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Education for Sustainable Development
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Lecture - 03
Sustainable Development Goals (Contd.)

Hello friends, welcome to this NPTEL course on Education for Sustainable Development. In the last class, we have discussed about some of the SDGs, some of the sustainable development goal that is 1, 2 and 3; up to 3 SDG we have discussed. Today we will discuss about the SDG 4 that is a quality education, that is the quality education.

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ENSURE INCLUSIVE & EQUITABLE QUALITY EDUCATION & PROMOTE LIFELONG LEARNING OPPORTUNITIES FOR ALL

4 QUALITY EDUCATION

Education is the process of facilitating learning or the acquisition of knowledge, skills, values, beliefs and habits.

Quality education specifically entails issues such as appropriate skills development, gender parity, provision of relevant school infrastructure, equipment, educational materials and resources, scholarships or teaching force.

Education liberates the intellect, unlocks the imagination and is fundamental for self-respect. It is the key to prosperity and opens a world of opportunities, making it possible for each of us to contribute to a progressive, healthy society. Learning benefits every human being and should be available to all.

Since 2000 there has been enormous progress in achieving the target of universal primary education. The total enrolment rate in developing regions reached 91% in 2015, and the worldwide number of children out of school has dropped by almost half. There has also been a dramatic increase in literacy rates, and many more girls are in school than ever before.

Achieving inclusive and quality education for all reaffirms the belief that education is one of the most powerful and proven vehicles for sustainable development.

It also aims to provide equal access to affordable vocational training, to eliminate gender and wealth disparities, and achieve universal access to a quality higher education

IIT Kharagpur NPTEL

So, SDG 4 is you know to ensure the inclusive and equitable quality education and promote lifelong learning opportunities for all, that is the theme of SDG 4 quality education. So, by quality education again it emphasizes on; that means as because education is the process of facilitating the learning or acquisition of knowledge, skills, beliefs and habits. So, we have to ensure, we have to enhance the quality of education to do justice, to equality, to quality of study materials, quality of learning, quality of learning resources all kinds of things.

So, here quality education specifically it enters the issues such as you know appropriate skill development, gender equality, provision for the relevant school infrastructure, then equipment, educational materials, then you know resources available, infrastructure, scholarship and teaching force all kinds of things. That means we have to enhance the quality in all aspects, in all aspects like you know teacher training, quality, material, then technology, then other kinds of resources, learning materials and resources. So, in all these aspects, we have to ensure the quality.

Now, with the you know with the internet and with the globalization etcetera, the learning materials are learning resources are open; it is open and you know enormous volume of resources are there, but we have to again customize it as per the requirement of our students, of our children. So, education does, we can say another goal of education that education liberates the intellect unlocks the imagination and the and it is a fundamental for self-respects, ok.

So, we can say as with education not only we qualify for some kind of jobs etcetera; it enhances our intellectual curiosity, it enhances our imagination and also the more and more we competences and we develop so it also enhances our self-respect, self-esteem etcetera, self-efficacy. So, therefore, it is you can say it is the key to prosperity, all kinds of prosperity and availing all kinds of the opportunities that is and making it possible for each of us to contribute to progressive healthy society.

So, in that way only through education only we can prosper not only in our own lives and subjective well-being etcetera; but also we can significantly contribute towards the society. So, that is why learning benefits every human being and should be available to all. So, that is why the primary goal of this SDG 4 is that to how to ensure, how to ensure quality education to all the citizens of the country, citizens of the country. So, now, we since 2000 there has been enormous progress also.

As all of you know that we have so many, we have had so many of our education policies etcetera and the recent the most recent one is a, you can see the National Policy on Education 2020. So, which has actually brought the remarkable changes, remarkable revisions and remarkable modification as per the need of the ours for the requirement of the stakeholders.

So, that is why there is a, again moreover with all kinds of the efforts in previous education policies, effort policy implications with mid day meal and you know universalization primary education and other kinds of the policies also.

Yes, definitely we have enhanced our literacy rate has been has increased; but even then that means there has been dramatic increase in literacy rate and may many more girls are now coming to the school. So, now, girls education we have been successful in uplifting, enhancing the girls education as a result of this many of the education policies.

So, that is why achieving the inclusive and quality education for all, reaffirms the belief that education is one of the most powerful and proven vehicle for the sustainable development. So, as we know that UNESCO itself has announced that ESD is the only tool is the key tool to achieve all the 17 SDGs. Similarly, here also in within the country, within the domain of education also; it also we can emphasize that quality education, not that for the namesake or for the formal certification etcetera.

