

**Strategies for Sustainable Design**  
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**Lecture 38**  
**Emerging Technologies and their Possible Intervention in Design**

Hello everyone, in this lecture we will discuss about emerging technologies and their possible intervention in design. So, which are those emerging new technological areas which are having some actually positive impact you know some positive actually like intervention in the like a building industry in the design, whether it is control, whether it is like a operations or you know or the manufacturing or the even like afterlife.

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So we will see like one by one these are the some actually smart technologies some smart actually cities solutions which are actually in a whole these are actually able to constitute a smart city actually concept and the recent times you may be aware smart city actually this scheme was adopted by Government of India and there are over like 100 cities which are converted into like a smart city and some new cities are also being established which will be completely like a smart in terms of.

So what is actually those things which are actually making them smart. So, we will try understanding the these are technologies one by one. So of course, the 3 aspects of sustainability

are there, so these projects these buildings are environmentally conscious you know they are socially responsible also as well as they are economically projected to be viable also. So, as long as they are able to satisfy on the 3 important aspects of sustainability, they can be actually taken as the smart city actually our projects.

So, majorly if we see what are those technologies, so in that one this green technology like I am becoming like a environmentally actually a conscious is one of the actually major criteria's, then building information modeling so that the actually real time information of like the components of the building how is it consuming like energy, how is it consuming resources can also be actually taken care of.

So, for that we have this building information modeling system. So, BIM has become one of the actually important actually technological interventions in the recent time to facilitate buildings. Further we have like a security related technology, such as like a several types of like a scanner you know sensors and the CCTVs are in place to ensure the safety and security of the occupants and the entire actually premises.

So, that is one of the major technological areas where a huge intervention is actually made. Further we have like another energy sources which can be installed on the like in the building such as like a photovoltaic cell, such as like a windmill. So, depending upon actually geographical location you know so this is also one of the technologies which has in the recent times has taken over in the like in the buildings and we are aware of already like a net zero electric like a building.

So, these buildings are actually pre-planned to produce their own energy requirements and they are actually self-sufficient, they are actually not dependent on the grid rather at some point of the year they are supplying back to the grid. Further, we have a certain like a pollution control system in the place such as like a air pollution control system such as like water pollution control systems within the premises like indoor air quality like sensors and measurements so that we can keep on improving the fresh air inside the premises to improve the health and well-being of the occupants.

Then we have like a smart grid solution so that the buildings are like a connected with the national grid, in case of like the power surplus the buildings can supply their power to the like a

national grid and other like chemical actually leakage and chemical actually pollution detection systems are also in the place.

So, this is one of the actually technologies where certain like a hazardous chemical can be actually sensed before causing a damage to the like inhabitants of the building and several like a real-time updating technologies things are also in the place and they are being installed in like a building. So, this is also one of the areas where technology has impregnated you know to get out the actually a real life real time actually updates and information under the like a BIM.

Then we have like a water management actually a technology in the place to supply to regularly the water supply plus control the quality of it you know plus manage the waste water which is generated inside the building to how to go for recycling or reusing, repurposing etc. So, this water management has also evolved in the recent times as one of the actually technological intervention areas.

Further we have like all these smart parking systems where the number of parking's available can be informed beforehand you know optimizing on the utility of the parking area so that nobody actually loses the chance of parking or if it is like available. So, how this parking systems you know are like a working like a man less actually with the way of like this technological intervention.

So, there is like several types of systems in the place in the like a building premises where automated entries are actually granted depending upon the identity of the like owner or the car and then one can park and take out their cars like efficiently and in that also like spaces are like optimized so the cars can be actually taken through like these automated actually parking systems.

So, there also this technology has actually impregnated and we have actually several such examples in the cities such as like a New Delhi, Bombay and like a Kolkata, Bangalore, etc. Further we have on the like other hazardous to control the other hazards which are like likely possible in like a some parts of the country such as like earthquakes you know so we have actually some like a sirens and some other like a control systems where like a public broadcast systems etc, where the information as soon as the information is received about any such

occurrence this can be broadcasted to the occupants you know and the loss of the lives and property can be actually minimized.

Further we have like a networking system-based technologies to connect each and every user or can you connect each and every like appliance in the like a building premises so that their real time actually feedback can be taken whether they need any replacement or a replenishment etc. So, the supply of the resources and goods can be actually maintained at the faster actually pace.

So, this real-time stock taking and the connectivity with the help of like a IOT'S internet of things you know the mostly these gadgets and other like a service providing actually tools and equipment are being connected with the internet. So, this is also one of the major actually intervention areas of technology in the like a building premises.

