NPTEL
NPTEL ONLINE COURSE
ECOLOGY AND ENVIRONMENT
Sustainability and Case Studies
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SUSTAINABLE
DEVELOPMENT GOALS

As has been mentioned in the first introductive lecture, the purpose of this course is not to make you into a professional ecologist or an environmental engineer or an environmental activist, but make you sensitive to the issues of ecology and environment in the framework of sustainable development.

So, we need to know something about sustainable development goals. I am sure many of you are aware of these sustainable development goals or SDGs as they are known, but this lecture is going to be just a reminder of this sustainable development goals. They were framed by the United Nations, all the countries that are part of the United Nations and many other organizations and they came into effect in January 2016 and the programs of United Nations and many organizations belonging to United Nations that is UNDP. They will all be based on the sustainable development goals until the year 2030, they are also known as Global Goals, and they are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

There are 17 goals, in fact, these goals are a follow up to the success of millennium development goals which were framed in 2000, and they were operational until 2015. The millennium development goals, they were only 8 of them, but now in sustainable development goals or SDGs, they have been extended to 17. They include new areas such as climate change, economic inequality etcetera. One thing very important for us to recognize at this point is all these 17 goals are very much interconnected, which means achieving one goal depends on tackling issues involved in another goal, so we cannot achieve one goal, without achieving the other goals all have to be done simultaneously.

So, let us look at these 17 SDGs. The first goal or goal 1 on the right side you see the logo for that particular goal, the goal 1 is no poverty. It is quite self-explanatory, which means that we are resolved to end poverty in all its forms and everywhere all over the world. The second goal is zero hunger, which means we have to achieve food security, improve nutrition and promote sustainable agriculture. Unless, we, promote sustainable agriculture which means that whatever the resources we are using for producing more food that should be in a sustainable way, whatever the resources we are using we should not deplete them and something should be available for the future.

Goal 3 is good health and well-being. Which means, we have to ensure healthy lives, promote wellbeing for all. It is important to promote well-being for all at all ages for children, infants, adults, senior citizens of all ages we have to have healthy lives.

Goal 4 is the quality education. Ensure inclusive, inclusive means, this education should be accessible to all, even the poorest of the poor. So, ensure inclusive and equitable quality education. An equitable quality that means, almost the same level of education for all, the same quality of education for all people. Another thing that is important here in the goal 4 is, it should promote lifelong learning opportunities, the education just doesn't end in a few years. The education continues for the entire lifetime, and then we should provide opportunities for the learning to all.

Goal 5 is gender equality; again this is self-explanatory which means we have to empower all women and girls. Goal 6 is clean water and sanitation. It is quite an important goal because providing clean water and providing adequate sanitation would also mean improving the public health, and achieving this other goal that we talked about, the healthy lives. So, we have to ensure the availability and sustainable management of water, which means that we provide water for the present needs, enough water, adequate water of good quality for the present generation. And sustainable management of water, which means we have to leave some of these water resources for future use, so sustainable management of water and this includes not only the water but sanitation facilities for all.

Goal 7, this is affordable and clean energy. We have to ensure access to affordable, that means it should not be too costly. Reliable, that means we have to provide energy at all times and not to get to a situation where there are too many you know power outages. And reliable also means, during the disasters also we may, we should have access to the energy, and of course the word sustainable is also included here. So, whatever the resources we are utilizing for generating this energy, they should be available in future too. And modern energy for all, what they mean by modern energy for all here is not just the energy derived from the conventional sources like fossil fuels, but the energy, wind energy, tidal energy, solar energy, these are all what the term as modern energy sources. So, modern energy for all, that is part of the goal 7.