Quality education actually is the vehicle to achieve all kinds of the prosperity to build a very inclusive society, to you know to bring that to achieve that sustainable development; because you know sustainable development needs a kind of mindset, needs a kind of paradigm shift in our outlook. So, that can only be possible through you know education; education moreover the quality education.

That is why in order to bring, because of the lack of education facilities in the rural sector and some of the you know some of the you know remote areas. So, there actually there happens that the gap between the, you know gap between the schools system by gap between the education system, platforms even among the students with not only the range of diversity increases, but also the gap, gaps also takes place.

So, in order to fill up those gaps, in order to narrow down these gap; how to uniformize, how to make it uniform, how to make it more qualitative then by providing, that is only possible by providing quality education.

So, how to ensure quality education? So, for that matter we have to you know nowadays with the use of technology, now we are you know even NCERT, CBSC they are also providing the

online education, learning materials, books, all kinds of things that is to bring parity in the system of education within our country.

So, again this goal also provides equal, also advocates for providing equal access and affordable vocational training to all the stakeholders, all the citizens, all the students and learners and to eliminate any kind of gender bias or any kind of disparity or any kind of you know any kind of any discrimination, differentiation etcetera.

But to facilitate, but to facilitate all kinds of the affordable vocational training after the higher secondary level; then eliminate gender inequality or any kind of wealth disparities or that is the with an intention to achieve the universal access to quality education, both at the school level as well as the higher education level. But why we are emphasizing more on the school level? Because you know school level is the you can say it is the foundation, it is the foundation of our whole education system.

So, in order to make our education system more sustainable, we need to start from the grass root level; we need to start from the very beginning, the primary level and the primary level itself. So, nowadays with only getting the learning materials, quality materials through different kinds of you know online courses for the higher education students, it is not enough; because we have to uplift, we have to enhance the quality of our school education as well.

So, because you know that we will be discussing how to make our system, education system more sustainable, that we will be discussing in the due course; but now let us discuss about what is the goal of this SDG 4. And under this SDG 4 quality education, there are also other kinds of sub goals are there, targets are there that we will be discussing.

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EDUCATION IN INDIA

India has made great strides in improving access to quality education, increasing elementary school enrollment and reducing the number of out-of-school children.

These achievements have been bolstered by key laws, policies and programs such as the **Right of Children to Free and Compulsory Education (RTE) Act (2009)**, the **National Early Childhood Care and Education (ECCE) Policy (2013)**. However, challenges do remain.

An estimated 6.1 million children out of school in 2014 reduced from 13.46 million in 2006. Out of 100 students, 29 per cent of girls and boys drop out of school before completing the full cycle of elementary education, and often they are the most marginalized children. (Source: SRI-IMRB Surveys, 2009 and 2014)

Around 50 per cent of adolescents do not complete secondary education, while approximately 20 million children not attending pre-school. (Source Rapid Survey of Children 2013-2014 MWCD)

Half of primary school-going children – which constitutes nearly 50 million children – not achieving grade appropriate learning levels. (Source: National Achievement Survey, NCERT 2017)

Children's school readiness at age 5 has been far below expected levels. Over the first half of the Country Program, there have been various changes in the operating environment that have impacted upon how the UNICEF India Education Program shall operate moving forward.

UNICEF NPTU

Current what is the current status of education in India, let us discuss have a discussion. So, India has made the great strides in improving the access of quality educations, increasing the elementary school enrollment and reducing the number of dropouts in the school and motivating the children to go to the school for with the incentives like mid day meal, with the incentives like the books, uniforms all kinds of things.

So, these are some of the efforts that has been made, but then the, now the new type that the different policies; education policy national like early childhood education policy in 2013, then right to right for the right of the children for the free and compulsory education RTE Act 2009.

So, now gradually as the data source, gradually the children are the retention, thus the retention rate is increasing, the enrollment and retention is increasing. But even then around 50 percent of the adolescents do not complete their secondary education, while approximately 20 million children they attend, similar they also are not attending the preschool.

This is the outcome of the survey of the children 2013 to 14 done by MWCD. So, because most of the half of the children, half of the school going children primarily are staying in the rural sector and they are not that much motivated; they are not that, their parents are not that

much keen to send their children to the schools, because of the n number of reasons, n number of contextual factors and socioeconomic factors.

So, now, so that is a National Achievement Survey NCERT 2017; it is it shows that half of the primary school going children, which constitute nearly 50 million children not achieving the grade appropriate learning levels. So, therefore, children's school readiness at the age of 5 has been far below the expected level. So, over the, that is why over the first half of the country program. So, there have been the various changes in the operating environment that have impacted upon how the UNICEF India education program shall operate and move ahead.