Further we have like other hazard prevention systems in the place such as like earthquake we have a some actually prevention systems for the other hazards also such as like a cyclones, typhoons and landslides, etc. in the place depending upon the (( )) (07:28) location. Extending it to beyond actually the building like right outside the building we have like other like a technological input also where one can actually apply for like a you know optimized like a traffic management systems or the movement of the like a traffic in and around the building the entry, exit points, etc.

So, in response to that actually these traffic lights can be actually controlled to have actually the efficient traffic system. Further in this line we have other like technological interventions in like a fire prevention in the like a structural integrity and monetary systems and we have like electrical management systems also in the place, so collectively you can see all of these areas and even more you know they have actually received several technological interventions in the like recent years and the buildings are like a more smarter than the like times before and they can perform to the like a maximum and they can optimize on the spending of resources and like energy.

So, these are actually impacting of like these technological interventions in the building resulting into optimization of resources and the comfort you know, so these are actually resultant so one can actually plan there like a design exercises around the technological interventions the technologies which are possible today for like implementations on our lack of projects.

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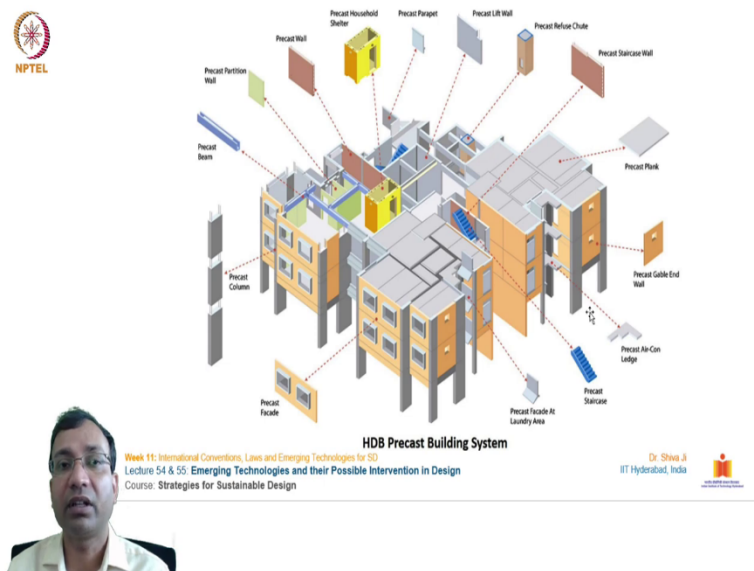
Further in this like how these technologies are actually having a impact having like a positive impact on improving like the overall like ambiance and the efficiency of our like cities, so with the help of like automated like information on the like a repairing which is needed so preventing repairing are actually can be carried out you know reducing the cost of like maintenance or you know damages caused by like you know the normal wear and tear so resulting into a huge saving, so you can see some figures over here you can actually get this information from the internet how these technologies are actually saving the resources and the energy consumption in these like buildings particularly in these many areas.

Further on the like infrastructure productivity like how infrastructure can be utilized more for like the larger output because the infrastructure once established you know will be there standing for a very long period of time, so the capital invested you know all the spaces or the buildings actually created can be utilized into multiple ways also.

For example, if there is a space allocated for like running like a certain activity, so what happens once the activity is performed like a scheduled time, so after that actually schedule time what happens in that building after that time so what this can be actually thought of and automated actually systems can be actually designed to actually extend the usage of that actually building premises.

Similarly, we have seen like a technological intervention in like a traffic management you know the resulting into like a time saving of the like users and the city dwellers, so how this optimized traffic management systems can be actually designed around these buildings or the business busy district business district areas and also optimizing on the like a cost saving and the time saving and resource saving and fuel saving etcetera. Further we have like a discussed earlier in parking based technological systems and the smart grid systems resulting into saving on the resources.

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So, how these new technologies are coming to the aid to the overall design of the design and construction sector, so we have this like a prefab actually construction systems also in the place. For example, if a building is going to be constructed in the like a busy you know business drift stick of any like a city it is going to cause a lot of (( ))(11:30) disturbance also to the surrounding area plus having a construction actually work going on for a longer period of time will further actually extend or increase the cost you know of that building.

So, how these are prefabricated actually building components can be utilized to actually create like an optimum and efficient actually like a solution you know like a shorter span of time. So, this is also one of the actually technological you know intervention areas by going for like a prefabricated building components for like a faster actually growth and faster actually like a piece of like a construction in the like places.

