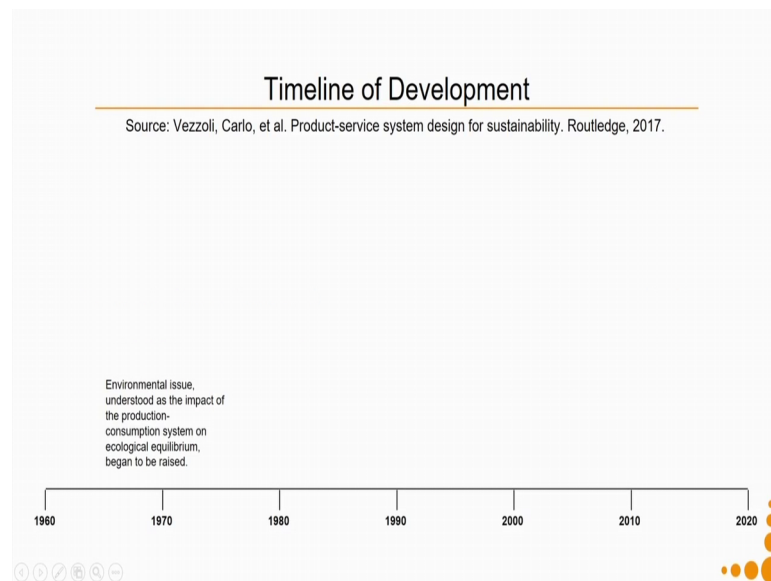


System Design for Sustainability
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Lecture - 05
Evolution of Sustainability within Design

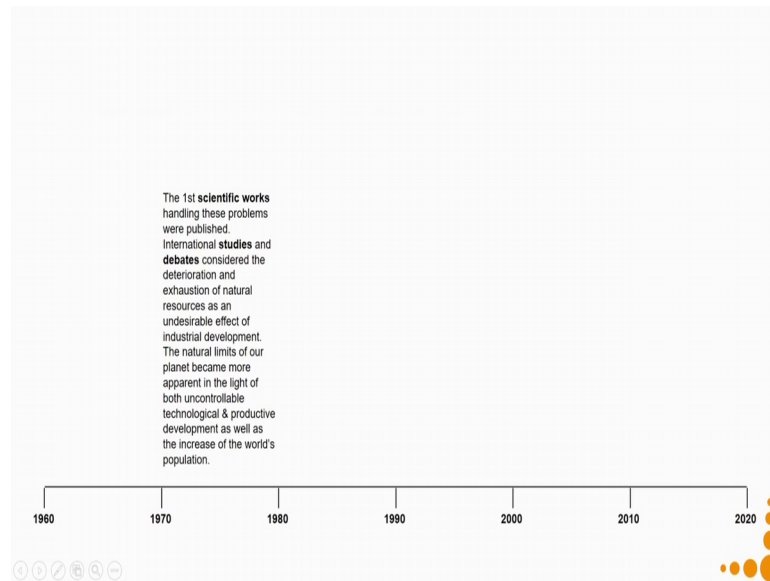
Hello everyone. So, in this week we will be discussing about Evolution of Sustainability within Design. How diverse approaches to design for sustainability exist why they exist and the relationship between these approaches and their application contexts. This week will help you in trying to know about all these approaches and it will also enable you with the knowledge on how to use this different approaches depending on the context to which you have to apply it.

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So, let us go ahead now. So, in order to understand the evolution of design for sustainability as a concept or to understand how sustainability evolved during the whole design journey, we will first try to understand the history, we start from somewhere in the late 1960s it is the time from which the environmental issues as an impact of the production and consumption system on ecological equilibrium began to be raised by different organisations different people. So, the major reason for these discussions to emerge was because people slowly started realising all the environmentally damaging effects being caused due to industrial revolution.

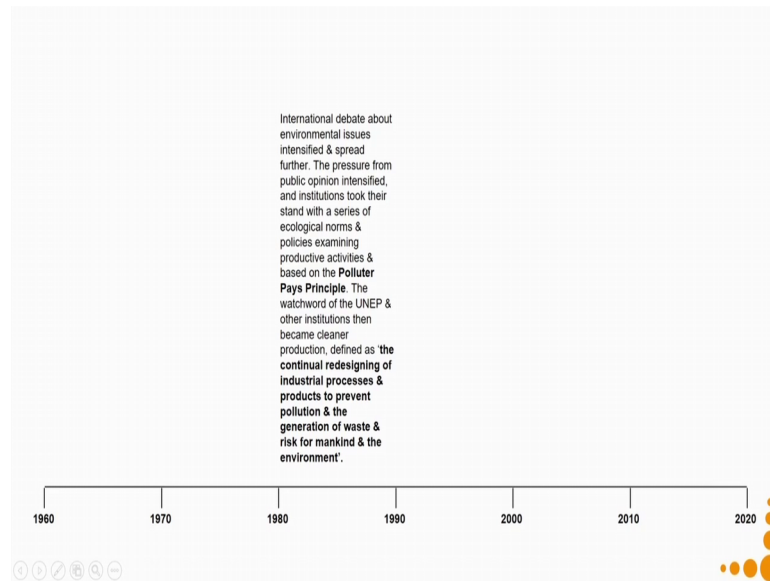
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Next from around the 1970s, the first scientific works scientific research to understand the impact of different kinds of activities on environment on human beings and so on started cropping up. Also it is during this time that there were various international level studies also which were conducted and debates started happening in this particular area. Most of the studies and debates considered the deterioration and exertion of natural resources as an undesirable effect of industrial development.

People were more concerned about the fact that what happens if you run out of coal. People became very concerned what happens if we run out of all the iron ore. The natural limits thus the concept of natural limits of our world of our planet came into being, it became more apparent in the light of both uncontrollable technological and productive development as well as the increase of the world's population. It was also the time from which the medical facilities enable people to have longer life to ensure lesser and lesser mortality rate at birth thus the world's population also started increasing way much faster than what it had happened in decades before that.

