United Nations Sustainable Development Goals (UN SDGs)
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Design for Sustainability

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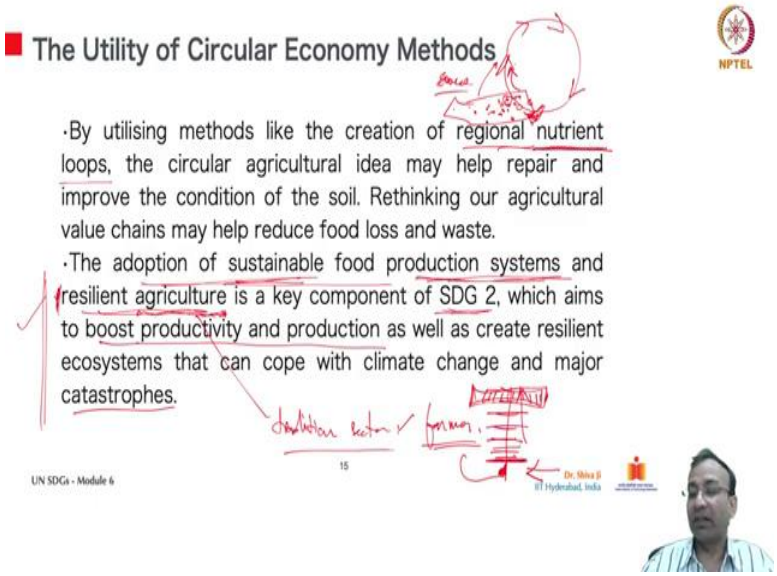

So, by utilizing methods like the creation of regional nutrient loops regional nutrient loops I will explain the circular agricultural idea may help repair and improve the condition of the soil, rethinking our agricultural value chains may help reduce food loss and waste. The adoption of sustainable food production systems and resilient agriculture is a key component of SDG2.

So, which aims to boost productivity and production as well as create resilient ecosystems that can cope with climate change and major catastrophes. So, let me explain regional nutrient loops. So, what happens we saw in the circularity these are kind of thing this is how it goes. So, at the life, at the end of your life stage when a certain thing comes to salvaging so you can break it down into components, these components again are fed as source as a resource to a fresh new cycle of manufacturing that you can call it as a nutrient, so this this becomes as nutrient to this one the new cycle.

So, regional nutrient means there is something which happens locally at some place for example that is unique to that place itself, then again it varies to the other place and so on, so that becomes regional nutrient group. So, every place might have its own characteristic and features of what all it can add so that is the thing.

And for food security systems that SDG2 what is needed it is given here in this paragraph, production systems, adoption of sustainable food production systems because this we have

but we want sustainable food production. So, resilient agriculture, because agriculture if you see is a traditional sector where our India is known for its agriculture and all that and a huge number of farmers and this has been prosperous from a long time and because of this agriculture sectors very great contribution.

So, resilience because still if you see the conventional agriculture follows the conventional rain patterns and seeds and all of those things, so how those can be improved and we given adaptive capacity or even this bouncing back capacity that resilience so that it does not get impacted in case of any catastrophes and disasters or maybe droughts, floods and all of that kind of things, because ultimately it hits the farmer the lowest unit in this whole chain there is levels and this comes right over here.

So, if this gets impacted all of this get impacted, so to safeguard this to make this food secure to guarantee this thing we need to guarantee at this stage also, so it is the same thing this guarantee getting trans, translated, translated, translated to the last level.

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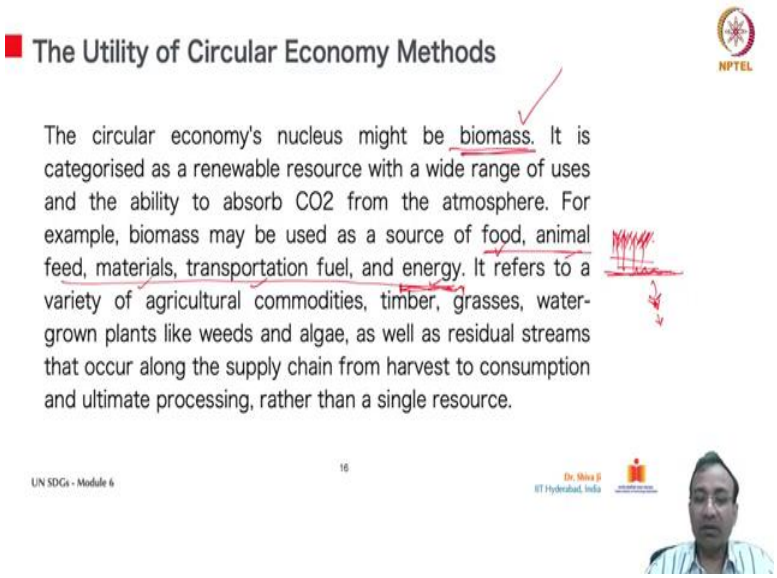

The circular economy's nucleus might be biomass. It is categorized as renewable resource with a wide range of uses and ability to absorb CO2 from the atmosphere, one of the examples of biomass. For example, biomass may be used as a source of food, animal feed, material, transportation fuel and energy.