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This you must be aware of like a 3D printing it is a like additive manufacturing actually technology. So how this 3D printing is also adding to the like a construction of like a like an efficient way plus it minimizes a huge amount of like a waste you know because it does not leave any like a residue or any like a extra actually material it lays only material where it is necessary or whether where it is designed to be laid.

So, resulting into significant saving from like a conventional like a reductive way of like a construction methodology actually systems. And there are 3D printers coming in like a very big scale also and they are good enough to actually build up some like a small scale like structures maybe 1 or 2 storey high.

There are several examples from across the world, you may have seen it already in the news like how several agencies' companies you know these are actually come up with coming up with innovative ways for 3D actually printing the buildings. So, this is going to be one of the disruptive actually innovations in the like recent times as far as this construction sector is concerned because it will significantly reduce the operations you know the management, the costing you know the material or the energy consumption by the building.

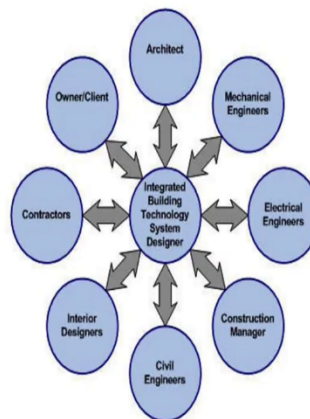
So, this is one of the actually areas where you must actually put some attention you can take help of this 3D printing actually technology and you can come up with some solutions like how the

materials you know which are from the like a which are required for actually building construction can be utilized for like a 3D printing in an efficient way.

So, we can take help of actually 3D printing in designing and printing the components of the buildings because it can play a very important role in actually fabricating some components which are very difficult to fabricate by like a conventional actually methods. So, we can reduce on the like a material as well as we can reduce on the like energy consumption part also by minimizing the material consumption and the like energy actually conjunct.

So, 3D printing actually one of the promising areas where one can actually explore several designs so even from the like a design perspective, we can go for actually fabricating a complex forms and complex actually shapes you know very easily with this actually technique. So, this is one of the actually disruptive technological actually potential areas you know where one can actually make some strong actually intervention in the like a building sector.

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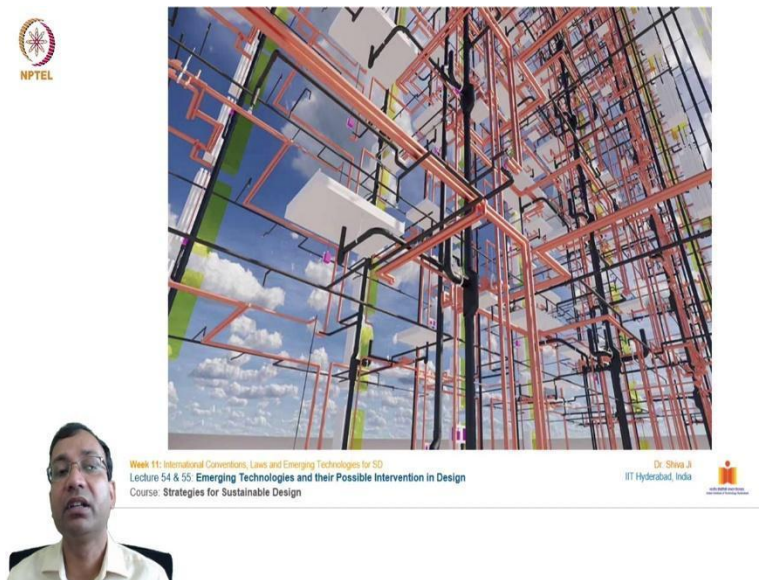
So, if we see like a with an integrated building technology system like a designer, so it touches it has the potential to touch each and every stakeholder of like a any like a premise such as like architect, mechanical engineers, electrical engineers you know construction manager, civil engineers, interior designers, contractors you know owners, clients you know or even the like occupants.



So, how this technology can be utilized further to strengthen this actually bond strengthen this actually relationship because this relationship actually is the responsible actually thing for an efficient actually functioning of any like a building premise. So, because building actually lasts for like several years, several decades okay and in that period in its like operations stage it utilizes a huge number of resources and like an energy.

So, how this can be actually brought down so any while increasing the actually efficiency of it so this technological actually interventions can come to the rescue.

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So, you see over here this very complex actually network of like a pipes n number of like actually segments you can see of these pipes are running over there. So, the pipes are color coded if you start actually understanding what are what are these and how they are functioning you know they are color coded in different colors you know they have actually different diameters, different lengths you know they are laid in like a different level you know so this is actually a model taken off from a like a building. So, removing the other like a building component just keeping the actually piping in this actually picture.