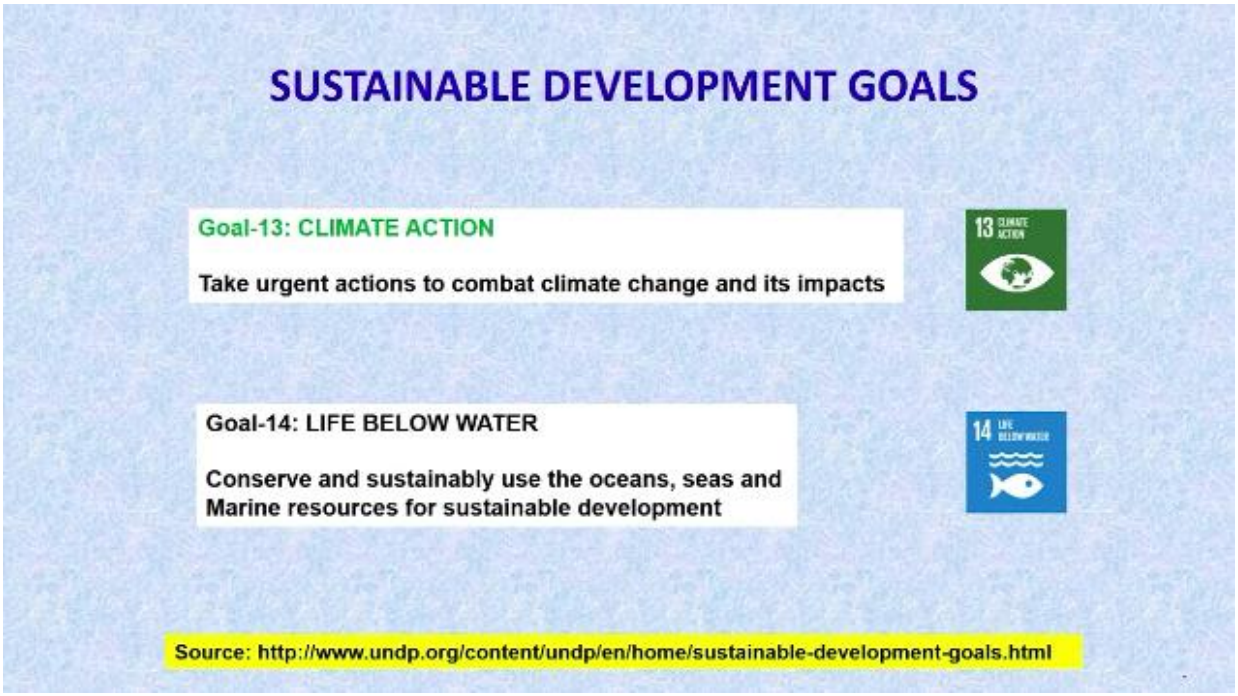
Goal 8 is decent work and economic growth. All the countries and organizations should promote sustained again the word comes inclusive that means the work should be available for all and sustainable economic growth, the economic growth should not be only for a few years now, but then it should be on a long-term basis.

Goal 9 is industry, innovation, and infrastructure. We have to strive for building, resilient infrastructure. What we mean by resilient infrastructure means whatever the infrastructure that we create, even if there is some disaster or some unknown, I mean unforeseen circumstances it might be dysfunctional for some time but then it should come back. It should bounce back, so that is a resilient infrastructure. Inclusive and sustainable industrialization, this theme about inclusive and sustainable, these two words keep coming again and again in all the goals, so we need to understand then what is this sustainability, that we will do a little later.

And of course, the countries and organizations should promote innovations. Then goal 10 is reduced inequalities, is very important, they should not be too much of disparity between people and this inequality should be reduced within each country and among the different countries. It is not good to have very rich people and very poor people living together. We should have all of them to be equally, I mean more or less equally wealthy, only such societies will be sustainable.

In the goal 11 is sustainable cities and communities. This is again a very important goal, as far as this course is a concern, because there is a lot of urbanization that is taking place, many people are migrating from villages to urban centers in search of employment, food, and other opportunities. So, we have to make our cities or urban centers and other human settlements inclusive, they should be place for all in this cities, and safe, again resilient and sustainable, our cities should be resilient and sustainable.