So, biomass these days if you see has become a very important ingredient of even power generation also that is why you are seeing an energy over here, all of this agricultural produce

once it is kind of harvested and the crop is kind of taken care of, so the residue part which remains in the field that contributes to this biomass.

So, how that can also be used because typically it goes waste it is thrown it kind of rods here and there and sometimes it goes in the landfill, sometimes it is thrown, sometimes it is fed as animal feed and things like that, so those are the things you are seeing over here. Food, animal food, material, transportation fuel and even energy.

So, there is another new not so new but yes developing applications of it or bringing efficiency into this whole biomass thing is a new phenomena which is happening on a very fast. It refers to a variety of agricultural commodities, timber, grasses, water grown plants like beets and algae as well as residual strains that occur along the supply chain from harvest to consumption and ultimate processing rather than a single resource.

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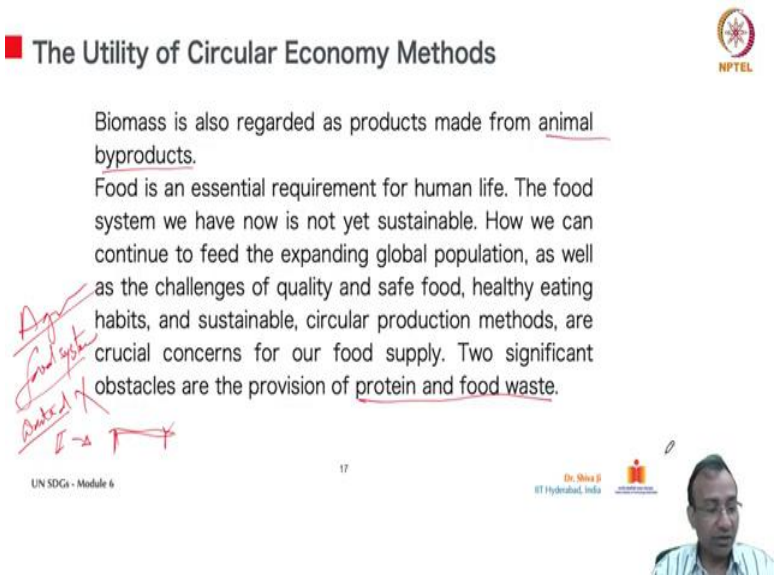

Biomass is also regarded as the products made from animal by-products, so that also is used. Food is an essential requirement for human life, the food system we have now is not yet sustainable, how we can continue to feed the expanding global population as well as the challenges of quality and safe food, healthy eating habits and sustainable, circular production methods and crucial concerns for our food supply.

Two significant obstacles are the provisions of protein and food waste. So, agriculture is there coming down from generations and hundreds and thousands of years. Food Systems also if you see we have this supply and supply demand supply in chain but we know huge percentage of it goes into the waste it gets simply just gets wasted which is not a good thing

so overall how and in the previous lectures we have seen how some kids are overfed they are overweight and some kids are facing stunting and like less weight and less body height and less nutrition not so proper growth of the body and all of those things. So, these are actually gaps which needs to be field so that thing so how this can be done that is the actually a challenge for the system.

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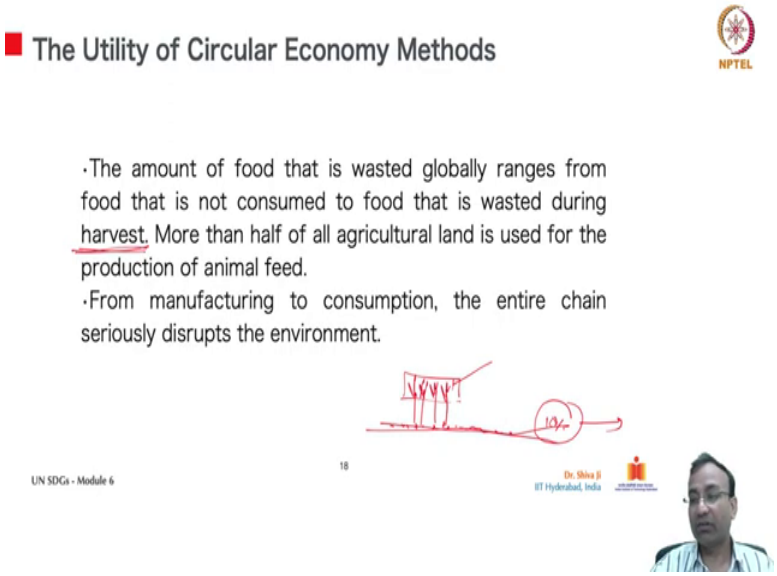

The amount of food that is wasted globally ranges from food that is not consumed to food that is waste during the harvest, so harvest time, in the harvest time also actually it starts kind of getting wasted, so if it is a paddy or wheat field you may have seen, so while harvesting taking these seeds this part some of it actually falls and if you calculate that also comes to big percentage, it varies from place to place but it comes overall in a big percentage. So, more than half of the all agricultural land is used for the production of animal feed from manufacturing to consumption the entire chain seriously disrupts the environment.