So, you see like these set up actually pipes they are supplying either like some material or they are taking back some material you know for like a processing and recycling or like icy waste or they may be actually supplying water they may be supplying like a so other like a material or like a resources needed for the building.

So, this is actually a short taking from like a BIM actually. So how this BIM like building information modeling helps us to lay down the each and every actually segment, each and every part of this actually this piping network which is actually implemented in any given building. So, that the operators you know so the people who are taking care of the maintenance and operations of this building can actually take care of it and they can actually create some like isolation areas if there is like any fault in like a certain segment you know they can identify that fault they can actually isolate that segment you know without interrupting the services to the entire building you know they can go and they can take some corrective measures.

So, this is actually network you know like usually we do not actually see with our like naked eyes but our buildings are actually fully functional like a sort of like a living organisms who actually consume you know resources who actually does some work you actually which actually leaves out some like other like a waste material also. So, this is like a living system you know so this is how actually this building work and these are technological interventions can help actually conducting this work efficiently.

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Further so we are talking about BIM over here building information modeling, so starting from the like a design phase you know starting from the like a conceptual phase we are which aware we are like envisioning like what kind of you know services and what kind of operations and the utility we actually desired from like this actually premise you know and then going further like a

detailed design you know analysis in documentation, fabrication you know construction you know the other logistics related with the construction you know operations and maintenance, renovation you know regular actually preventing maintenance, etc, programming, etc and then the end of the life actually stays.

So, build actually BIM handles the operation stage completely so it takes care of each and every actually component each and every actual service which is there inside that building whether this is like water supply you know the fresh air or the concealed conditioned air supply, whether it is like a fire prevention system or some alarm system or maybe energy actually a consumption system maybe for lighting you know ventilation etc, even for like operating like lifts you know escalators etc.

So, this takes care of all of those things even it can calculate the energy load you know which are which can actually happen on any given building at any point of the time in the year. So, this has actually this analytical component also, so which takes care of like you know energy planning so that the energy consumption can be minimized. So, you see like a BIM is a very utilitarian actually a technological actually intervention in the building industry all together.

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**NPTEL**

### Top Considerations for Glass Selection & Specification

In addition to the important considerations of aesthetics and energy related performance characteristics of glass products, it is critical that attention be given to other design considerations. This should be done by the appropriate design professional as early in the design cycle as possible.

- Surface Orientation**  
When darker tinted glasses are specified, it is critical that the glass be fabricated and glazed with consistent surface orientation.
- Color Shift**  
Color shift can occur when some coatings and films are incorporated into the glass design with other materials.
- Wind & Snow Loads**  
Specify the appropriate glass thickness and type (annealed, heat strengthened, tempered) to resist wind and/or snow loads.
- Safety**  
Appropriate safety glazing materials, such as tempered or laminated glass, must be specified where required by code or application.
- Thermal Stress**  
Strengthened glass (heat strengthened or tempered) may be required to resist thermally induced stresses. These stresses are caused by a number of design factors.
- Aesthetics & Mock-Up**  
Many glass products can be used with other materials for improved performance and aesthetics.
- Energy & Sustainable Design**  
For more than 70 years, Viro has been a leader in the advancement of glass technology designed to enhance comfort and save energy.

**Viro Architectural Glass**

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Further we have like if we go for like a material wise so how the efficient materials can be brought into like a actually uses in these actually buildings, so this is that is actually discussed over here on this particular slide. So, how they actually technology from like a material science

can be utilized in this the actually application of like a certain materials. For example, a glass over here, so the surface orientation is like a factor you know which can actually decide the application and the types of the glass and the thickness of it you know then the color shift what kind of actually color actually we want at what time of the year, at what time of the day you know whether we want like a larger like a intake of light inside or we want to reduce the light depending upon the actually hour and the months you know so all of these factors are the actually a play important role in deciding actually this material the materials specifications.

So, we see like in the materials science also this material the area also it is very important to have actually technological input, so there are some actually technologies available these days which actually help like controlling the glass so the intake of the light you know can also be controlled and can be changed by the like occupants the orientation of fins also can be changed depending upon the time and the month of the year how much light we want to like take inside the building premises.

So, such like efficient methods are there to improve upon the experience of our operations of any building. Such as like some other factors such as like a wind and snow load like a safety concerns the thermal stress the aesthetics and the overall look of the building look and appeal of the building and of course the energy and sustainable like components and the actually the strategies like how these can be also utilized on these actually buildings with the technological interventions are actually a matter of interest and appeal these days. So, one actually must take help of a such like a technological actually inputs and apply on there like a project.