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During the 1980s and 1990s, environmental international debate about environmental in issues intensified further and it spread further and further. Also for public opinions started shaping up which also started putting pressure on different institutions and governments, and to look into ecological norms and policies productive activities and so on.

In this particular part of the time a concept called polluter pays principle came up. What it implies is whoever causes the pollution should pay for it. So, more and more sanctions are imposed on the industries, because it was assumed that because of the industrial activities in a pollution is being caused. UNEP which is United Nations environmental programme and other such institutions then became then they started becoming the people who watch things related to cleaner production, and they defined cleaner production as the continual redesigning of industrial processes and products to prevent pollution and the generation of waste and risk for mankind and the environment.

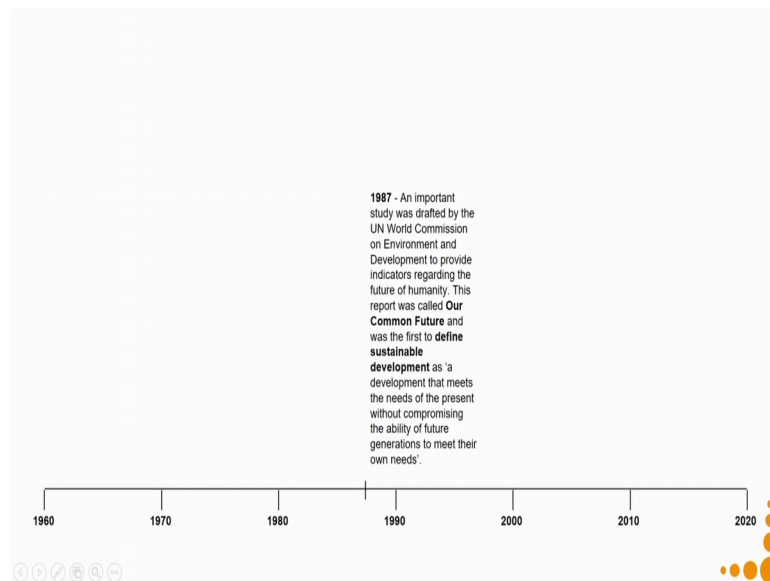
So, what you can see here is, we realise that we have polluted our lakes, we have polluted our rivers. So, we realise that we have to do two kind of things; first thing is we have to take our industrial processes towards cleaner and cleaner process. So, that I may do not or we do not end up polluting our rivers and ponds or say polluting our air our polluting our soil and so on.

We also realise that we have to do some cleaning activities of our existing water bodies,

air; soil because we have caused damaging already caused damaging effects to them. So, these were the two approaches we started gaining momentum both in terms of public opinion policies, and also at the end of research where people started trying to find out what are the different impacts, how things can be cleaned up.

In 1987 a very interesting development happened. So, in our last week we read about the definition of sustainable development.

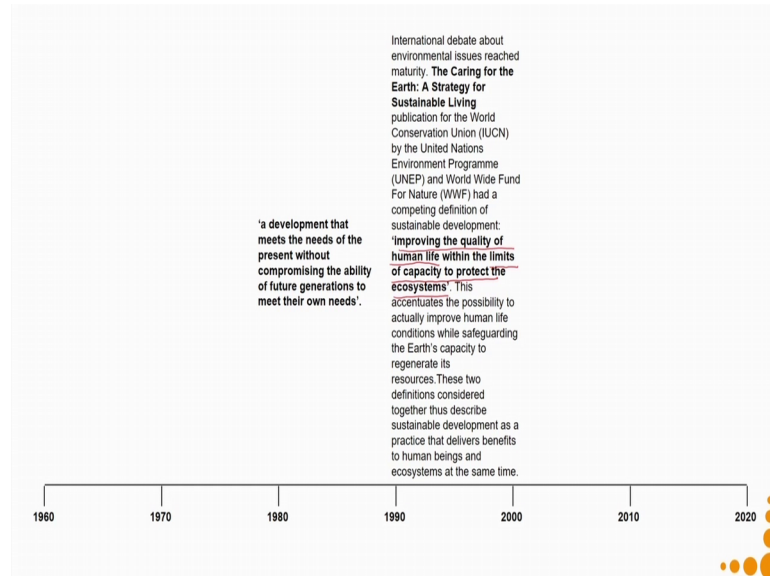
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This definition as we read last week it said a development that meets the needs of the present, without compromising the ability of the future generations to meet their own needs. So, in 1987 this particular definition was coined. So, this definition was coined during the United Nations world commission on environment and development, the commission was set up to provide indicators regarding the future of humanity. So, this report was called our common future and was the first to define sustainable development. Before that more and more policy level work or industrial activity level work was more on the side of preventing pollution from happening or cleaning up the existing polluted resources.

From here on, the concept of sustainable development as a systemic development as a development which has to happen on all the three sectors that is social, economic and as well as environmental started cropping up.

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During the 1990s and 2000 mostly there was international debate about the environmental issues these issues reach their maturity in during this decade, the caring for the earth. A strategy for sustainable living it is a publication for the World Conservation Union IUCN by the United Nations environment programme along with worldwide fund for nature.