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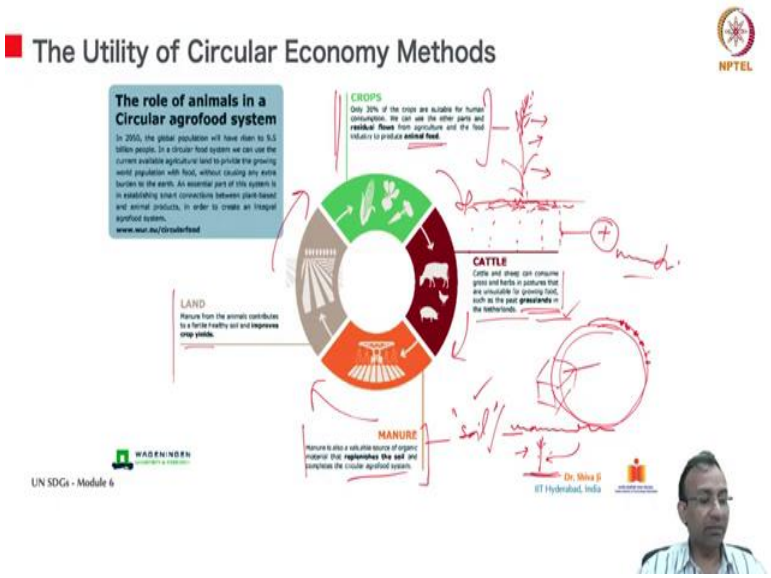

So, here you can see these four aspects in agriculture sector so we have this at the top crops only 30 percent of crops are suitable for human consumption we can use the other parts and residual flows from agriculture and the food industry to produce animal feed. So, how more, how efficiently it can be used because overall if you see production there are in these seeds which are the most usable thing and then there are stem and leaves and all of that.

So, it is assuming all of that, all of these parts also can be used for variety of purposes. The cattle, cattle and sheep can consume grass and herbs in pastures that are unsuitable for growing food such as the peat grasslands in the Netherlands. So, maybe you can search it separately is an interesting devoted land where cattle actually feed freely and roam on this thing.

Manure, manure is also a variable source of organic material that replenishes the soil and completes the circular aggro food systems. So, soil in itself is not good enough to support agriculture, soil is the one of the strong mediums with the help of nutrients, moisture and manure, so manure is that it becomes manure once it gets (())(9:11) with right amount of other elements also such as I mentioned water that moisture and manure, nutrients and many other things then it becomes full manure which supports which is able to give nutrition to plants otherwise simple soil maybe a dead soil if there has no organic compounds (())(9:37) moisture, no water and then it will be just piece of rock or maybe a sand or something which cannot be used directly.

So, only this you may be aware on this entire planet this we have this crust and in that also just first few feet depth two to three feet depth often like this soil actually carries the most

nutrients and manure and moisture and all of that which is right for the agricultural purpose, if you dig deeper it will contain maybe other things also maybe pieces of stone, breaks and other things, not so suitable for (())(10:22) agricultural uses, you have to turn that soil into a proper fertile soil suitable for agriculture.

Land, manure from animals contribute to the fertile healthy soil and improves crop yield, so of course again these plants once they are discarded some amount of it is actually gates, rots and decomposes and then it kind of discharges nutrients which help further boosting nutritional value of the soil which again helps crops. So, you see this whole thing the kind of a cyclic relation here also one leads to another and helps another and sometimes complements also.

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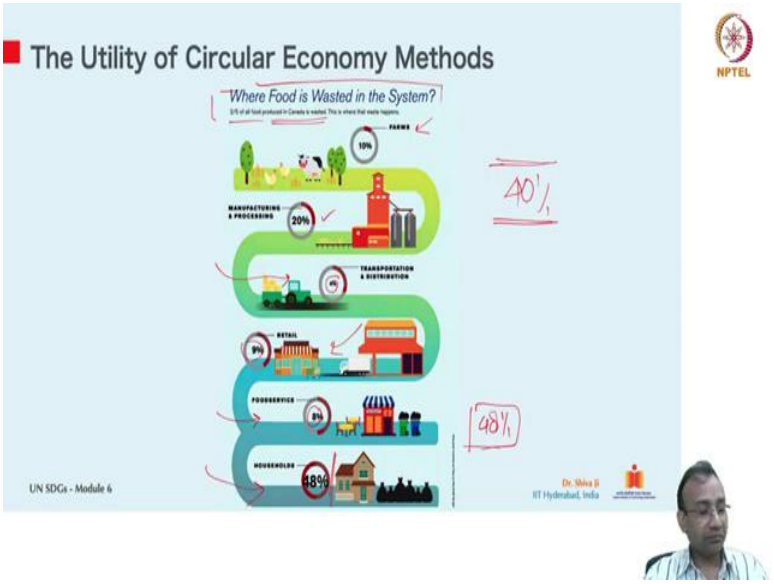

So, we were talking about wastage in the food system. So, now with this you can see where is that whole waste happening so it is a typical this thing from Canada, so two of every five of all food produced in Canada is wasted. So, it is 40 percent it is a mind-boggling figure how is it possible to waste 40 percent of total produce food it is really disturbing.