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**Fire Life Safety Systems**

**Fire Alarm**  
Fire alarm system is a system of interconnected fire detectors, fire alarm control panel, and fire alarm sounders. It is used to detect and alert the occupants of a building in the event of a fire.

**Fire Extinguishers**  
Fire extinguishers are portable devices used to extinguish small fires. They are available in various types, including water, foam, dry powder, and CO2.

**Fire Hydrants**  
Fire hydrants are a source of water for fire fighting. They are connected to a network of pipes and valves that supply water to fire hydrants throughout a city.

**Fire Escape**  
Fire escape is a vertical structure that provides a means of egress from a building in the event of a fire. It is typically made of metal and is located on the exterior of the building.

**Fire Staircase**  
Fire staircase is a staircase that is designed to provide a safe means of egress from a building in the event of a fire. It is typically enclosed in a fire-rated enclosure.

**Fire Lift**  
Fire lift is a lift that is designed to provide a means of egress from a building in the event of a fire. It is typically equipped with a fire-rated enclosure and a fire alarm system.

**Fire Fighting Equipment**  
Fire fighting equipment includes fire extinguishers, fire hoses, fire nozzles, fire ladders, and fire axes. These tools are used by fire fighters to extinguish fires and rescue victims.

**Fire Fighting Personnel**  
Fire fighting personnel are trained individuals who are responsible for extinguishing fires and rescuing victims. They are equipped with fire fighting equipment and are trained in fire fighting techniques.

**Fire Line**  
Fire line is a line of fire that is being fought by fire fighters. It is typically marked with a fire hose and a fire nozzle.

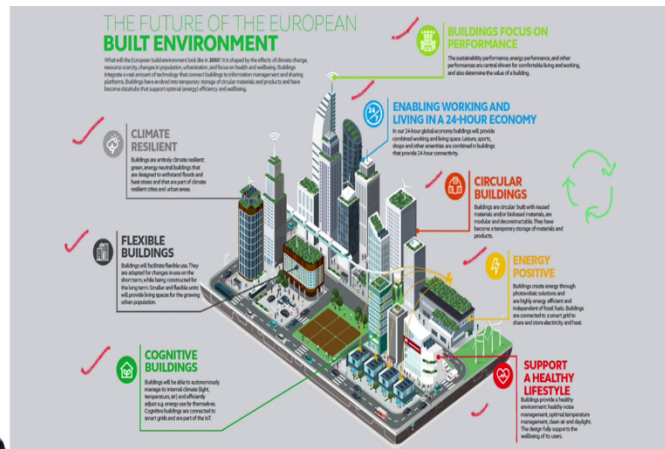
**Fire Lane**  
Fire lane is a lane that is reserved for fire fighting equipment. It is typically marked with a fire hydrant and a fire hose.

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Further there are actually technological interventions in the fire safety also in the buildings. So, new types of actually sensors and isolators are actually coming these days to which can actually sense the fire and can isolate actually a certain segment of the building in order to reducing the spread of the fire in the other sections of the building.

So, this system are also being installed in the multi-storey actually structures because they are highly vulnerable to actually damages by the fire and extreme actually hazards are actually likely in case of like a such a actually incidences. So, this technology is being implemented in most of these upcoming like a high riser actually buildings you know enabling actually the fire safety over actually a longer period of time.

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So, in an like a overall sense if we see like we have like a several actually areas, several domains where the technological interventions are happening in the like a building industry today. So, starting from like a climate resilience, so to how to go for actually UHIE reduction that we have discussed earlier so the green roofings are like a in the like a promotion as you can see in this illustration this is a this talks about the future of the like a European built environment.

So, how they this they are actually trying to envision like how this how their actually cities are going to be like in the like coming actually year. Further the technological inputs for like a flexibility of uses of these are actually the buildings, so the how the activities a certain activity can be wrapped up in a shorter span of time and the building actually floor pad can be made available for like other activity.

So, the flexibility in like adaptability of the like a building spaces so this is also one of the areas one of the actually domains where technology has come to like its rescue. Further like a cognitive building, so the buildings are actually able to sense a number of actually things. So, how and they are able to strategize and you know plan the use of the resources or they are able to actually take a corrective actions you know to safeguard actually if there is a safety or security is concerned you know or if there is any like a kind of hazard is concerned so they are able to actually take some corrective measures also.

So, this is where we are seeing the buildings are turning into like you know the smart buildings really. So, once they develop actually these are cognitive abilities you know based on their actual data collection you know on the real-time basis they may be able to take even more like a corrective measures to prevent like a hazards or actually take care of the like occupants.