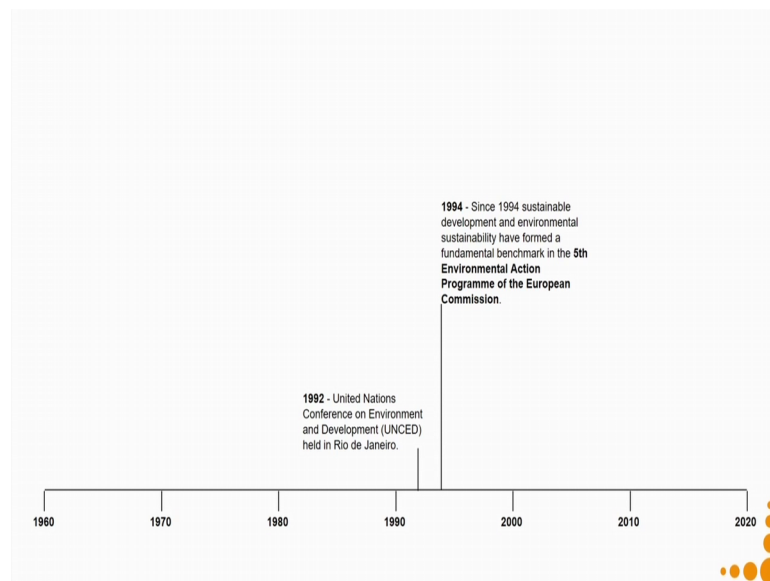
Now, because of worldwide fund for nature coming in a new computing definition came up of sustainable development, which states improving the quality of human life within the limits of capacity to protect the ecosystem. So, if you compare it against the 1987 definition which says, sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It does not clearly talk about ecosystems, it the whole definition in is in terms of the needs of human beings the present as well as the future that the need should not the needs of today's generation and the future should be fulfilled.

Now, you can see in this particular definition which says improving the quality of human life, within the limits of capacity to protect the ecosystems. I first time bring in so, quality of human life and capacity to protect the ecosystems. So, this definition accentuates the possibility to actually improve human life conditions while safeguarding the earth's capacity to regenerate its resources. So, these two definitions considered together help us to describe sustainable development in a manner in which we can

practice that is we can to design so, that benefits a brought both to the human being as well as the ecosystem.

So, in if you see this ecosystem definition it also implies that we have to protect the bees; we have to put in place ways and methods which helps us to protect the bee, protect the tigers because they are part of the ecosystem the larger ecosystem.

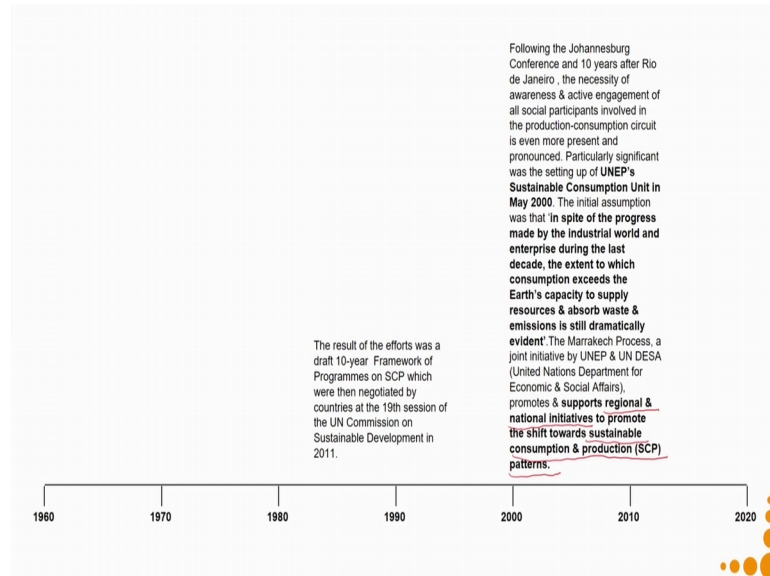
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To be more specific in 1992 United Nations Conference on Environment and development UNCED was held in Rio de Janeiro then in 1994 sustainable development and environmental sustainability, have formed a fundamental benchmark in the environmental action programme of the European commission as well.

So, now, you can see slowly in this particular decade specially after the 1987, specially after the 1987 he went where the definition of sustainable development were cropped in, more and more initiatives were taken by various are international organisations as well as policy making organisations in order to build in definitions of sustainable development as well as build in action plan for sustainable development and environmental sustainability. These also became a benchmarking frameworks so that activities of the whole country or maybe a region can be benchmarked against these plans.

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Following the Johannesburg conference in almost 10 years from Rio de Janeiro conference which was 1987, the necessity of awareness and active engagement of all social participants involved in the production consumption circuit is even more present and pronounced was realised, what is this mean? So, if you see from the late 1960s up to almost 1987 or we can say more towards the mid of 1980s the concerns were more towards how do I select methods of producing products and services, which do not cause pollution to the environment or which cause less pollution to the environment. Mostly it was concerned with the fact that it causes less damage and also how do I clean up all the damages which I have done.

So, the full focus was on the production side, because people felt that it is the industrial production which causes all the damaging effects, but slowly post the development of sustainable development started shaping up we started realising that it is not the production side only, the major challenge is the consumption side. We realise that the rate at which we are consuming at this moment, we cannot continue at the same rate because if you do not reduce our consumption, we will still be making our planet unsustainable our ecosystem will not be able to sustain us.

So, thus comes the concept that we need to look at the production consumption circuit. You can still see that we are talking about production and consumption. So, it is started by understanding how do I make my production greener and also my consumption

greener. Slowly the shift went to consumption and production. So, you see in the end of this paragraph I am talking about consumption and production. So, it is not like reversing the words without having a meaning for it, it has a deep meaning inside it

So, as I told you earlier it was thought that all the environmental damages all the unsustainability are being caused mostly by the polluting industries that is the production processes. Slowly it was realise that our consumptions are also very high. So, in order to bring in sustainability, I have to look at the production and consumption circuit. It was also realise say I make a biodegradable product, somebody want consumer uses the product at the end of the life the consumer might not have a access to a process of biodegrading that product. Not all of us own a paper composting machine at home, non all of us own a paper recycling machine at home neither do we take the effort of taking our paper to a composting unit or a recycling facility.

So, when we talk about the production and the consumption circuit, what it also implied that the producers has to take charge of the fact that they have to build in mechanism in the market. So, that all these papers which need to be recycled or needs to be decomposed, can be collected back from the consumers as a result we call it production consumption circuit.

So, in our first lecture I had given you one example on how moving the air conditioners to without any star ratings, to the five star rating stages had an impact on increase in consumption. So, earlier when air conditioners where high power consuming machines lesser number of people bought the air conditioner, because the running cost of an air conditioner was very high.