So, in the forms directly at the rate of 10 percent and then it goes to the manufacturing processes here by 20 percent, then transportation and distribution 4 percent, then in retail places also around 9 percent, food services may around 8 percent and households like at the consumer level you and me when we eat we end up sometimes wasting 48 percent, that is the study from Canada.

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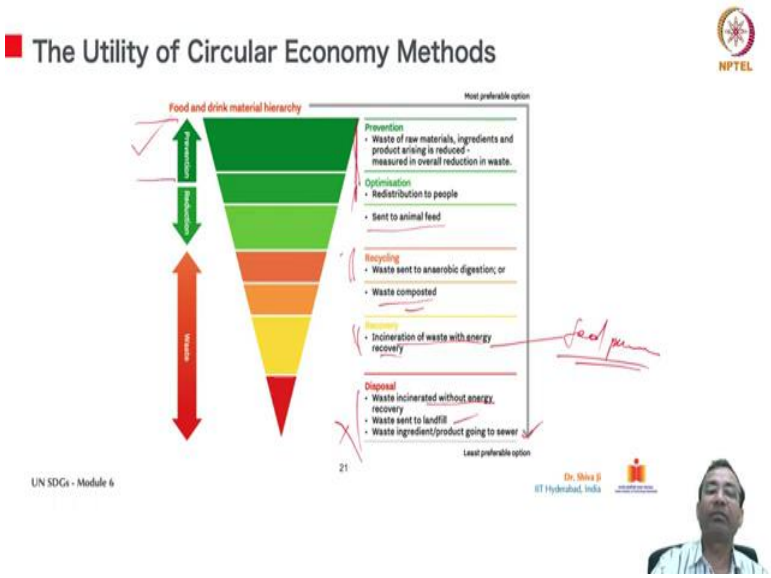

So, here we have this hierarchy, so where is it possible for you to bring the most impact most favourable control or impact, so by prevention which is there at the top waste of raw materials ingredients and product Rising is reduced measured in overall reduction in waste, optimization, redistribution of people, sent to animal feeds for recycling is sent to anaerobic digestion or waste composed and that is aerobic.

Recovery, incineration of waste with energy recovery if you kind of make it as a field for power generation plant, so some of the power generation newer power generation plants they run on the waste also by burning waste. Disposal, waste insulated without energy recovery waste into land Fields with wasting gradient product going to receiver and other places because this is completely undesirable kind of situation. So, here you can see, this is the stage where prevention is possible most preferred, most favourable, then reduction and then this is the not so favourable zone.

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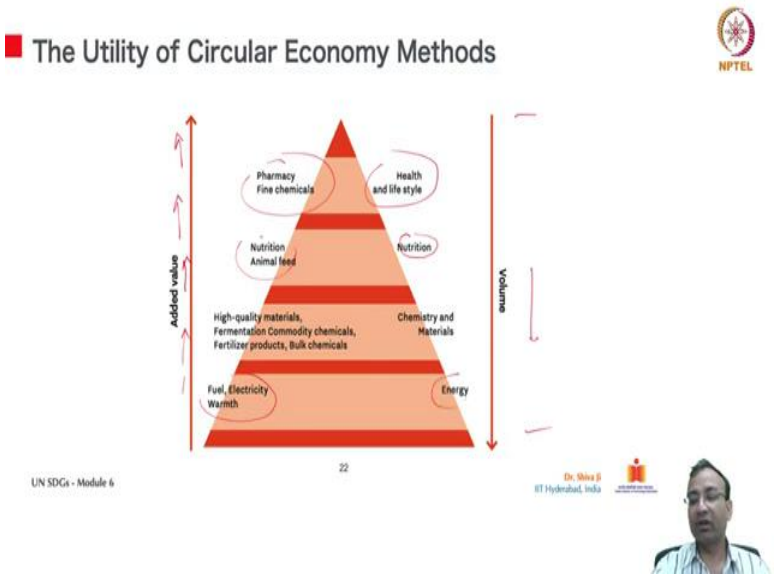

On the same line, the value how much is the value added into this whole hierarchy. So, here you see it, it gets increased value and volume, so this side it is in more volume but this side it has more value. So, health and lifestyle, Pharmacy, Fine Chemicals, nutrition annual feed, nutrition at the bottom side we have few little strategy warmth, energy, then the middle chemistry and materials high quality materials etc, etc.

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So, related to SDG 6 we will see half of the word population already faces acute water shortage that we know in India we do not have portable water supply in our taps, we need to use separate maybe filtering units for that purpose, at least once a year as a result of the demand for water outpacing population growth. Although having access to essential

amenities water, sanitation and hygiene is a human right, billions of people still struggle every day to get such things.