Goal 12 is responsible consumption and production. This is also a very important goal where we promote sustainable consumption that means take what you just need and don't take more than what you need and then waste it. And this goes from individuals to you know, the societies, to the countries and then at all levels. We should ensure sustainable consumption and also produce what is just needed, don't produce more than what is needed. So, goal 12 pertains to ensuring sustainable consumption and production patterns.



Goal 13 is climate action; climate change is imminent, global warming is imminent, and sea level rise is going to occur. All this will have a significant effect on our lives, on our future. We have to take urgent actions to combat this climate change; we have to live in a way that the temperature rises are not very significant. We have to understand, what is the implication of this climate change and what is its effect on our resources, on our systems and then we have to adapt to this climate change. So, climate action is an important goal among the sustainable development goals.

The goal 14 pertains to life below water, which means we need to conserve and, again the word sustainable is coming in here. We have to conserve and sustainably use the oceans, seas, and marine resources for sustainable development.

Then goal 15 pertains to life on land. There are several issues here. Several things that we need to take care of. The first one is we have to protect, restore, and promote sustainable use of terrestrial eco systems, whatever eco systems on the land. We have to use them in a very sustainable way, and leave something for the future. We have to manage our forest in a sustainable way; we have to fight desertification, we have to halt and reverse the land degradation because of anthropogenic activities. A lot of land is getting degraded and become, and is becoming useless, we have to halt that trend, and we have to reverse that trend. And we have been witnessing significant loss of biodiversity, and we have to stop that process, we have to halt this biodiversity loss. So, these are all part of our goal 15 which pertains to life on land.

The goal 16 is peace, justice, and strong institutions. Again self-explanatory which means we have to promote peaceful and inclusive societies for sustainable development because if peace does not exist if it does not include all the societies in our endeavours we will not have sustainable development at all.

And the goal 17 which is also quite important in my opinion and very key goal is partnerships for the goals. We cannot achieve all the other 16 SDGs without focusing on this, without fostering partnerships. We have to strengthen the means of implementation; we have to revitalize global partnerships, a single person, a single community or a single country cannot simply achieve the sustainable development goals, we are all in it together, we all have to work together. In this context, I will just highlight this goal 6 that is clean water and sanitation, which pertains to ensuring availability and sustainable management of water and sanitation for all and see how goal 17 is pertinent to achieving this goal 6 that is partnerships for the goals.

We need the input from environmental engineers, who give us the new technologies for water and wastewater treatment, maintaining river water quality, groundwater quality. We need inputs from environmental engineers for that. Hydraulic engineers, we need input from them too. They tell us how to design efficient irrigation methods so that for the same amount of water that we use, the crop yield increases. They tell us how to reduce the water leakage in water distribution systems, and they tell us how to protect the people from floods. Then we have water resources systems engineers who bring in the concept of systems thinking, optimal design, evaluation of many plans, designing of decision support systems and so on.

We need the inputs from ecologists, who tell us what is the effect of any developmental activity on ecology or they can also tell us what is the minimum amount of environmental flows we need to leave in the rivers and can take how much of water. We can take from the rivers and how much we have to leave it there in the river itself called environmental flows so that there is no degradation of the river or ecology. We need input from social scientists who can tell us if we have many different plans, many different designs. Which plan will be socially acceptable and they can also help us in making policy framework for implementing these plans and of course, we need economists who tell us about how much of money will be spent and what would be the benefits and whether that particular plan is economically viable or not. And we need to involve all the stakeholders; we need to make them an integral part of our planning process or implementation process.

Stakeholder	Area of interest
Politicians	Provision of basic services; job creation
City officials	Costs / ease of maintenance
Private developers	Increased profit / public image
Community groups	Job creation; public health / safety
Environmental groups	Protection of environment
Individuals	Additional costs/ benefits per household