So, this is the actually this is the educational status in India and how what sort of initiative the India is taking through different organizations, in through policy, national policies organization, NCERT and then UNICEF India programs. So, how it is moving towards gradually uplifting the even the literacy rate and the children's retention in the school and getting the primary education, uniform primary education and the quality and up to the quality level up to the quality level then.

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ACHIEVE GENDER EQUALITY & EMPOWER ALL WOMEN AND GIRLS

Gender Equality is a principle that states that all men and women need to be treated equally and to have the same rights despite their biological differences. These should not prevent them from having the same opportunities to succeed in school and in life.

Gender bias is undermining our social fabric and devalues all of us. It is not just a human rights issue; it is a tremendous waste of the world's human potential.

By denying women equal rights, we deny half the population a chance to live life at its fullest. Political, economic and social equality for women will benefit all the world's citizens.

But there are still large inequalities in some regions, with women systematically denied the same work rights as a man.

Sexual violence and exploitation, the unequal division of unpaid care and domestic work, and discrimination in public office all remain huge barriers.

5 GENDER EQUALITY

NPTEL

So, achieve the gender equality and empower all women and girls; that is again that is the goal number SDG 5, that is SDG 5 gender equality, that is achieving the gender equality and empower all women and girls.

Here we are emphasizing categorically more on women education, bringing women to the workforce measurement, mainstream workforce then educating our girls etcetera. So, that is why gender equality all of us we are you we know that the now the gender equality has become very sensitive issue nowadays.

And how the government is making effort to give more emphasis on this and ensuring that the gender equality is being maintained everywhere. So, gender equality is the principle that states that all men and women need to be treated equally, having the same rights despite any kind of by all kind of biological differences and they should not be prevented from availing that kind of opportunities to succeed in life, in education, in schools etcetera.

So, therefore, gender bias is; because you know gender bias is undermining our social fabric, it devalues our you know our prestige, our efficacy, our esteem etcetera. So, that is why that is it is not, actually it is a gender bias; it is actually affecting it is a malicious issue of human rights also. So, that is a it is a tremendous wastage of manpower or human potential. So, and by denying the women equal rights, actually we are wasting our talents, we are wasting our prosperity; we are not getting, we are wasting our opportunity to get the thing.

So, gradually the in the condition the status of women and is increasing in the main measure, in the main workforce, mainstream workforce with the political, with the economical and the social you know social policy implementations, even organizations and corporate sectors they are also making a policy like not only welcoming or inviting diversity; but also giving more you know flexibility and privileges for the women workforce, so that they can come and work, maintain a work life balance as per their personal life challenges they are facing.

Similarly, so, but even then inspite of all this effort, there are still in all lot of inequalities are there; in some regions, in some areas area, some regions and with women systematically, where the women systematically are denied for the same work rights in terms of wages, in terms of time, in terms of flexibility etcetera. So, we have to, again we have to ensure that

how gender equality can be achieved; that is the SDG 5 how it can be achieved, not only globally, globally the other countries are doing.

But at least Indian context how we can achieve this and how can we enhance our, you know enhance our you know quality and enhance our number of, that means the rating of gender equality. So, like being the largest democratic country, so it is it becomes our responsibility is the responsibility of our citizens of all stakeholders that is to bring that parity. Because you know womens education is the you know it is a you can say it is a root, it is the platform for the generational success, for the sustainable future, for a sustainable future as well.

So, moreover nowadays as all of us we know this kind of, this kind of the this kind of the nasty issues that is sexual violence, exploitation, all kinds of the disparities, all kind of the nuisance things that discrimination all kinds of it actually it becomes a very huge kind of hurdle, huge barrier and hurdle in the process, in the progress of women empowerment, child girls education etcetera. So, now the five that 5th SDG is primarily emphasizing on gender equality, especially for bringing uplifting, upgrading the status of women and girl children in our society.

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GENDER EQUALITY IN INDIA

Discrimination against women and girls is a pervasive and long-running phenomenon that characterizes Indian society at every level.

India's progress towards gender equality, measured by its position on rankings such as the [Gender Development Index](#) has been disappointing, despite fairly rapid rates of [economic growth](#).

In the past decade, while Indian GDP has grown by around 6%, there has been a [large decline in female labour force participation](#) from 34% to 27%. The [male-female wage gap has been stagnant at 50%](#) (a recent survey finds a [27% gender pay gap](#) in white-collar jobs).

Crimes against women [show an upward trend](#), in particular brutal crimes such as rapes, dowry deaths, and honor killings.

These trends are disturbing, as a natural prediction would be that with growth comes education and prosperity, and a [possible decline in adherence to traditional institutions and socially prescribed gender roles that hold women back](#).