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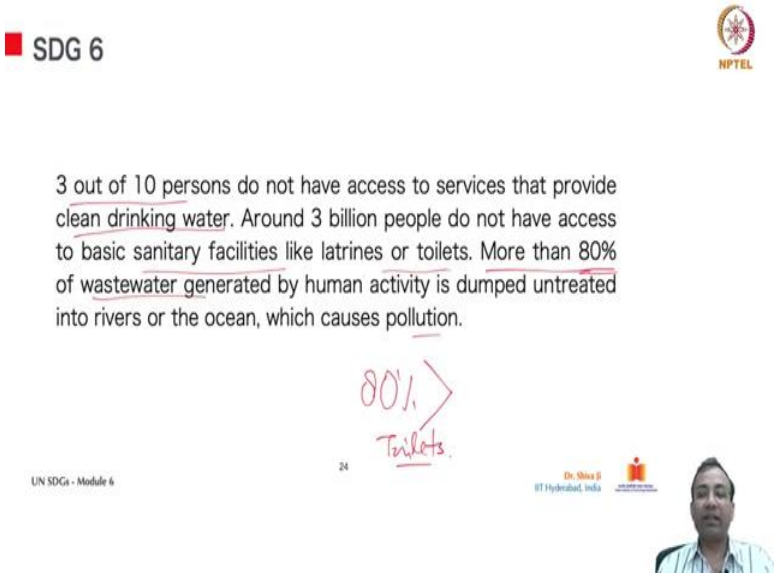

3 out of 10 persons do not have access to services that provide clean drinking, 3 out of 10. Around 3 billion people do not have access to basic sanitary facilities, latrines and toilets. More than 80 of wastewater generated by human activity is dumped untreated into rivers or the oceans which cause pollutions. So, you see this more than 80 percent of waste water which comes from toilets, it goes directly to the rivers or oceans or other water bodies which in turn would definitely causes a lot of issues in the ecosystem.

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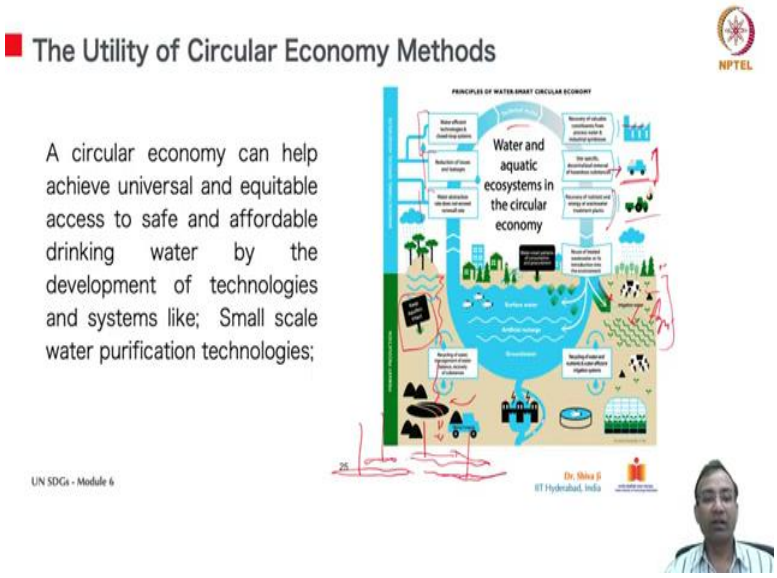

The utility of circular economy methods will see here, so here water-based one circular economies model is drawn, how can you go for optimizing or maximizing the efficiency of water in the consumption cycles and how this can be saved from getting wasted. So, here water efficient technologies, closed loop system, reduction of losses and leakage, water absorption, rate does not exceed the renewal rate.

So, here recovery of value constituents from process water industrial symbiosis, it cause your site specific decentralized removals are the substances, so that it gets treated and there is no toxic waste going into the system or in the water bodies. In the soil recovery of nutrients and energy at wastewater treatment plant. Reuse of treated waste water or its introduction into the environment. So, from here again it is kind of looking we call it as safe enough to go back to the system.

So, here we see in the agriculture system, so we have cattle, we have plants, trees and plants. Then from here recycling of water and nutrients and water efficient irrigation system, the cycling of water management of water balance recovery of substances. And from here if you see deeper intact, so this percolation allows water to go in seep in and they actually get deposited over a long period of time in small smaller aquafer sometimes they run in several kilometres. And from here we actually take our water supplies necessities.

So, a circular economy can help achieve Universal and Equitable access to safe and affordable drinking water by the development of technologies and systems like, small scale water purification technologies.

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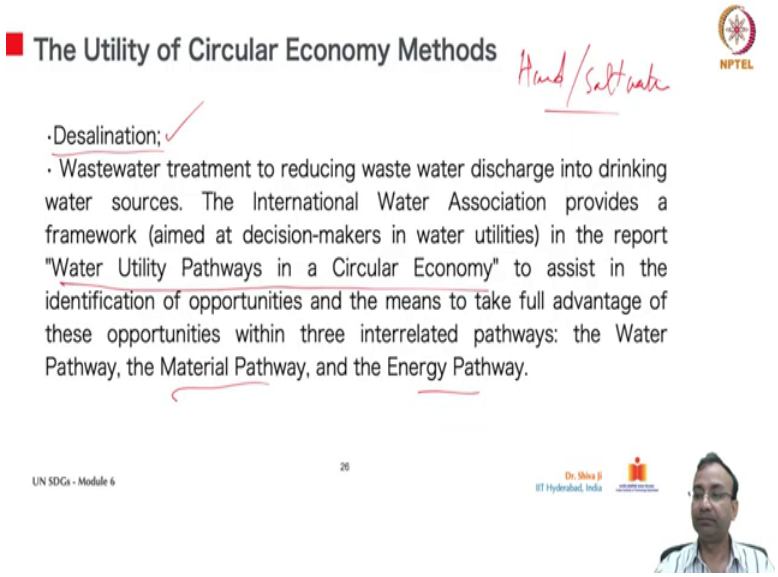