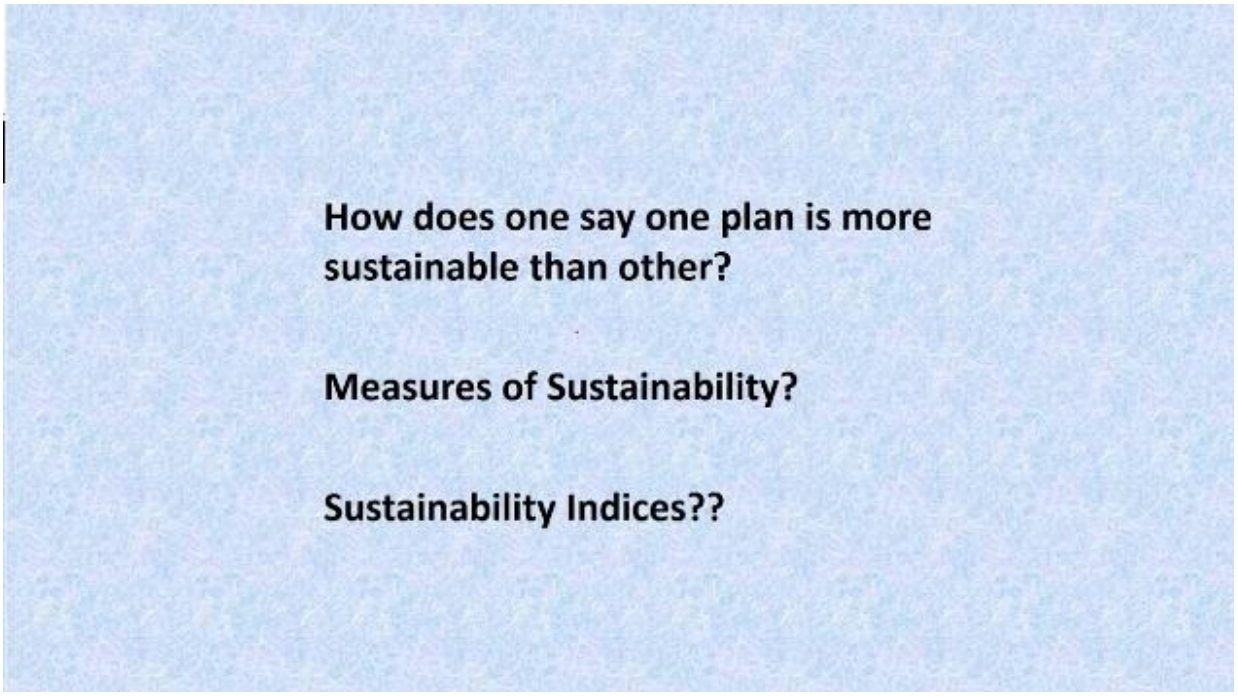
When we say stakeholders, let us say for a typical water resources project, we have stakeholders. Here, politicians, city officials, then private developers, community groups, environmental groups, and we have individuals. What do they bring in to the discussions? Politicians would be interested in providing basic services to the citizens, create jobs for them so that there is a development that is taking place. The city officials who are implementing these plans would be worried about the costs so that they can implement these things and then after implementing how they would maintain them, these facilities. Let us say water supply system, what is the ease of maintenance, what is the ease of operation? Then we have private developers, of course, the private developers would be looking for some profit. Nobody will come for social service there, they would look for an increased profit. But then they are also concerned about the public image they have, and then there are community groups who would be asking questions regarding how many new jobs are created, what is the effect on the public. If I come up with some kind of public health, if I come up with some idea about a water resources project or a sanitation project and they also will be asking questions, tough questions about the safety. Let us say if I am coming up with a dam project, they would definitely ask what happens if the dam fails, or what happens to the people on the upstream side of the dam because of inundation, that is what they bring to the discussions.

Then we have environmental groups who would be worried about what is the effect of my project on the environment, and they will ask those questions. Also, they will be the knowledge that they have in that area.