The slide includes a photograph of a group of women in traditional Indian attire, a circular inset video of a woman speaking, and logos for the Indian Institute of Technology (IIT) and NPTEL at the bottom.

So, now, this is the status of gender equality in India; these are the data that you may not get in any text book or in open source you may not be actually. But we have captured it for,

because as because there is no such text book in this course, so we are providing this kind of data as a learning material.

So, this is the status of women in India, that is discrimination against women and girls; as all of us aware of what is the different kinds of the you know crimes happening with the in the society with the women etcetera, what is the percentage and the gender, as the gender development index shows that what is the process of economic growth, because of this due to this disappointing results etcetera what is the economic growth. So, in the past decade when the Indian GDP has grown around 6 percent, there has been a large decline in the female labor force participation.

Why? Because from that has been decreased from 34 to 27 percent; the male, female because that another reason that male female wage gap. Wage gap it has been stagnant at 50 percent; recent survey finds that 27 percent gender pay gap is there in white collar jobs. The crime against women it shows an upward trend; then again honor killing, then the brutal crime such as the rapes, dowry deaths and all kinds of the these kind of killings, all kind these are all crime against women.

So, these kind of trends actually are very disturbing, it is are very actually it is a it is a kind part; it is a type of disaster we can say, it is the kind of disaster in our society. So, it is very difficult, because it we have to, how to remove these things; because we have to remove it from the mindset, from the attitude, from the thinking process of the citizens. And for that how to, for that how to update upgrade the thinking process attitude and behavior; that is only education is the only tool, education is the only tool.

So, there is a possible decline in the adherence to the traditional institution and socially prescribed gender roles that hold the women back; that is this the kind of you know the bias that is still exist in our society. So, this is the existing status of gender equality in India; now this is the data, now how to overcome all these thing, how to go beyond this, how to achieve the SDG 5 for our country.

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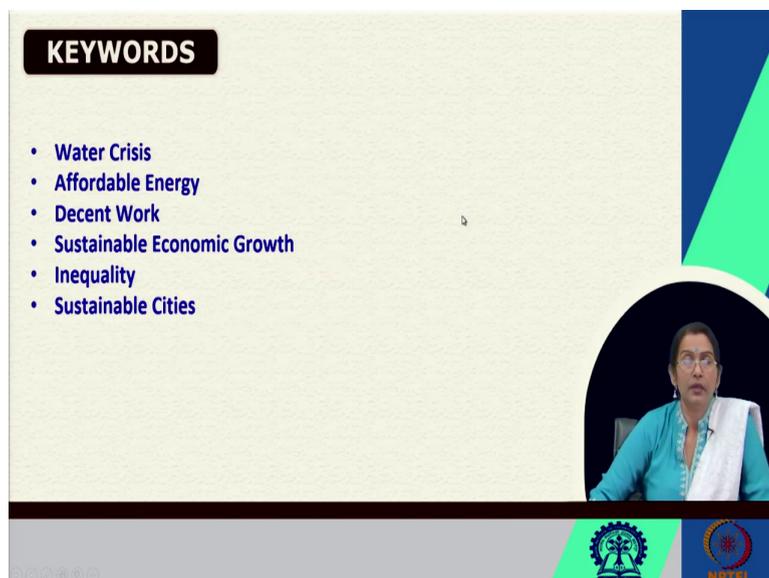
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- <bing.com/videos>

The slide features a video inset of a woman in a blue and white sari on the right side. At the bottom, there are logos for a university and NPTEL.

So, these are some of the references, these are some of the reference related to this up to this kind of the gender equality and this kind of SDG. Now, we will switch over to another thing.

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KEYWORDS

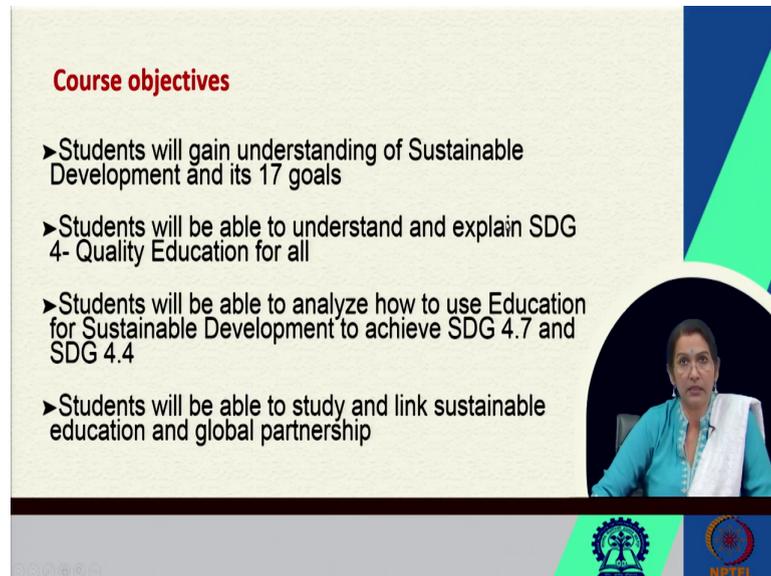
- Water Crisis
- Affordable Energy
- Decent Work
- Sustainable Economic Growth
- Inequality
- Sustainable Cities

The slide features a video inset of a woman in a blue and white sari on the right side. At the bottom, there are logos for a university and NPTEL.