One of that those technologies is desalination, many places they have hard water or I think even salt water, our oceans they are all salt water districts, even there are so much of water you cannot use it for our regular consumption in its as it is found. So, there is this technology desalination which takes out those hard salts and makes water usable, but this currently it costs a lot, so not everybody will be able to or not every country also is able to afford and distribute in new places.

So, wastewater treatment reducing wastewater discharge into drinking water sources the International Water Association provides a framework in the report water utility pathways in the circular economy to assist in the identification of opportunities and the means to take full advantage of these opportunities within three interrelated pathways, the water pathway, the material pathway, the energy pathway.

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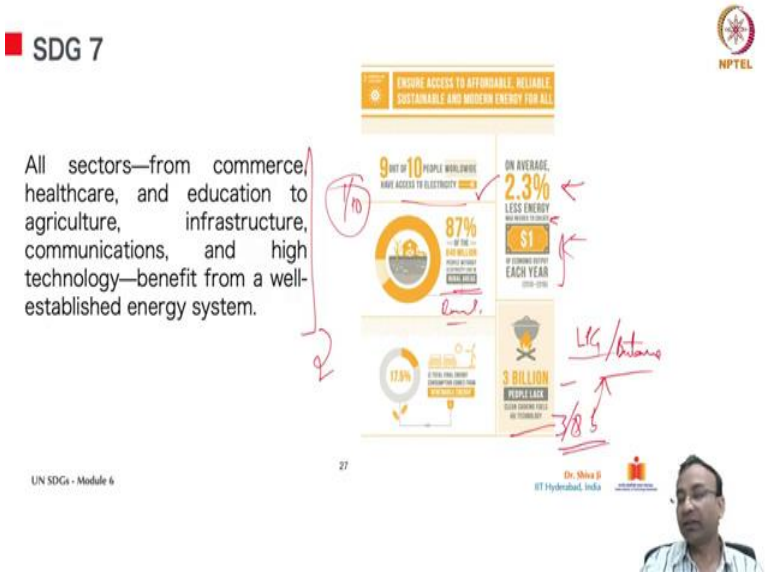

Related to SDG 7, all sectors from commerce, healthcare and education to agriculture, infrastructure, communications and high technology, benefit from a well-established energy system, of course, because energy the demand for energy is from all the sectors, there is no one or no entity which can say they do not need any sort of energy because they are conducting because of for their conducting works and machines and even other type of requirements energies and central requirement.

So, 9 out of 10 people worldwide have access to electricity currently, but 1, 87 percent of the 840 million people without electricity live in rural areas. So, rural areas if you see are the majorly impacted ones, on average 2.3 percent less energy was needed to create 1 dollar of economic output each year.

So, there is like a saving 2.3 percent less energy was needed, so that much was saved for every 1 dollar worth of economic output. 3 billion people lack clean cooking fuels and technology, so they do not have perhaps LPG, butane supplies, we call it typically the clean energy, clean cooking energy sources. So, out of 8, 3 billion people have no access to such clean in a clean cooking systems.

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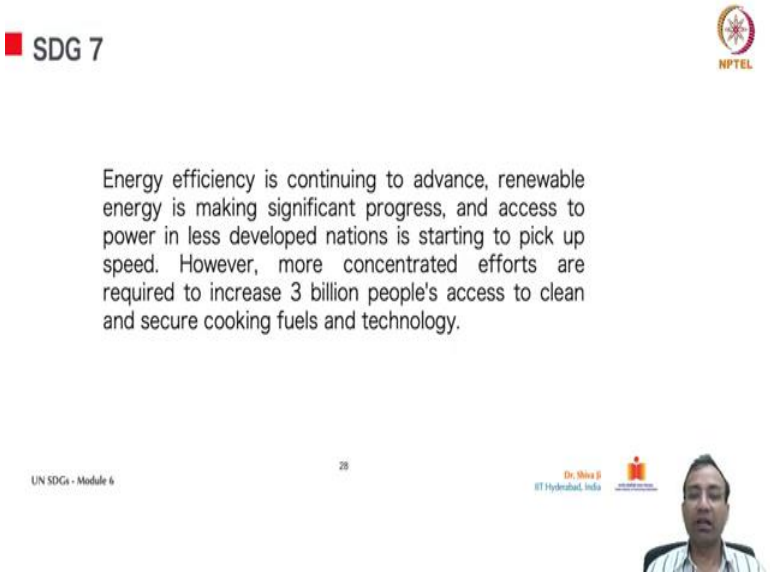

Energy Efficiency is continuing to advance, renewable energy is making significant progress and access to power in less developed nations is starting to pick up speed. However, more concentrated efforts are required to increase 3 billion people's access to clean and secure cooking fuels and technology.

