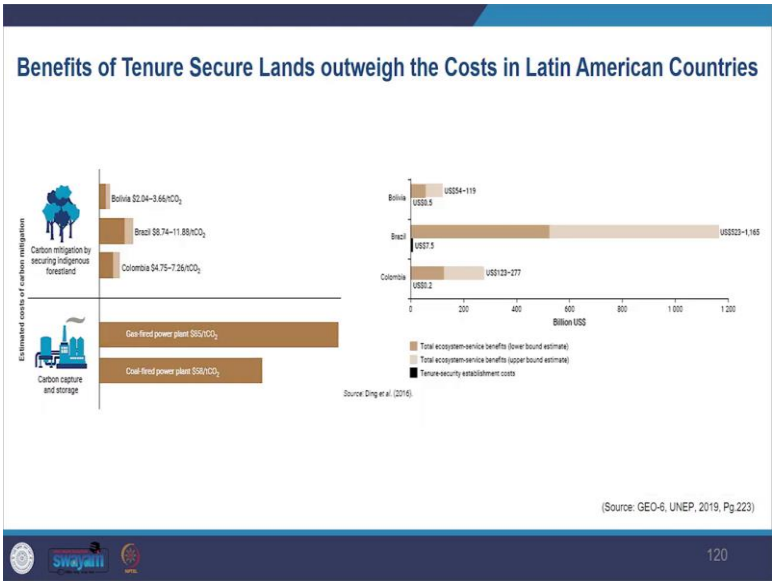
(Refer Slide Time: 41:33)



So, because of industrialization, there is increased pressure on land, which makes vulnerable communities more vulnerable without proper ownership and the map you can see the number of land deals per country, the darker red shade indicates high land dealing. So, you can see here, what kind of land dealing the scale of land dealing happening in places most deals are taking place by private sectors, and local involvement is less loss of land leads to loss.

It has multiple repercussions loss of investment in human capital, negative effects on land improvement, reducing agricultural productivity, and even that influences the residence of the community. So, studies indicate that local indigenous communities successfully manage and conserve land. So, that is been promoted.

(Refer Slide Time: 42:29)



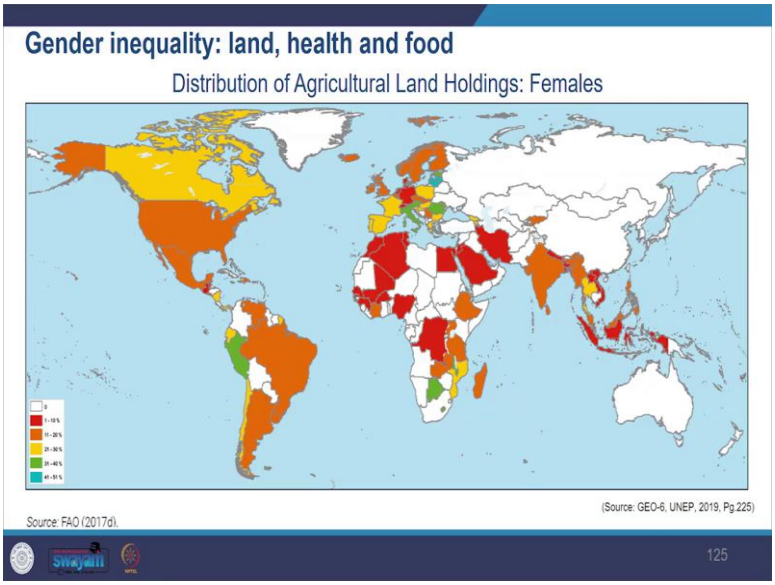
So, you can also look at the World Resource Institute study which emphasizes that land secure land tenure and improve, improves, and strengthens the ecosystem services, it is important to look at the local context, reinforce local governance, and safeguard the rights of the indigenous people. So, you can see here, that you

may also find FAO voluntary guidelines on the responsible governance of tenure. So, how that can be taken care of?

Apart from that land also provides socio-cultural services land provides a variety of socio-cultural, and aesthetic benefits, and if that is lost, because of land degradation, deforestation, and desertification, the values go down, the out-migration happens, the networks, the social networks break up. So, all these, one needs to consider.

And then we talked about gender inequality, land, health, and food. So, existing gender inequality may contribute to increased poverty, people displacement, resource scarcity, and other conflicts. So, a lot has been done to strengthen women's ownership and participation in land management which will lead to household food security, dietary, diversity, and children's health. So, concerns have been raised because a lot of activities have been done in that and it is the general idea that women spend the money more traditionally for the household, they engage more in the agricultural activity.