Further if you see like the buildings focus on the performance, so the how the building is performing on the like a consumption consumption of material resources or energy anything so that also like is one of the actually prime areas of like a intervention in the recent times and there are all of these like a BIM models they are actually helping to minimize actually consumption of resources and energy in the building premises.

Further enabling the working and living in a 24 hour like economy, so the buildings are adopting like a multi-uses pattern so the buildings are like adopting this pattern where they can be used even in the night time, even in the odd hours of the like on the day. So, how this can be actually made use of because actually infrastructure actually projects such as the building is a huge investment so how the maximum efficiency and the optimization actually can be taken from this is the actually matter of like a further exploration.

Then circular building, so circular buildings means the circular economy the closing actually life cycle you know so this is this is this actually concept comes from there so we have discussed it earlier. So, the resource consumption so how the buildings can actually close the cycles you know so that is actually target so like with several means for example, like a sourcing of the water and sourcing of the like electricity.

So the how the buildings can actually close the loop you know so the from the like a generation from the manufacturing till the consumption and the recycling and even repurposing so the in what ways buildings can contribute because buildings actually consume a huge amount of like resources you know every day there is a lot of like a materials which goes inside the building and every day if you observe there is a huge amount of like a trash also gets out of the building.

So, how this trash you know can be minimized or completely maybe you know completely taken care of completely can be you know the amount can be actually brought to the liquor nil. So, this is actually concept which we are actually discussing over here, if buildings also can follow the circular actually a model of like a closing the life cycle it will be much better because the

buildings are the ones who are actually housing like users, the habitants and in turn they are actually producing a huge amount of waste and we are aware of the problems created by these landfills and the waste actually solid or the liquid or semi-liquid.

Further like energy positive, well we have discussed it n number of times in the like a net zero energy building so in that concept of you see like the buildings are supposed to be actually generating their own actually power requirements because that is a decentralized actually model of power generation we are talking about here because any centralized actually model such as like a maybe like a thermal power plant or a maybe a nuclear power plant or a hydro power plant they have their own impacts at the mammoth scale.

So, that actually impacting that actually damaging impact can be minimized by adopting actually standalone actually power generation systems you know on the like from the like individual buildings itself. Further lastly we have this support healthy lifestyle, so the how the buildings can actually promote a healthy and well thought of you know actually lifestyle of is like a users, so by creating actually a nice indoor like air quality by giving them an ambient actually atmosphere around we will by giving them a good views outside so that there are like a positive impacts on the like psychological actually dimensions of the like a human comfort.

So, starting from the like a physical comforts to the like a psychological comforts how buildings can actually come to the rescue and there is actually huge scope for like a technology to actually address each of these actually intervention areas.



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Further in the networking also like each and every gadget each and every appliance you know each of our like electronic devices are actually connected with the internet you know they are receiving the information they are receiving the data they are the functioning with the desired actually given like a commands, so for that this huge networking system is one of the very important and necessary actually things to do.

So, whether it is like a wired-based connection, whether it is like a wireless based connection you know irrespective of it so this thing a network a good networking actually inside the building premises is one of the actually most required entities. In the recent actually a pandemic actually this state you may have experienced the uses of these electronic gadgets such as like a phones, computers and internet have grown like a considerably high you know because they are able to actually facilitate us for like our education, e-commerce activities and several other things.

So, we can actually with the help of these growth like a telecom and like a computing you know the India which has India was already witnessing for last few years so this has actually come very handy for like Indians to survive you know over this actually pandemic situations. So, obviously there is a need to further strengthen this networking in the like a building premises to actually achieve an optimum actually connection.

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Further on the materials part here this slide is taken from this aluminum association. So this is where they have actually spoken about how the technology to improve one material you know on like a several parameters you know has resulted into an efficient use of that material. For example, aluminum over here so you can see you can go through these details on there like a website but we can discuss a few of these over here like in this figure if you see the 95 percent of aluminum in buildings they recycle at the end of the life use you know according to the 2004 study by the Delf University of Technology well this study actually is taken from the Netherlands, so this data is from the Netherlands it may not be actually true for like Indian conditions but we can have our own actually analysis of such materials.

But yes the important of like keeping this slide over here is that like one material like how this aluminum as a material you know can be utilized in our like a today's model because it has certain actually properties which are advantageous over like other like materials such as it does not rust like a normal like a mild steel or iron it rusts but the aluminum does not rust, plus like it has a like some other like advantages also, if you see like aluminum is infinitely recyclable in fact nearly 75 percent of all aluminum ever produced is still in used in any use actually today.