Now, because of all the environmental norms coming into picture all the environmental related policies, it was mandated upon the manufacturers to start selling electronic products with star rating and with the mandate that slowly they have to phase out all products which have a star rating of 1 to 3 and keep products which have a star rating of 4 to 5.

So, once the star rated air conditioners came into the market, the star rated air conditioner meant that because the machine is more efficiently design the machine consumes lower and lower energy. So, now, although my air conditioner the initial price of the air conditioner went away went up, the running cost of the air conditioner fell drastically; a

five star air conditioners running cost is very very low as compared to its previous generations of air conditioners.

So, more and more people could now afford air conditioners. So, also the industry move towards small energy efficient technology, the impact on the energy requirement of the society went way much higher why because the consumption grows up. Hence it was slowly realised that if we try to target in a sustainability from production to consumption, it is not the right approach we have to target it from the consumption as our priority because we have to bring the consumption to sustainable rates and then we also work on the production side of it.

Another example for the same; say all of us own a washing machine how long does that washing machine work may be one hour daily if you do not have a lots of people in your house it might work only one hour in two weeks or one hour in one week or one hour in three days.

So, a washing machine which is full of so many material components, and it is on by each and every household is we used for such a short time of in a short span of time. And I am as a society I am consuming so many washing machines which is so much of metal so much of plastics. Even if I make a very efficient washing machine still because of the my consumption of washing machines in terms of numbers is so high, my consumption of resources will be very the material resources of the earth will be very high.

But see instead of that if I build washing machines which can be own by an entire building, then the chances that the washing machine will be running for many many hours in a particular day. So, if it is a building with 20 households, the possibility that the washing machine can run for about 20 hours daily is high; it might run at least it might run for 10 hours a day which is way much more better utilisation of all the materials that I have spent on to it. So, I could bring in reduction in material consumption by influencing the consumption pattern.

Hence in this particular decade the shift also started focusing on production consumption as a circuit and then finally, it shifted to sustainable consumption and production patterns. So, you can see I am first talking about circuit, which means how do I produce, how do I distribute my products, how I consume my products the entire system.

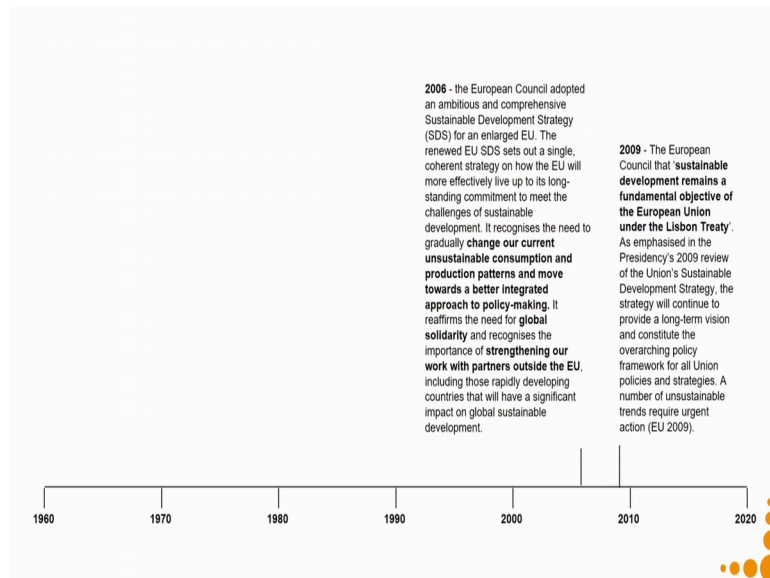
Now, I am talking about pattern sustain. So, the last statement over here which talks about sustainable consumption and production patterns. So, what I am talking about here is habits how people are habituated to consume something and how I have to devise strategies so that people start consuming it in a sustainable manner, it comes into their habit and as a result I bring in sustainable consumption as well as production.

So, in this particular time significant event was setting up of the UNEP sustainable consumption unit in May 2000. So, again you can see it talks about sustainable consumption unit. So, the whole units main purpose was to try to understand consumption and try to strategize on sustainable consumption. So, the initial assumption was that in spite of the progress made by the industrial world and enterprise during the last decade, the extent to which consumption exceeds earth's capacity to supply resources and absorb waste and emissions is till dramatically evident. Because of this realise that we have to actually work on the consumption side more heavily

So, the market process a joint initiative by UNEP that is United Nations environmental programme and UN DESA which is United Nations Department for Economic and Social Affairs, they came together to promote and support regional and national initiatives. In context of sustainability it is very important to understand that sustainability; one sustainability strategy is not applicable globally not even nationally, not even at the state level. So, we have to promote and support regional and national initiatives, which might have different nature depending on the context to promote the shift towards sustainable consumption and production patterns.

So, the result of the efforts was a draft of a 10 year framework of programs on sustainable consumption and production SEP, which were then negotiated by different countries at the 19 session of the UN commission on sustainable development in 2011. So, different countries at different targets for themselves, different ways of achieving them depending on the context. And these are all 10 year frameworks and so these 10 year frameworks have been repeatedly formed one after another to keep on moving towards higher and higher goals.