(Refer Slide Time: 44:10)

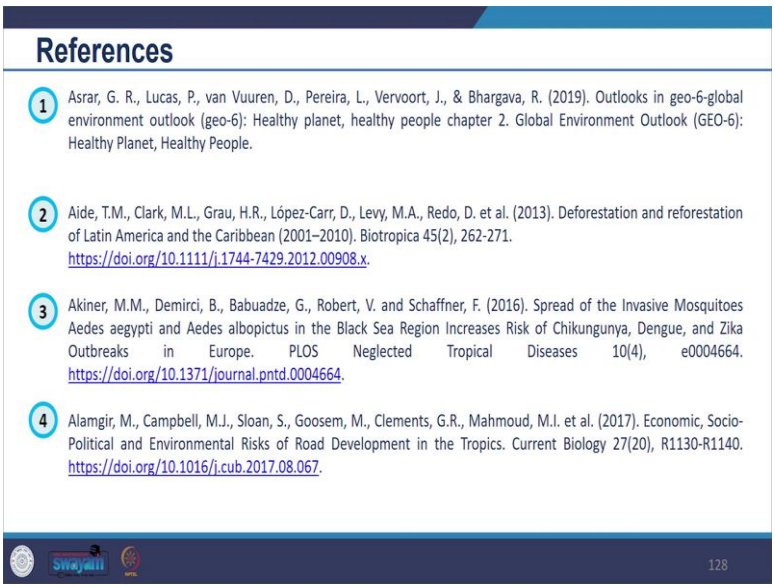


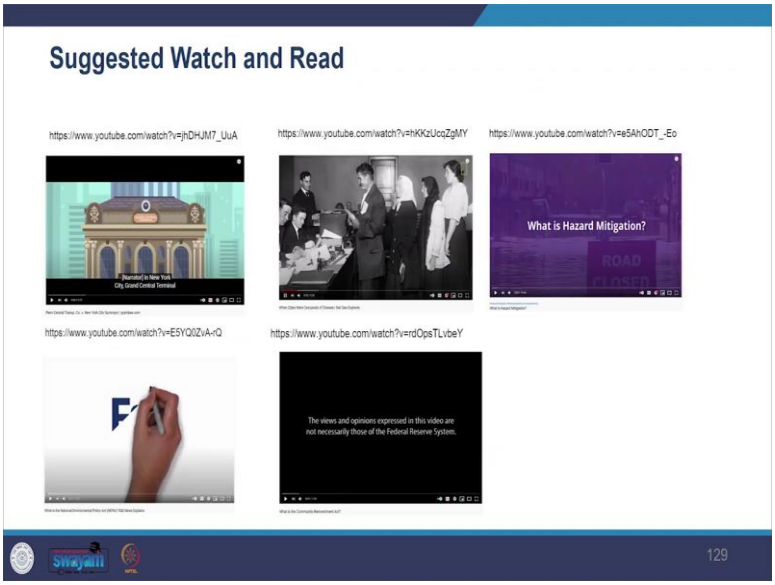
At the same time, we see that there is less ownership in the image, you can see that land ownership by women, and the darker red color indicates low ownership, you look at the color of our country along with others here. So, you see how the women's landholding scenario is across the globe, and also pay attention to the country here. So, that is all for today.

(Refer Slide Time: 44:37)

So, summarizing what we covered today. So, we looked at land resources and the Sustainable Development Goals why it is important, and how it helps us to attain Sustainable Development Goals. We looked at the drivers and pressures on the land resources, we looked at the key states and trends in the case of land as well as we looked at the impact of changes in land use and any dynamics with changes.

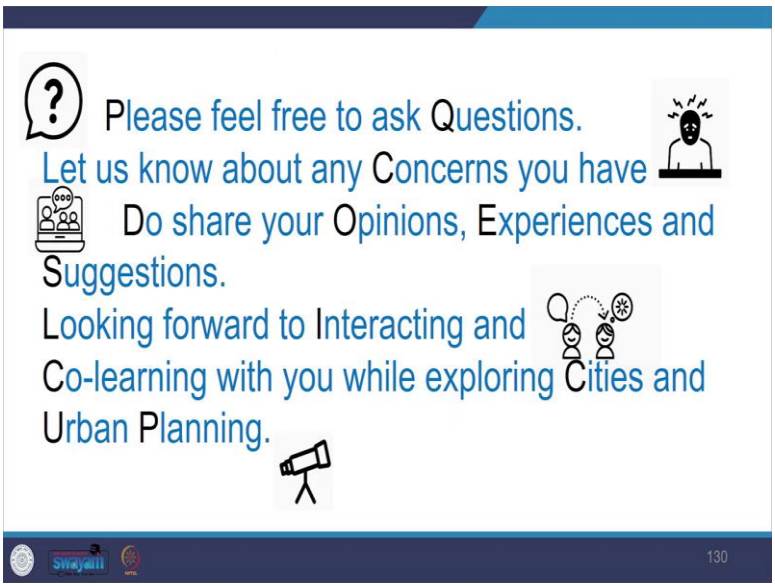
(Refer Slide Time: 44:58)





Here you can see the references our coverage has been limited as the scope of the subject. Additional resources to read and watch are provided to you in the list given here.

(Refer Slide Time: 45:10)



Please feel free to ask questions. Let us know about any concerns you have to share your opinions experiences and suggestions. Thank you.