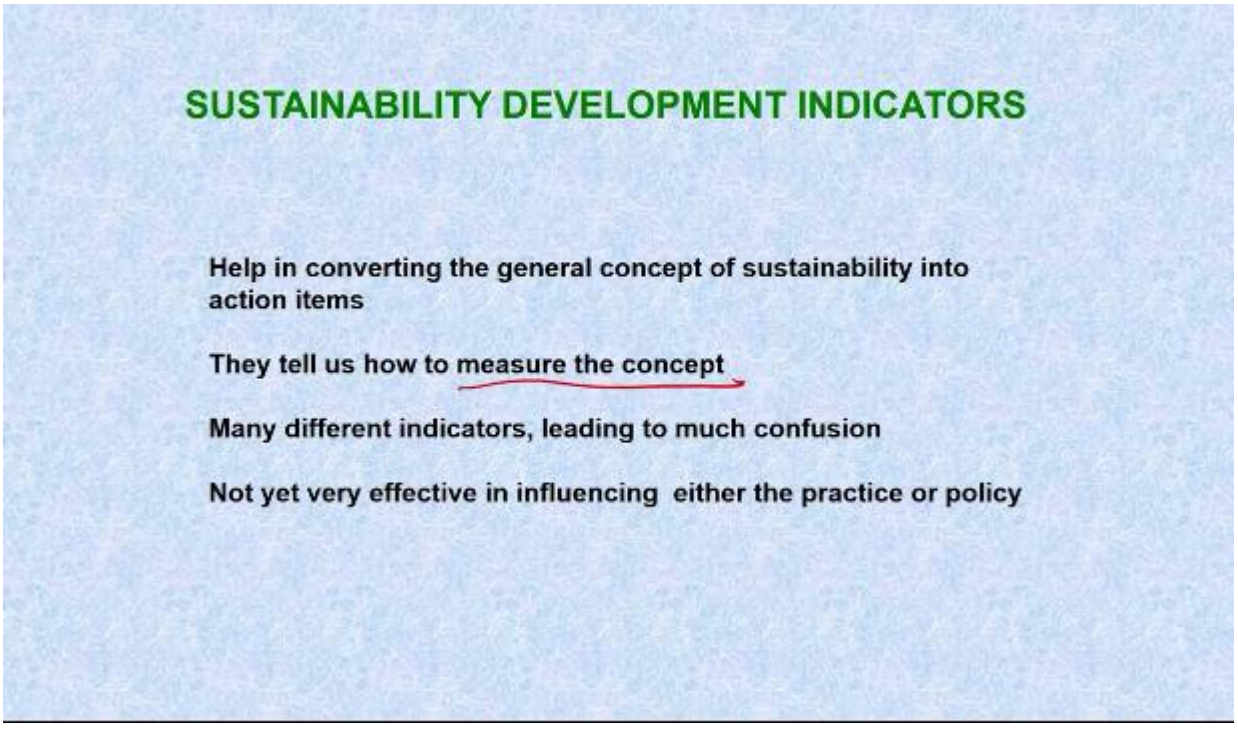
And then individuals, again all these things finally boils down to somebody paying for it that is taxpayers, so they will be worried about what are the additional costs that they have to bear and then what are the benefits that each household is going to get, so these are all the stakeholders, and we need to involve them right from the planning stage and during the implementation stage, and they should have some ownership then only the project would be sustainable or the plan will be sustainable.

Now we have been using this word sustainable quite a bit now. What is the definition of the sustainability? As per Brundtland commission of United Nations on March 20, 1987, this was defined as sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It is a very beautiful concept, easy said but very difficult to implement.