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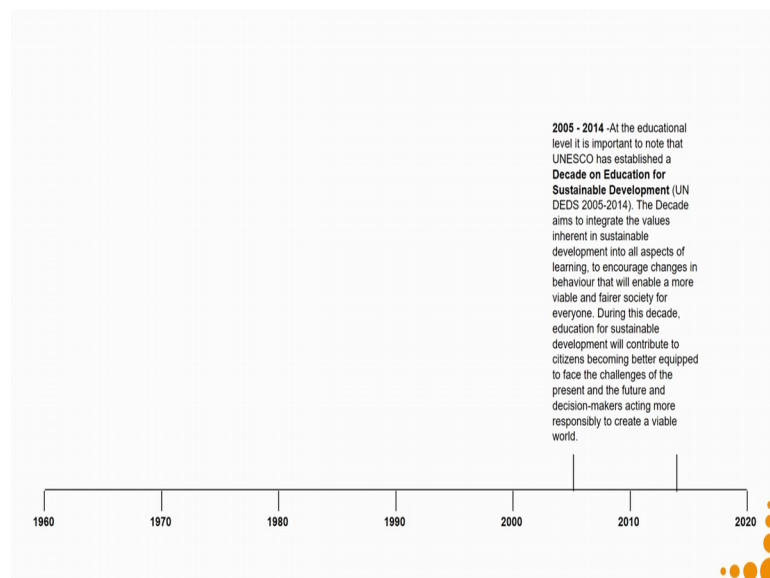
In 2006 the European council adopted an ambitious and comprehensive sustainable development strategy, for the enlarged European Union. The renewed European Union SDS sets out a single coherent strategy on how the EU will more effectively live up to its long standard commitment to meet the challenges of sustainable development. It recognises the need to gradually change our current unsustainable consumption and production patterns and move towards a better integrated approach to policy making, why policy making? Because these policy making will further help in bringing actual practice related activities in various organisations, which can take them further into the society it reaffirms the need for a global solidarity.

So, everybody should agree with the sustainability, the idea of sustainability, and recognise the importance of strengthening our work with partners outside EU. So, in our previous lectures we spoke about sustainability as a domain which is connected in time, which is connected in space. So, I cannot look up at sustainability from only from my countries perspective only from my regions perspective.

Hence the need for strengthening working with partners outside the EU specially with a special focus on developing countries, why so? Because the developing countries are where at that point of time going through the same kind of industrial revolution, which the already developed countries of the time had gone through and they have realised all the unsustainabilities that they have brought in.

So, if you may a there it was realise that if changes in pattern of industrialisation in patterns of consumption, is brought in the developing countries. So, that before entering into the unsustainabilities on the, directly go into the sustainable consumption production only, hence the important of a partnering with developing countries. In 2009, the European council that sustainable development remains a fundamental object of the European union under the Lisbon treaty was made, it was emphasised in this review that the union sustainable development strategy, the strategy will continue to provide a long term vision and constitute the overarching policy framework for all European union policies and strategies.

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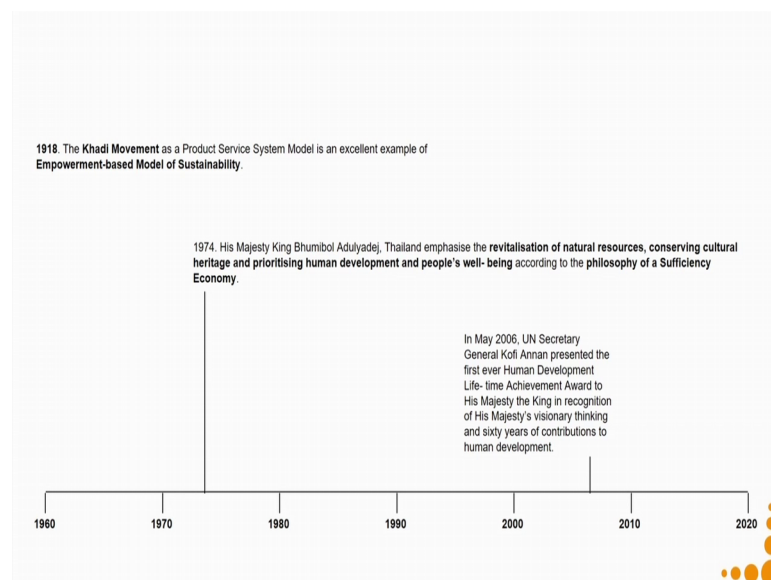
Also the decade from starting from 2005 to 2014 was designated by UNESCO as decade on education for sustainable development. Because until and unless we do not know what sustainable development is, because its sustainable development can be achieved through sustainable consumption in a big way. So, actually each and every person should know about sustainable development about what is sustainability about sustainable consumption, hence a need an urgent need to have a decade on education for sustainable development.

The decade aim to integrate the values inherent in sustainable development into all aspects of learning; may be kindergarten, college education, research work in all aspects. To encourage changes in behaviour that will enable a more viable and fairer society for

everyone. During this decade, education for sustainable development contributed to citizens becoming better equipped to face the challenges of the present and the future, and decision makers acting more responsibility to create a viable world.

The supreme court of India had actually passed rules saying that all school curriculum in India will have to have a course on environmental studies some other developments.

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So, in we spoke till now more about starting from the industrialised context all the efforts which have been done by the United Nations and the European commission now, coming to the Asian countries.

Because the Asian countries follow the different developmental cycle and different they had different developmental requirements, their history followed a different course of action. So, in 1974 his Majesty king Bhumibol Adulyadej he was the king then of Thailand he came up with this concept called philosophy of a sufficiency economy. We will go more into depth of what sufficiency economy is in later parts of this course.

So, why this kind of a philosophy. So, this philosophy emphasises the revitalisation of natural resources, conserving cultural heritage and prioritising human development and peoples wellbeing. So, you can see the Asian countries at that point of time the same timeline which I have been talking about, once undergoing different sort of development most of them where getting there owning their freedom from the colonial colonization

that might have happened to them.