So, now, we will be discussing about the other SDG. So, after SDG 5, then that is SDG 6 is there and throughout these discussions; these will be the key words, like water crisis,

affordable energy, decent work these are the key words that we will be discussing next onwards.

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Course objectives

- ▶ Students will gain understanding of Sustainable Development and its 17 goals
- ▶ Students will be able to understand and explain SDG 4- Quality Education for all
- ▶ Students will be able to analyze how to use Education for Sustainable Development to achieve SDG 4.7 and SDG 4.4
- ▶ Students will be able to study and link sustainable education and global partnership

The slide features a video inset of a woman in a blue and white sari. At the bottom, there are logos for a university and NPTEL.

And these are the course objectives is common to all the slides and all the things, expected learning outcomes.

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Expected Learning outcomes

- ▶ By the end of the course students will be able to:
- ▶ Describe the UNESCO's 17 Sustainable Development Goals
- ▶ Identify elements of Education for Sustainable Development
- ▶ Illustrate and integrate ESD to achieve SDG 4.7
- ▶ Explain and formulate ESD to accomplish SDG 4.4
- ▶ Interpolate sustainable education and global partnership

The slide features a video inset of a woman in a blue and white sari. At the bottom, there are logos for a university and NPTEL.

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ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER & SANITATION FOR ALL

- Water is essential to life. It constitutes up to 65% of the human body and 90% of the structure of plants.
- Nevertheless, this fundamental element to existence is seriously threatened because of pollution of rivers, suffers shortages in certain regions of the world and costly management in cities.
- One in three people live without sanitation. This is causing unnecessary disease and death. Although huge strides have been made with access to clean drinking water, lack of sanitation is undermining these advances.
- If we provide affordable equipment and education in hygiene practices, we can stop this senseless suffering and loss of life.
- Safe and affordable drinking water for all by 2030 requires we invest in adequate infrastructure, provide sanitation facilities, and encourage hygiene. Protecting and restoring water-related ecosystems is essential.

6 CLEAN WATER AND SANITATION

IIT Bombay logo and NPTU logo are visible at the bottom of the slide.

So, now, we will focus on SDG 6, that is the clean water and sanitation. So, that is that ensure how to ensure the availability and sustainable management of water and the sanitation for all, that is the focus of SDG 6; to ensure availability and sustainable management of water and sanitation for all. So, that is as because all of us as we know that water is a very essential part and how the quality of water is being is decreasing and the shortage of water and all kinds of things.

So, the that is why the as because and moreover the pollution also takes place, the water has been you know depletion of water quality takes place, because of the pollutions of the rivers. And so, it also suffers from the shortage in certain kinds of region as because of the world and costly management of the cities then the population growth, then you can say the even because of the climate change also there is in some areas, some zones the volume of the rain, yearly rains rainy seasons or the rains are also decreasing.

So, that is these are the reasons, similarly and in India the major problem is lies with the sanitations and this is the causing of unnecessary disease and death; because the poor quality of sanitation also affects primarily the rural people.

So, you know that the all of us as we know that this government has already introduced since 2014 all these you know Swachh Bharat Abhiyan and in the process how to; that means

preparation of in every household, in every household they have built up the government authorities, they have built up the toilets for everybody, for every household.

And you know for cooking gas all these kind of initiatives are they stood to; that means to enhance the quality of life of the rural people especially. So, although these huge strides have been made access to the, even the access has been made to for clean or getting the clean drinking water, electricity etcetera; but still sanitation is still undermining, is undermining in and in its process, because we need to update it.

So, even though the process has been started, the initiative has been taken by the thing; but the community people the people, the citizens, the stakeholders they have to be very active, they have to be very alert and I mean and you know they have to be very attentive and alert you know regarding this health care, sanitation and you know pollution aspect, they have to be very keen and careful.

So, it provides affordable equipment and education in hygiene practices, so that we can stop senseless suffering of the life. So, moreover along with this infrastructure facility, along with the infrastructural facilities or the construction of kind this kind of household toilets and other kinds of facilities; but education is there.