So, that is actually a huge feat here as far as like the sustainability is concerned because this material 75 of all aluminum produced till now in the entire world is still in use somewhere so that is an amazing actually fit if you compare it with the other materials such as like a plastics

and others, so this is highly advantageous because plastics has turned out to be one of the most hazardous actually material inventions which has happened on this planet.

Further like a produced recycled aluminum saves more than 90 percent of the energy and produces just 8 percent of the greenhouse gases associated with the making new aluminum. So, what I am like amazing feat if you say if you compare because it has a very high recyclability actually quotient so it saves a lot a lot of like energy also. Further like a government officials should consider energy savings from recycling aluminum when developing policies.

So, how this aluminum can be actually brought into like a further uses in our like a buildings and like other like a product designs that can be still (( ))(32:26) us to like explore some more advantages we can see over here, so we can see over here like aluminum building products are weatherproof and corrosion resistant as we discussed earlier.

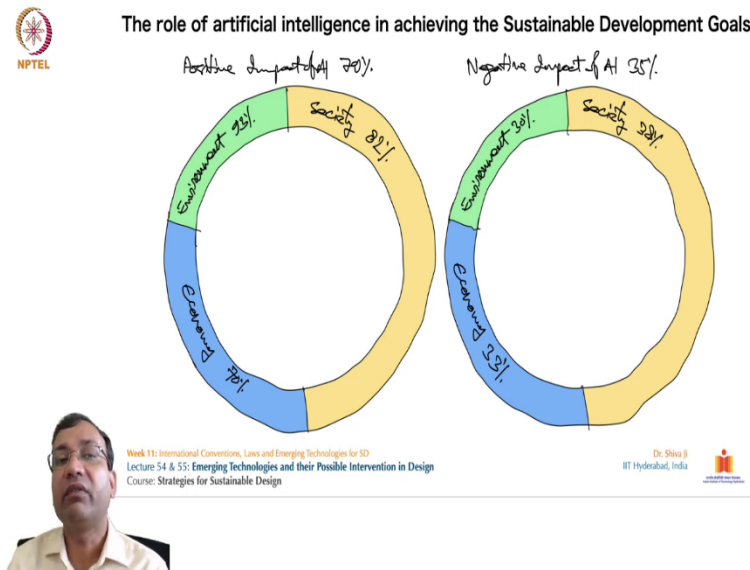
Architects can design light structures with great design flexibility aluminum's durability means it can serve its function in a building for many decades to reduce like a maintenance costs you know further like aluminum's exceptionally high strength to weight ratio makes it especially useful as like a structural material weighing up to 65 percent less than steel. So, this is one of the actually biggest advantages in a like a lighter actually weight we can have actually more strength.

So, how is aluminum further can be utilized so this is actually this technological actually intervention is coming so with the help of technology how a material can be refined and put to use in like a certain applications. So, this is one of the actually best examples, like you see like using aluminum in buildings can help them qualify for green building status such as like a rating system such as like a lead also, so the lead actually has a certain actually advantages and it gives some like advantages actually a point for adopting like a such material.

Coated aluminum roofs can reflect up to 95 of the sunlight while dramatically lowering energy consumption because the heat gain of this material is lesser compared to other material so the overall heat load on the building will obviously be very low. Further 50 to 85 percent is the range of estimated recycled coat content of like all aluminum building products including like roofs, slidings you know curtain walls, window frames, facades you know door frames, etc.

Further like a aluminum's contribution to energy savings during the life cycle of building is equivalent to hundreds of millions of barrels of crude oil uses annually. Well, if we compare with the other like a material's well certainly it has like advantages so why not to use actually technological interventions to improve upon these materials you know and reducing the impact.

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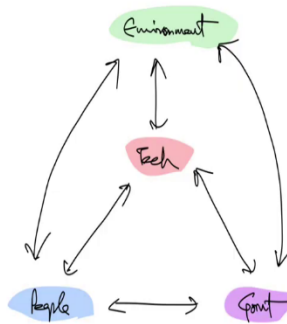
So how technology such as like artificial intelligence you know can play a role in like achieving the sustainable development goals, so there is actually a study you can refer this study over here in this journal from like nature communications and also this see's like the positive impact of AI you know up to like 79 percent you know so it is divided here into like three aspects of sustainability environment you know society and economy.

So, what are these actually the disease you know you see over here they are color coded and numbered you know like how much of impact is possible you know how much of positive impact is possible how much of like a negative is also impact is also like I studied over here is possible you know is a like a study through like this research so it shows like there is a huge scope of actually improvement you know with the technological interventions such as like artificial intelligence.