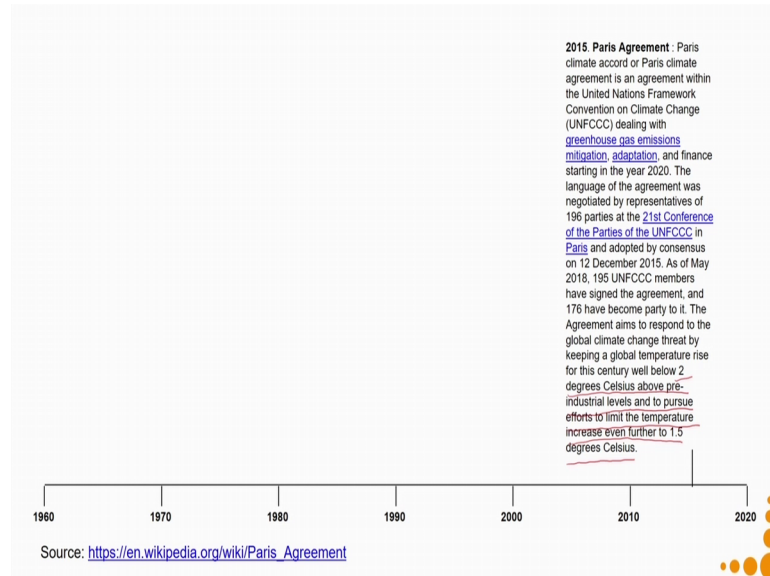
Their society was trying to develop trying to bring in development. So, for them the requirements of the society, the requirements of the human being, the requirement of social development the economic development at a very different structure. Hence the king came up with this kind of a philosophy and again if you see the three main emphasis of the philosophy it talks about revitalisation of natural resources, which implies that if natural resources got damaged then you revitalise it conserving the cultural heritage. So, we should not lose our cultural heritage and prioritising human development again they form part of the three dimensions of sustainability.

In May 2006 the United Nations secretary general Kofi Annan presented the first ever human development lifetime achievement award to his Majesty the king, in recognition of his visionary thinking as his 60 years of contribution to human development in Thailand.

Coming closer to in India so you might be aware of the Khadi movement. So, its started somewhere around 1918 conceptualised by visionaries like Mahatma Gandhi; the Khadi movement is regarded as a great example of product service system model which is an empowerment based model of sustainability. So, it talks about empowering people. So, that people are in charge of their economic activities, they take care of their environment around them because it will have an impact on their economic as well as social activities, and because they are empowered now they have economic power they also get more socially empowered.

We will discuss more on how this Khadi movement and its connection with product service system model when we go into the details of what product service system model is and what is its connection with sustainability. So, you can see this is as early as 1918. So, these movements are very different they are more focused on to context which are developing context where the prime requirement is development of the prime requirement is human development and peoples wellbeing and most of these people are poor at the given instance of time and they required creation of new economic opportunities, creation of avenues in which they can protect their environment.

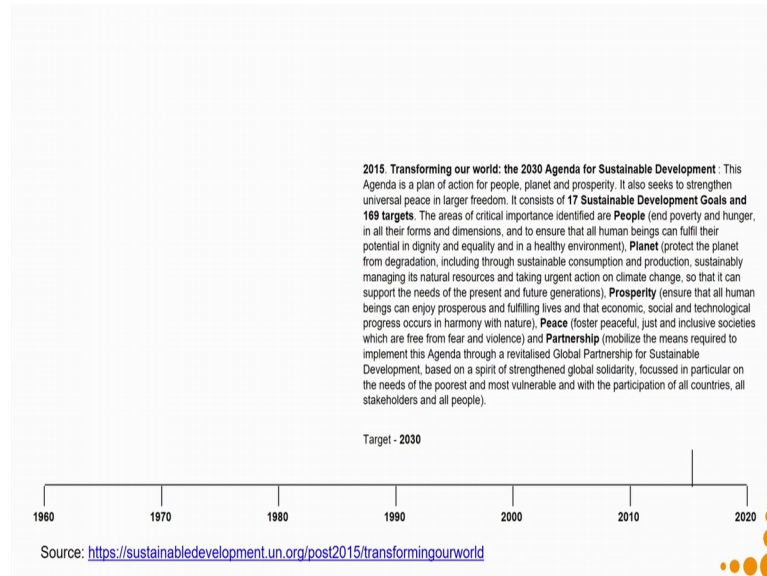
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In 2015 you must have heard about the Paris agreement it has been quite a lot in use. So, Paris climate accord or Paris climate agreement was signed it is an agreement within the United Nations framework convention on climate change, dealing with greenhouse gas emissions and its ways of a mitigation adaptation and finance and the agreement is supposed to take effect from 2020.

The language of the agreement was negotiated by representatives of 196 countries at the 21st conference of the of the parties in the Paris convention, and it was adapted by consensus on 12th of December in 2015. So, this consist the agreement aims to respond to global climate change thread by keeping a global temperature rise for this century well below 2 degree celsius above preindustrial levels, and to pursue efforts to limit the temperature increase even further to 1.5 degree Celsius. Each and every country who is a signatory to this agreement had to come up with their own strategies to achieve the same; because again each country is a different context each country is in a different level of industrialisation has different kinds of consumption patterns production techniques ways of producing energy. So, each and every country was asked to come up with their own strategies with their own goalposts, and as a whole as a globe everybody is supposed to together achieve the target that the global temperature rise for this entire century should be below 2 degree celsius above preindustrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degree celsius if that is possible.

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Also in 2015 that was signed the previous one was signed in December 2015 this one is from September 2015, it is about transforming our world the 2030 agenda for sustainable development. So, this agenda is a plan of action for people planet and prosperity, it consist of 17 sustainable development goals and 169 targets. It has four important criteria people planet prosperity peace and partnership.

Again in this particular agenda also all the signing countries, they had had to come up with their own strategies to achieve the 17 sustainable development goals and the 169 targets. The target is set for 2030 in the domain people a higher priority is supposed to be given to end poverty and hunger in all their forms and dimensions, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment. For the planet it is protect the planet from degradation including through sustainable consumption and production sustainable managing its natural resources and taking urgent action on climate change so, that it can support the needs of the present and future generations; on the criteria of prosperity ensure that all human beings can enjoy prosperous and fulfilling life and that economics social and technological progress occur in harmony with nature.

Peace is another important aspect, where it is asking to encourage to foster peaceful just and inclusive societies which are free from fear and violence and the most important thing partnership. In order to do achieve all these thing mobilize the means required to

implement this agenda through revitalised global partnership for sustainable development. So, no longer look specific to a region although we have a region specific strategies, but we are supposed to partner with all the other global in all other initiatives happening in all other region, and achieved the agenda by 2030.