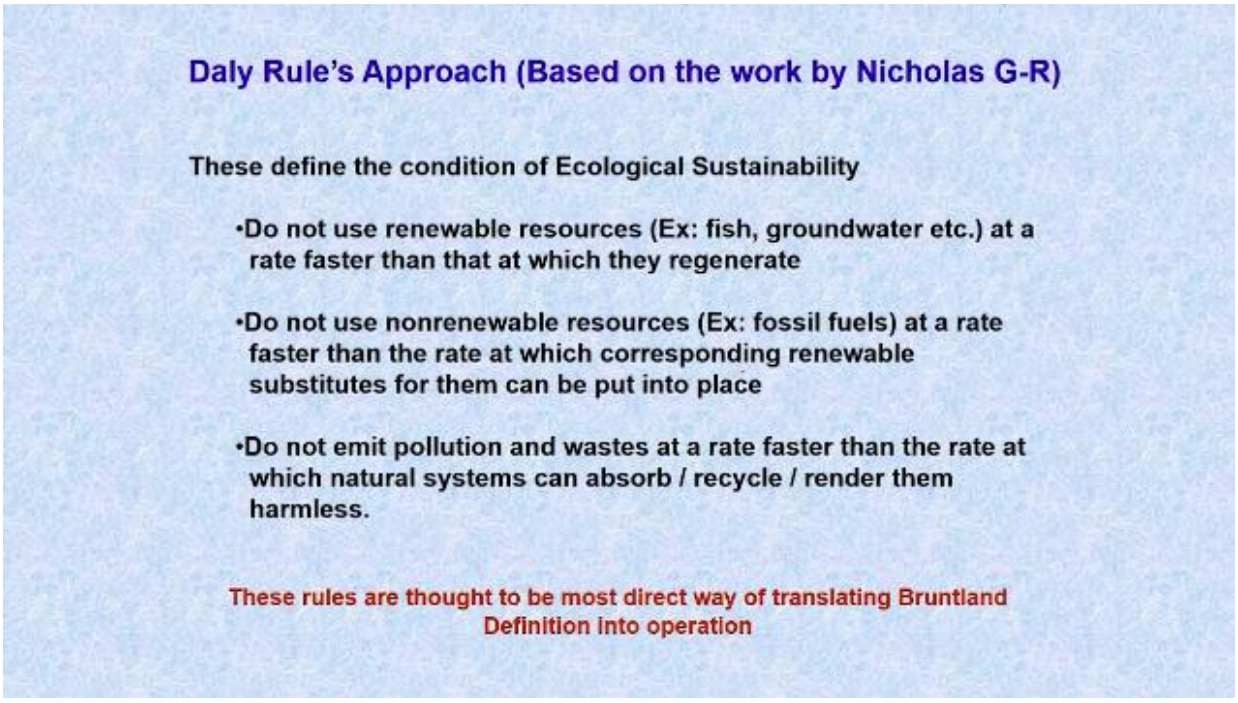
Adams in 2006, gave this very illustrative picture about what is sustainability. We have the three pillars of sustainability, are social, then environment and economic. The intersection of social concerns and economic concerns gives rise to equitability, the intersection between social concerns and environmental concerns will give rise to bearable projects, and the intersection between environmental issues and economic issues gives you what you call a viable project. And intersection of all the three that is social, environment and economics will give you a sustainable development. That means, whenever we talk about sustainable development we have to keep in mind the economic issues, what is the effect it is going to have on the environment and whether the project or that development is socially acceptable, leads to some kind of an equitable development for all sections of society.