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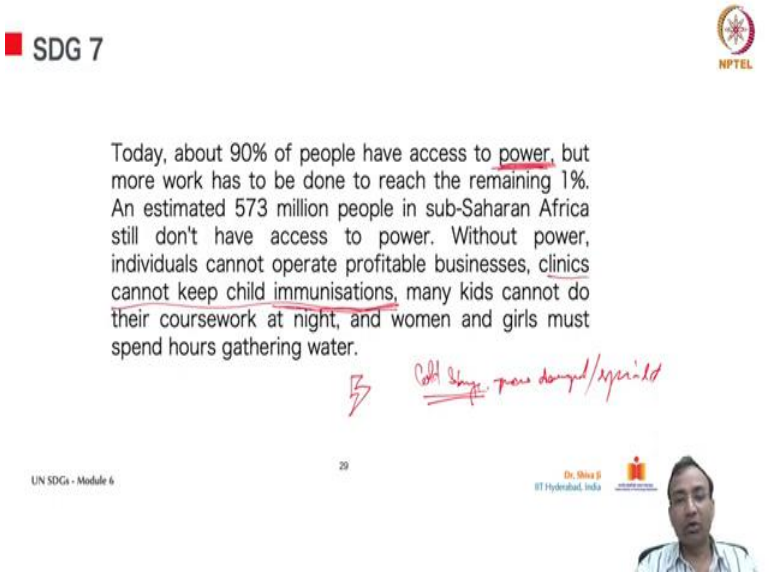

Today, about 90 of people have access to power, but more work has to be done to reach the remaining 1 percent. An estimated 573 million people in sub-Saharan Africa still do not have access to power without power individuals cannot cooperate profitable businesses, clinics cannot keep child immunizations, many kids cannot do their coursework at night and women and girls must spend hours gathering water.

So, if you see with the lack of power, how it impacts the people from the rural areas. So, there is a huge number of him people who are still living without power. So, this is one important point mentioned here, for immunization schemes one needs to carry vaccines to the far-away places. And since there are no cold storage systems properly in those places, there is no continuation supply of electricity. So, this is prone to getting damaged for get spoiled.

So, just imagine a little bit so much of effort actually goes into producing analysis thing and if it is just simply waste it, because we do not have storage systems, it is really unfortunate. So, this is one of the examples where in electricity, this energy is in an essential component in today's time because even if you are not using it directly but you are using it indefinitely indirectly in many forms, even if you come from far away remote places also.

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In relation to SDG 8, economic growth that is sustained and inclusive can advance society, produce good employment for everybody and raise standards of life. Although labor productivity and real GDP per person have improved globally. 731 million people still live in poverty defined by living on less than U.S dollar 1.9 per day.

So, the real GDP grew by 4.8 percent annually. Median hourly pay for men is 12 higher than that of women, so still there is disparity, global unemployment rate 5 percent, one-fifth of young people are not in education employment training.

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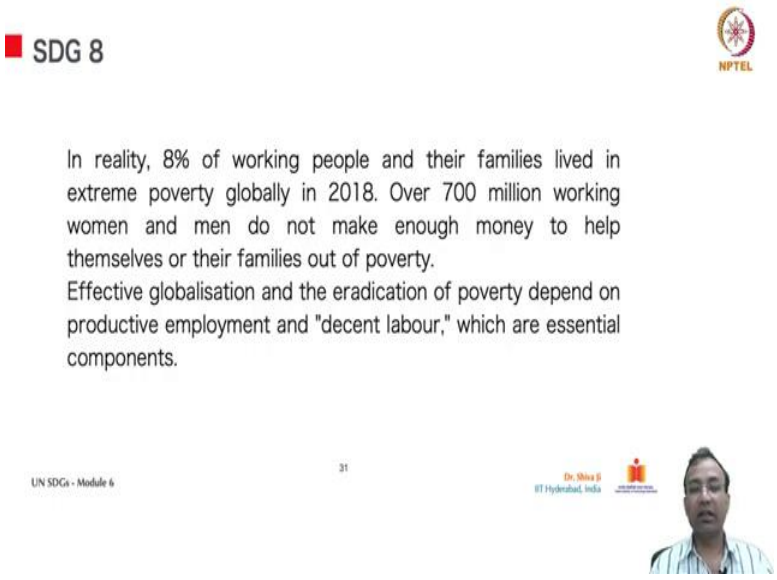

In reality 8 percent of working people and their families lived in extreme poverty globally in 2018, over 700 million working women and men do not make enough money to help themselves or families out of poverty. Effective globalization and eradication of poverty depend on productive employment and decent labor which are essential components.