So, how do we summarise this historical development in terms of design, because at the end of the day we are supposed to use all these developments into design and design the future consumption and production.

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D4S has over the years changed from

- Intervention after process-caused damages (e.g. clean up a polluted lake), to
- Intervention in processes (e.g. use clean technologies to avoid polluting the lake), to
- Intervention in products and services (e.g. design product and services that do not necessitate processes that could pollute a lake), to
- Intervention in consumption patterns (e.g. understand which consumption patterns do not (or less) require products with processes that could pollute that lake).

So, we saw design for sustainability D4S as it is called in many places as over the years changed from. So, first you make up you already understood that you have dirtier lake. So, clean up a polluted lake. So, intervention after process cause damage, the process here was industrial production or say my habit of throwing garbage.

So, intervention after process caused damage example clean up a polluted lake to use clean technologies to avoid polluting the lake. So, maybe I use some water treatment facility in my industry so, that my water is treated. So, so I am using a cleaner technology. So, I avoid polluting the lake. So, which means now intervention in the process itself, there after design products and services that do not necessitate processes that could pollute a lake.

So, why do we even need to clean up that water, why do not we develop products and

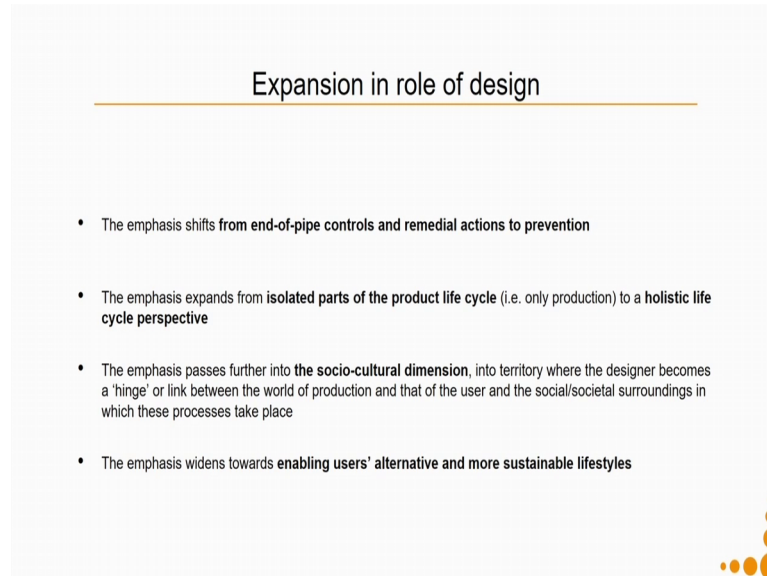
services that just done do not necessitate me in any particular way to go and pollute the lake. So, that is intervention in the products and the services rather than the manufacturing processes which was the earlier case to finally, intervention in consumption pattern that is understand, which consumption patterns do not or less required products with processes that could pollute that lake.

So, say for example, if we start washing our cloths with say ultrasonic waves, which means we do not required soap. So, the soap has a damaging effect on the environment, can that way of consumption patterns of cleaning up close without a soap is a change in consumption pattern because I have to change my mind set, that cloths can be cleaned without a washing powder, it can be cleaned with something which is totally invisible which is ultrasonic waves.

So, that can be a pattern, but we have to understand how do we change people's pattern of consumption of that is cleaning cloths or say for example, I redesign cloths which just do not need to be clean do not need to be washed. Again we have to bring in a change in pattern, because it might be very awkward for a person to adopt to the whole situation in which he or she stops washing clothes. So, the final one is intervention in the consumption patterns. So, that we understand which consumption pattern do not or less required products with processes that could pollute the link.

Now, coming to expansion in role of design. So, the first which you saw it was like emphasis shifts from end of pipe controls, like I have done the damage.

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Expansion in role of design

- The emphasis shifts from end-of-pipe controls and remedial actions to prevention
- The emphasis expands from isolated parts of the product life cycle (i.e. only production) to a holistic life cycle perspective
- The emphasis passes further into the socio-cultural dimension, into territory where the designer becomes a 'hinge' or link between the world of production and that of the user and the social/societal surroundings in which these processes take place
- The emphasis widens towards enabling users' alternative and more sustainable lifestyles

Now let me take remedial actions the emphasis has shifted away from end of pipe controls and remedial actions to prevention. The emphasis expands it does not mean that the water bodies say for example, which we have already polluted, they do not need to clean, they need to be clean.

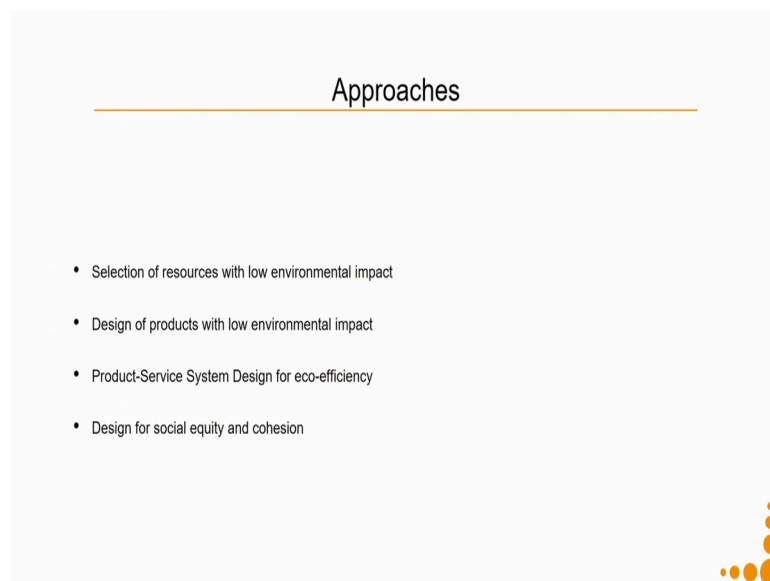
But our current role as designers, we need to think because we know certain activities will cause pollution. So, we need to shift our emphasis, we need to shift our emphasis from end of pipe controls or remedial actions to something in which we can prevent that thing from happening altogether. The emphasis expands from isolated parts of the product life cycle to a holistic life cycle perspective. So, rather than designing a product so, the rather than designing a mobile phone, I think in terms of how that mobile I design the entire life cycle how the raw materials need to be procured, how they need to be assembled into a product certain assembly processes might require more energy than other processes. Certain materials raw materials which I am using might be more rare earth materials or maybe extraction of them are more polluting.