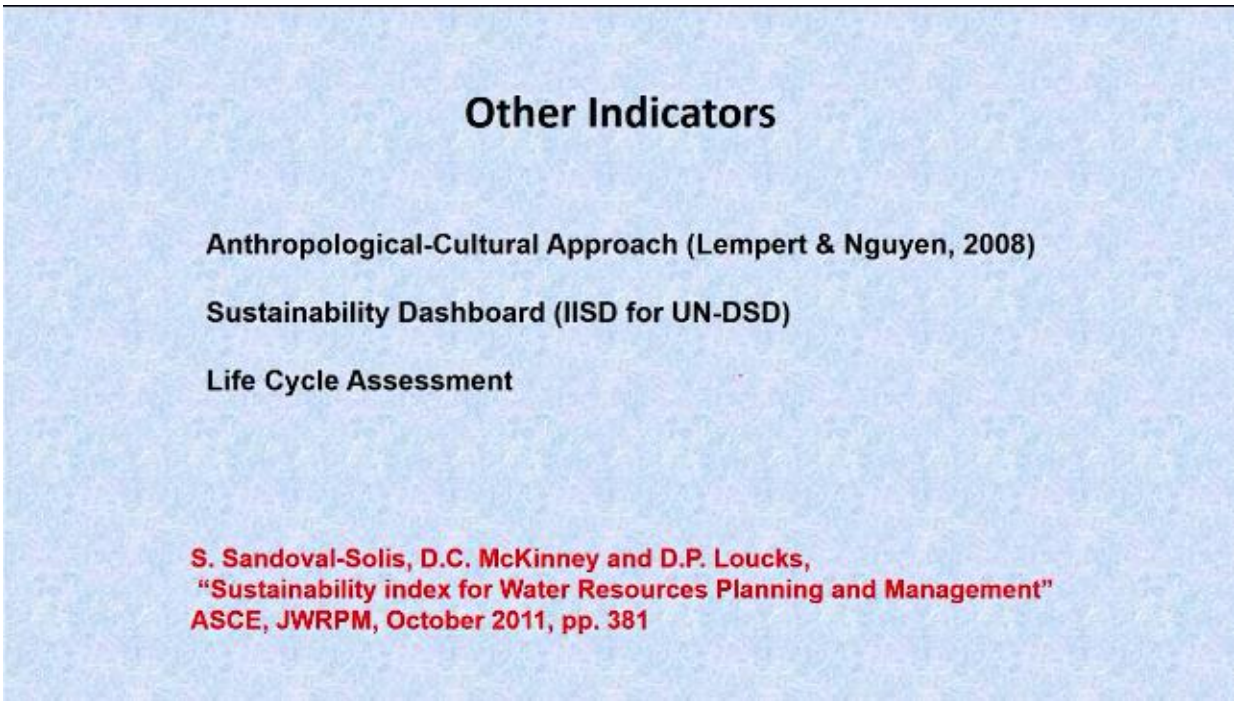
Then how does one say one plan is more sustainable than other? What are the measures of sustainability? What are all the different sustainability indices? Are there for saying one plan is more than, more sustainable than the other plan or other developmental process. So, there are sustainability development indicators, they help us in converting the general concept of sustainability into actionable items, they tell us how to measure the concept.



I must say, there are many many different indicators and if you go through them it may lead to much confusion and we also have to realize that they are not very effective, yet in influencing either the practice or policy. A lot of research is being done but then one day probably we will come up with appropriate sustainability indicators.



I will give you an example. Daly Rule's approach which is based on the work by Nicholas. These rules define the condition of ecological sustainability. There are three rules, the first rule says do not use renewable resources like fish or groundwater, they are all renewable resources do not use these renewable resources at a rate faster than that at which they regenerate. For example groundwater, every year in India it gets replenished due to recharge during the rainy season or a monsoon season. So, there is a maximum rate at which this groundwater recharge occurs. So, the first rule in using the groundwater is do not pump out groundwater at a rate greater than the rate at which it can be recharged. The other rule, the second one is, do not use non-renewable resources like for example fossil fuels at a rate faster than the rate at which corresponding renewable substitutes for them can be put into place, like corresponding renewable substitutes like wind energy or solar energy. So, we should not use non-renewable resources at a rate faster.



And the last rule is, this is for environment protection. Do not emit pollution and wastes which is liquid as well as solid at a rate faster than the rate at which natural systems can absorb or recycle or render them harmless. For example, all the rivers have a self-cleansing ability. They can clean themselves at a particular rate. So, if we load these rivers with contamination at a rate faster than their self-cleansing ability, then the river will die. And the river will get contaminated completely and becomes useless for many other purposes. So, do not emit pollution and wastes at a rate faster than the rate at which natural systems can absorb or recycle or render. These rules are thought to be a most direct way of translating Brundtland definition into operation, but the many other sustainability indicators like emergy sustainability index and ecological footprint approach and anthropological cultural approach, sustainability dash board. Then there is lifecycle assessment, one of my colleagues will talk more about this lifecycle assessment in a later lecture. And sustainability indices are also being developed for certain focus purposes like sustainability index for water resources. Planning and management has been developed by Sandoval Solis, McKinney and Loucks like that, a lot of work has been and is being done in the area of developing this sustainability indices, okay.

Thank you very much.