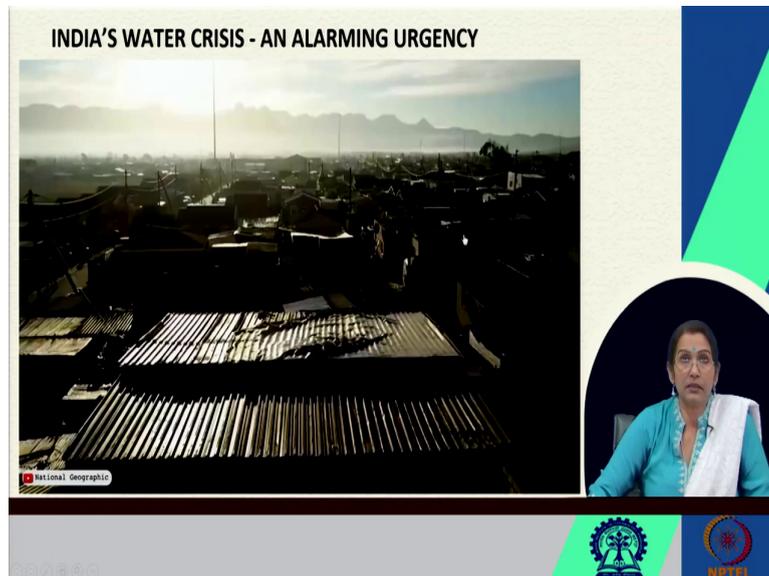
We have to educate them from time to time regarding the health and hygiene and how to stop this kind of thing, stop this kind of you know sufferings. So, this, that is why education and awareness programs are very important.

So, safe and affordable drinking water by all 2030 that is one of the agenda that requires that we; that is why we need to invest more adequately in our infrastructure, in our and sanitation facilities and encourage the personal hygiene and protecting restoring the water related ecosystem is also essential.

Now, this rain water harvesting and other kinds of the or other kinds of the plans schemes are also available; even start up business are also being are also working on the sustainable lifestyle, sustainable health, sustainable agriculture, so that is to enhance the quality of life of the people.

So, that is a clean water and sanitation as a very important factor, very important factor in restoring the restoring good health for our citizens.

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Then the next, this is the India's water crisis an alarming urgency; this is the picture captured from the from different, from the different source of online material.

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WATER AVAILABILITY IN INDIA

Water availability per person is dependent on population of the country and for India, per capita water availability in the country is reducing due to increase in population.

The average annual per capita water availability in the years 2001 and 2011 was assessed as 1816 cubic meters and 1545 cubic meters respectively which may further reduce to 1486 cubic meters and 1367 cubic meters in the years 2021 and 2031 respectively.

As per Ministry of Housing and Urban Affairs, 135 litre per capita per day (lpcd) has been suggested as the benchmark for urban water supply. For rural areas, a minimum service delivery of 55 lpcd has been fixed under Jal Jeevan Mission, which may be enhanced to higher level by states.

As mentioned in the report of National Commission for Integrated Water Resources Development (NCIWRD), the percentage of water used for irrigation out of the total water use for the year 1997-98 was 83.30%.

As per NCIWRD report, the percentage of water used for irrigation out of the total water use for the year 2025 under high demand scenario was estimated as 72.48%.

This information was given by the Union Minister of State for Jal Shakti & Social Justice and Empowerment, Shri Rattan Lal Kataria in a written reply in Rajya Sabha today.

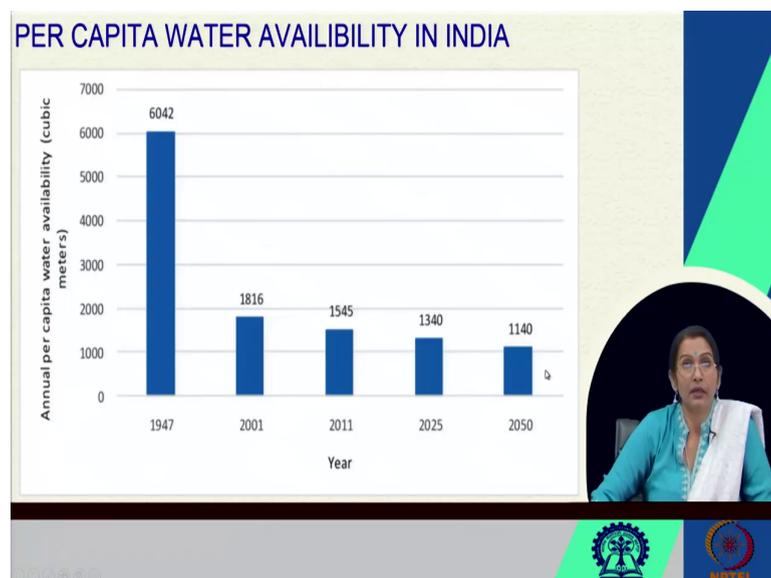
The slide contains text about water availability in India, including population-dependent factors and specific data points from 2001, 2011, 2021, and 2031. It also mentions government benchmarks and reports from NCIWRD. A video inset shows a woman speaking, and the NPTEL logo is at the bottom right.