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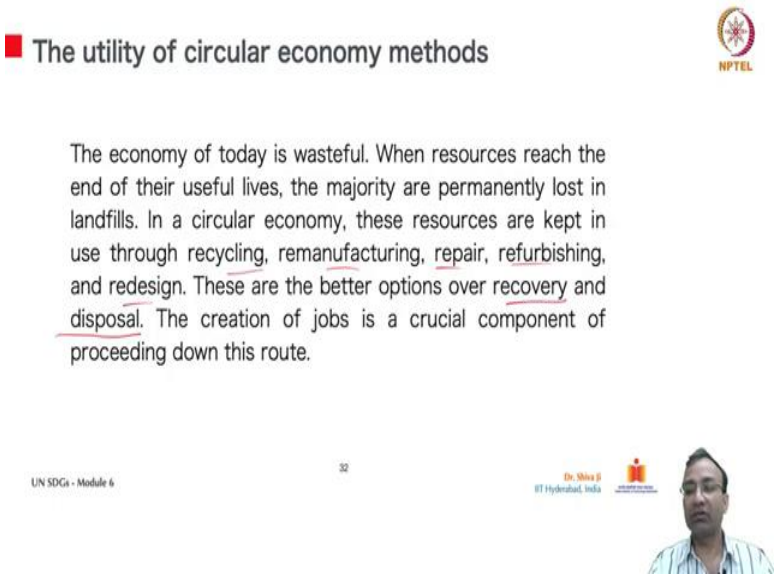

The economy of today is wasteful. When resources reached the end of their useful lives, the majority are permanently lost in landfills. In a circular economy these resources are kept in

use through recycling, remanufacturing, repair, refurbishing and redesign, etc. These are the better options over recovery and disposal. Of course, because the recovery and disposal are the last result, the creation of job is a crucial component of proceeding down this route.

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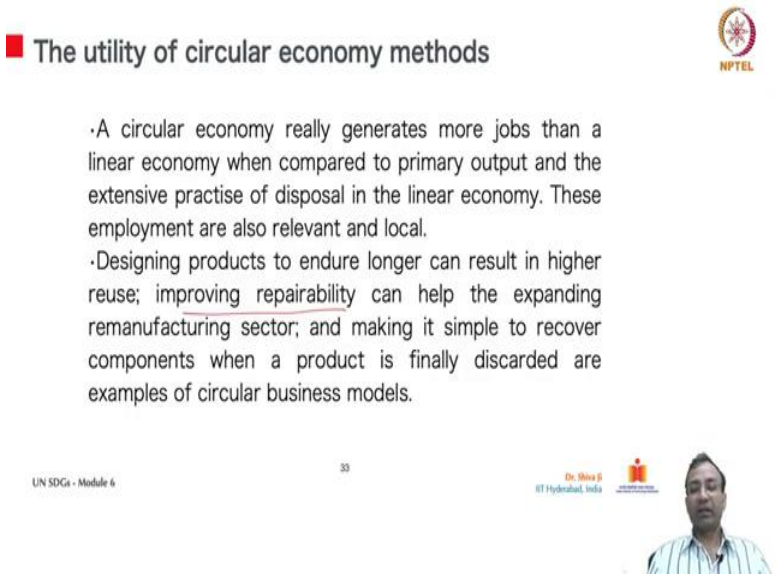

A circular economy really generates more jobs than a linear economy when compared to primary output and the extensive practices of disposal in the linear economy. These employment are also relevant and local. Designing products to endure longer can result in higher use, improving repairability can help the expanding remanufacturing sector and making it simple to recover components when a product is finally discarded are examples of circular business models.

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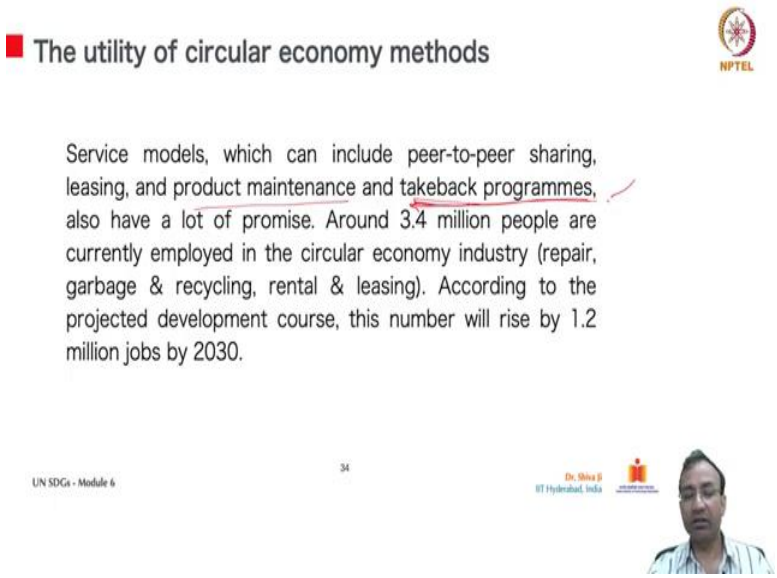

Service models, which can include peer-to-peer sharing, leasing and product maintenance and takeback programs also have a lot of promise, so take back programs you can underline over here, product maintenance and take back programs. So, take by programs are sometimes you may have seen while buying a phone companies give sum money in exchange of your old phone. Around 3.4 million people are currently employed in circular economy industry. According to projected development course this number will rise by 1.2 million jobs.

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Related to SDG 12, the global material footprint is rapidly growing outpacing population in economic growth. Developed countries use one-fifth of natural resources.