Then how do I distributed to people, how people after using it are supposed to discarded. So, rather than designing just the mobile phone I shift my attention to designing a holistic lifecycle perspective and only then I can reduce my unsustainabilities. The emphasis passes further into the sociocultural dimension, do I really need to encourage people to buy a mobile phone every 6 months every 1 year? Of course, it maximise my

profit, but can I find an alternative way of maximising by a profit without be creating a environmental burden of such huge quantities of e waste. So, emphasis further passes into the sociocultural damage and into territory where the designer becomes hinge or link between the world of production and that of the user, and the social or societal surroundings in which those processes are takes taking place.

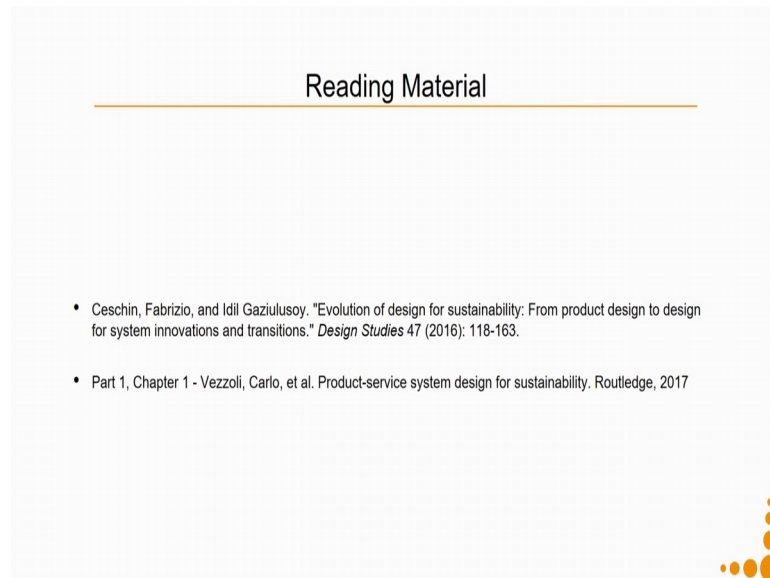
So, the emphasis widens towards enabling users alternatives and more lives sustainable lifestyle choices. If I do not know what is my alternative if I do not understand the unsustainabilities I am bringing in, I might not be able to move to a alternate. So, as a designer you have to also enable your users to be able to consume sustainable through knowledge through awareness and through availability of products and incentives to adopt them.

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Hence our approaches for design will be selection of resources with low environmental impact, design of products with low environmental impact. Products service system designed for eco efficiency and design for social equity and cohesion. We will try to understand each and each of these approaches and in the entire course of the this course, we will go through each and every approach and see how do we design using each and every approach and under what context each and every approach is more suitable.

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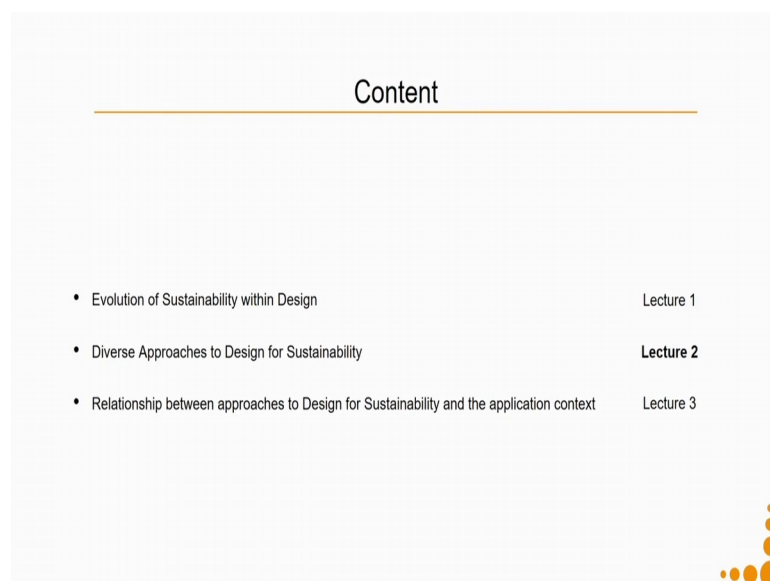
Reading Material

- Ceschin, Fabrizio, and Idil Gaziulusoy. "Evolution of design for sustainability: From product design to design for system innovations and transitions." *Design Studies* 47 (2016): 118-163.
- Part 1, Chapter 1 - Vezzoli, Carlo, et al. *Product-service system design for sustainability*. Routledge, 2017

So, the reading material that I will suggest for this particular week is; and the first one is a paper it is called evolution of design for sustainability from product design to design for system innovations and transitions, the second is a book. So, please go through part 1 chapter 1 of the book product service system designed for sustainability.

The book which I mentioned product service system designed for sustainability is a free to download book. So, you can download it from the internet.

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Content

• Evolution of Sustainability within Design	Lecture 1
• Diverse Approaches to Design for Sustainability	Lecture 2
• Relationship between approaches to Design for Sustainability and the application context	Lecture 3

In the next lecture we will be talking about the diverse approaches to design for

sustainability which I brought in the last slide, and there after the relationship between the approach and the application context.

Thank you.