So, now, this is the status of water availability in India; water availability per person is dependent on the population of the country and for India, per capita water availability in the country is reducing due to the increase in population, ok. So, this is the data that the average annual per capita water availability in 2001 and 11 it was like this given here. And as per the Ministry of Housing and Urban Affairs, 135 liter per capita per day has been suggested as the benchmark for the urban water supply.

But as per the National Commission of Commission for Integrated Water Resources Development, the percentage of water used for irrigation out of the total water used for the year was only 83.3 percent. And now it has gradually, that means it is mostly used for the irrigation out of the total water use for the year 25 with high demand scenario and the estimated was as the 72.48 percent.

So, this information was given by the Minister of State for Jal Shakti and social justice by the so and so, in the so and so in the Rajya Sabha. So, this is the status this the data about India's in Indian context the availability of the water and for agriculture purpose, for drinking purpose what is the status of water in India, this is the data captured.

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So, as you can see the per capita water availability in India; this is the diagram, per capita water availability in India, then in 1947 the percentage were like this and 2001, 12 and

towards this it is gradually decreasing, you can say decreasing, as you can see there is a scarcity of water how it is. So, maybe that it is assumed that by 25, 2025 it will be like this cubic, this cubic meter the cubic liter. So, and by 2050, gradually again decreasing.

So, how to that is. So, it is a, as because the water is you know one of the source of our life; so how to take care of this and how to, you know how to enhance the quality of water, how to use it, how to save it, how to preserve it, how to use it sustainably.

So, that is because now it has become so precious; in even within the country in summer season, in some of the areas, some of the areas how difficult it is to get the drinking water. So, that is water has become the most precious, you know most precious resource in our life next to energy, next to energy you can say.

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ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE & MODERN ENERGY FOR ALL

7 AFFORDABLE AND CLEAN ENERGY

- Between 2000 and 2016, the number of people with electricity increased from 78 to 87 percent, and the numbers without electricity dipped to just below one billion.
- Yet, as the population continues to grow, so will the demand for cheap energy, and an economy reliant on fossil fuels is creating drastic changes to our climate.
- Investing in solar, wind and thermal power, improving energy productivity, and ensuring energy for all is vital if we are to achieve SDG 7 by 2030.
- Expanding infrastructure and upgrading technology to provide clean and more efficient energy in all countries will encourage growth and help the environment.

The slide includes a video of a woman speaking and logos for IIT Bombay and NPTEL.

So, then comes the SDG 7, that is the affordable and clean energy; affordable and clean energy that is how to ensure the access to affordable and reliable sustainable and modern energy for all. So, between 2000 to 2016, so people having the electricity facilities have of course, increased from 78 to 87 percent; but even then the number of people who are without electricity also still this dipped just below the one billion.

So, as the population continues to grow, so well the demand of for the cheap energy, affordable energy and an economy reliant on the fossil fuels also creating the drastic change

in our to our climate. So, that is why we have to invest more on solar energy, wind power, thermal power to for improving the energy productivity and ensuring the energy for all, that is very vital to achieve the SDG 7 by 2030.

So, for that reason we have to expand our infrastructure, upgrading the technology and to provide the clean and more efficient energy in all the countries. So, and that will encourage the growth and development and help the environment.

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ENERGY AVAILABILITY IN INDIA

India has seen extraordinary successes in its recent energy development, but **many challenges remain, and the Covid-19 pandemic has been a major disruption.**

In recent years, India has brought electricity connections to hundreds of millions of its citizens; promoted the adoption of highly-efficient LED lighting by most households; and prompted a massive expansion in renewable sources of energy, led by solar power.

The gains for Indian citizens and their quality of life have been tangible. However, **the Covid-19 crisis has complicated efforts to resolve other pressing problems.**

These include a **lack of reliable electricity supply for many consumers; a continued reliance on solid biomass, mainly firewood, as a cooking fuel for some 660 million people; financially ailing electricity distribution companies, and air quality that has made Indian cities among the most polluted in the world**

The slide features a video inset of a woman in a blue and white top speaking. At the bottom, there are logos for the Ministry of Power and NIPTE.