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### Interaction of AI and society



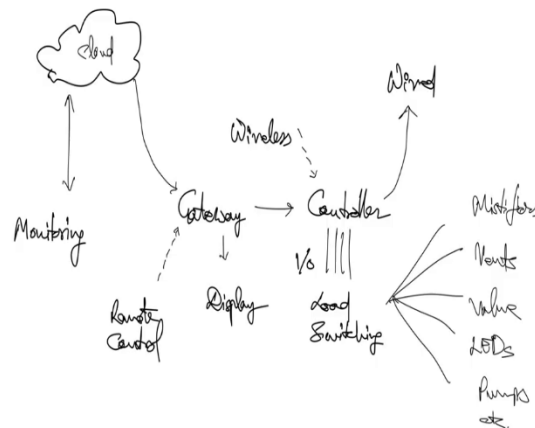
Week 11: International Conventions, Laws and Emerging Technologies for SD  
Lecture 54 & 55: Emerging Technologies and their Possible Intervention in Design  
Course: Strategies for Sustainable Design

Dr. Shiva B.  
IIT Hyderabad, India

Well with this slide we can see like a interaction of AI and the society, so how like artificial intelligence you know is coming in the like ecosystem coming in now like the entire actually this environment so it is illustrated over here where this is sketched so this is actually planetary boundary this dotted line outside and then we have technology, government and individuals and here we have like this environment at the top you know and there is actually these the activities and the interrelationships that we can see over here with these actually arrows.

So, there is certainly some relation like with this artificial intelligence this technology for the lack of people and for the like other species other life forms and well accordingly the resource consumption you can see or accordingly the actually a policy frameworks and legislations you know things can be actually planned you know how it can work actually for like a resource optimization or actually creating well-being in the society you know so this is how actually this technology can be actually fine-tuned to help actually the planet.

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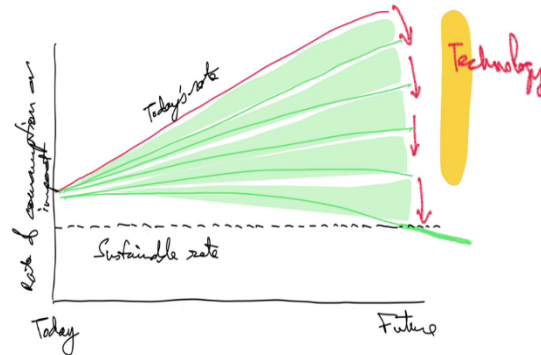
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Further we have spoken earlier about this networking, so how this wireless technology is coming to the rescue and adoption of actually new other like a technologies also in the like a buildings is actually illustrated over here.

This is taken from like this research paper you can refer this paper for more detail and also like well cloud computing you know the cloud monitoring how you can even if you are away from the building premise you can take care of it and this is BIM actually building information modeling and the sensors and other equipment installed in the building will keep us actually connected with the performance and the kind of the real-time actually data whatever is like a is going on inside the building and we can take actually preventive or corrective measures you know as and when required through our like phones or tabs or maybe computers.

So, it is it has become such a level as convenient as this that we can operate our buildings even while being at a you know remote location. So, with the help of like a such a technology you know of like a cloud computing, networking, etc. So, this is where we see like the impacts of technology in the like a building industry and well we can strategize why this technological actually interaction and then this actually lecture was needed you know for our understanding that how we can actually devise you know our buildings according to the technologies or you know our with adopting actually the new technologies new emerging actuary technologies which are coming to our like you know uses these days.

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Well this is the last slide in this lecture and it clearly actually gives us this impression like how important it is for us to go for luxerior technology adoption and the kind of you know the promising you know results it can give. So, you see this this red bar at the this red line at the top so this is actually the kind of impact you see here the rate of a consumption of like an impact like a today and here it is about the future and this dotted line talks about this sustainable actually rate of a consumerism and actually consumption.

So, it is it is shown over here through this research paper the details you can find through this paper over here the link is given how this technological actually we gets you know slab by slab you know (()) (38:57) by adopting like these many actually technologies how we can actually bring this actually this damaging actually curve down to a more sustainable you know a greener curve which is here right at the bottom.

So, this is actually consumption at today's rate you know this is going very high you know and this is the this curve is the responsible curve which is causing you know the global warming actually and this climate change impacts and several other like disturbances you know and the changes through our like a consumption pattern and now it will start bringing the efficiency in the whole actually consumption actually pattern you know and slowly it is expected that the required actually consumption rate to reach actually sustainable actually this growth line can be achieved in the future.

So, you see the impact and the role of the technology you know which is very promising you know and we must actually go for actually technology adoption to improve our overall actually sustainable growth and development actually processes. So, with this we have come to the end of this lecture.