So, this is again energy availability status in India. As you can see the many we have to, we are facing many many challenges and especially during this Covid 19 pandemic also it has been a major disruption. So, and in recent years, India has brought the electricity connection to hundreds of households in households and promoted the adoption of the highly efficient LED lights bulbs in the streets as well in the rural areas etcetera and most of the household.

But however, you know, however, this Covid 19 crisis has complicated the all efforts and you know frequent cyclones, frequent storms, thunderstorms and the frequent cyclones happening all around the country. So, that also that is also this, these are also you know disasters for us in disrupting our whole system. So, the lack of reliability electricity supply also; you know very soon we are getting the news that very soon our coal, our coal industry, coal power, coal

that means the energy being made through the coals are will be gradually decreasing are, gradually decreasing because of the shortage of this minerals and this from the coal mines.

So, that is why it kind of, that means how to explore, how to innovate the other ways and means of getting the energy; starting from the cooking fuel to the you know for the energy for running our factories, for you know for you know even for the internet bandwidth all kinds of things self-reliance.

So, all these kinds of things and the even the companies also, companies or the manufacturing sector, even the industry infrastructure and service industries how to provide; how to you know manage our all the activities with the energy creation.

Moreover, at the same time we have to control the pollution also; that means with zero carbon footprint or minimum carbon footprint how to create, how to produce energy, how to generate energy for our different activities and but that is why the energy should be clean and affordable.

Clean energy without affecting the environment or with the minimum carbon footprint and clean energy and affordable energy, so that everybody every single citizen everyone, every citizen of India can afford to get the, afford to get the connection get the that means get the connection from then afford to bring it to their households and the as a household.

Nowadays we are having your our expense; that means our expenditure or expenses, that mean our usage, our electricity usage now the with the increasing urban lifestyle also. So, consumptions or consumption electrical energy consumption is also increasing. So, with an increasing in an energy consumption, demand etcetera how to you know, how to mitigate, how to mitigate the shortage, how to resolve the shortage and to not only to provide the facilities to all the sectors but at the same time control the pollution and pollutions and how to produce it in a more in a cost effective way.

So, these are some of the challenges that nowadays we are facing.

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INDIA'S SOLAR POWER REVOLUTION

Solar power is set for explosive growth in India, matching coal's share in the Indian power generation mix within two decades in the STEPS – or even sooner in the Sustainable Development Scenario. As things stand, solar accounts for less than 4% of India's electricity generation, and coal close to 70%. By 2040, they converge in the low 30% in the STEPS, and this switch is even more rapid in other scenarios. This dramatic turnaround is driven by India's policy ambitions, notably the target to reach 450 GW of renewable capacity by 2030, and the extraordinary cost-competitiveness of solar, which out-competes existing coal-fired power by 2030 even when paired with battery storage. The rise of utility-scale renewable projects is underpinned by some innovative regulatory approaches that encourage pairing solar with other generation technologies, and with storage, to offer "round the clock" supply. Keeping up momentum behind investments in renewables also means tackling risks relating to delayed payments to generators, land acquisition, and regulatory and contract uncertainty. However, the projections in the STEPS do not come close to exhausting the scope for solar to meet India's energy needs, especially for other applications such as rooftop solar, solar thermal heating, and water pumps.

The slide includes a video call window showing a woman in a blue top and white shawl, a photograph of solar panels, and logos for IIT Bombay and NPTU.

So, now India's solar power revolution has taken place. So, this is the case study about the solar power, how it has been explored and what is the rate of growth in India, that is you can say by 2040. So, they are aspiring to converge the low 30 percentage in the STEPS and which and this switch is often been is even more rapid in other scenarios.

So, these are the 450 giga watt of the renewable energy capacity in by 2030, these are the agenda and how to make it cost competitiveness, how to enhance the cost competitiveness for the solar energy, how the how which out competes the existing coal power, coal fired by 2030. So, the rise of the utility scale renewable projects is also underpinned by some innovative regulatory approaches also.

So, and other generation technologies like with storage to offer round the clock supply; because there are some of the setbacks. Keeping up the momentum behind the investments in renewables also means tackling the risk relating to delayed payment of generators. So, so many these are the, you know these are the technical difficulties that we are facing.

So however, how to prepare it in a more cost effectiveness, what are the you know cost effectiveness how to that means what to how to strategically, how to strategically use it, how to sustainably use and strategically prepare it for you know for use in different kinds of you

know, different kinds of activities both in the industry sector as well as the normal house regular household sector.

Up to this we have discussed the SDG 7; in the next class then we will discuss about the SDG 8. So, for this for the time being now we stop here; we stop here, then in the next class, next session we will start the SDG 8.

Thank you.