

Episode -46

Sustainable development and building construction

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We need more houses to accommodate the ever increasing population. We have limited space, so we cannot grow horizontally. Also the cost of infrastructure will increase in a spread out city. So we explored the possibility of vertical growth. But we still need to be cautious. We need development which is sustainable. We need to think on many lines to make the development sustainable. Today, we are talking about the role of construction materials in development.

List of characters :

Professor

**Students : Anand, Samir, Rehman, Chinmay, Sachin, Aishwarya,
Sneha, Madhu**

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The class bell rings. There is a bit of chaos, students entering, talking, noise. The professor walks in. the noise goes down gradually.

Class rep: Good morning Sir

Students: Good morning Sir

Professor: Good morning, sit down.

(students sit down)

Professor: I will circulate the attendance sheet, please mark your own presence.

(A wave of laughter)

Professor: Yes, I know some of you mark proxy for your friends, I don't want that. If you don't like my lectures, don't attend, but I hate dishonesty. You let me know I will mark the attendance permanently.

(there is a little commotion, no sir, we like you,)

Professor: Ok ok. Let's start for the day. Today, we are going to discuss about various construction materials. First of all, tell me, what is development? And why do we aim at it?

Anand: Sir, development is demolishing old structures and constructing new ones.

(The class laughs)

Professor: Silence, he is partly correct, why should you laugh? Samir, you say something.

Samir: Developing the area to cater to the requirements

(Some commotion in the class again)

Professor: Ya, you all are thinking on the correct lines. Basically, it all starts with demand for more and more houses due to increasing population. We have limited land, so we cannot grow horizontally, at the same time we need houses so we started building high rise structures. When we build bigger structures, we need expertise in all fields right from planning till the actual usage. But there is a limit to everything. We cannot just go on adding floors, nor can we just go on adding buildings. The cities must be left with some breathing spaces.

Rehman: Breathing spaces?? Sir, how do cities breathe? I mean, I have known living things breathe.

(the class laughs again, oho scholar, oh what a knowledgeable person....eh sit down, listen to sir)

Professor: Shooooooooo, in fact I want you to ask questions, it should be an interactive session. Nothing wrong in what he said. Yes, Rehman, I said breathing spaces for the cities. Can you think of a city with back to back constructions, no yards, no gardens, no open spaces?

Students: No sir, we need gardens, play grounds.

Professor: Yes, those are the breathing spaces for the city. We grow, we construct many structures but we have to follow the rules of the local governing body. Do you know who is the local governing body?

Chinmay: For a small town, it is gram panchayat, Nagar parishads and bigger cities have municipal corporations. The town planning department governs the construction pattern in the area.

Professor: Correct. The local governing body sets out a development plan, outlining the necessities like roads, hospitals, fire stations, gardens, police stations, sports complexes, land fill sites, bridges etc. it also decides the construction that can be allowed for the town. In bigger cities like Mumbai, we need high rise structures which have many floors to accommodate the ever-growing demand for houses. But we cannot just go on constructing. We should know where to stop.

That is, we need development but it should be sustainable.

Aishwarya: Sir, it's a bit confusing when you say we need to develop but up to a limit, why? When we can add buildings, maybe we add more floors, and we solve the problem.

Professor: (Smiles) let me give you a very simple example. You had nice long hair, didn't you?

Aishwarya: Yes sir.

Professor: But you got them cut to half the length, right?

Aishwarya: Yes sir.

Professor: Why?

Aishwarya: It was very heavy on my head, I developed a neck problem, also. Most important was maintenance, Sir.

Professor: exactly, it means you could not sustain the growth of your hair. Though it looked beautiful, it created many problems for you. On the same lines, when you look at the cities, you can see many towers coming up. It is not only the construction, but we also need to provide for the basic necessities like water, drainage and sanitation and an effective disaster management system. There should be proper approach roads, such that traffic moves around smoothly. The garbage management is yet another menace. It only means, there are many systems which go hand in hand, they are essential for the smooth functioning of the cities life.

(The class bell rings)

Samir: Oh no. sir we want to listen to you. We like it when you are telling us all these important matters. The class time is too short.

(Everyone, yes sir yes sir, we want to know more sir.)

Chinmay: Moreover, sir, today we didn't talk about the materials at all.

Professor: So, what should we do?

Anand: Sir, tomorrow, our college gets over very early, if you can spare some time for us we all can meet.

All: yes sir, yes sir

Professor: Ok let's meet tomorrow. But not in the classroom.

All: Then?

Professor: We will meet on the terrace, I will seek permission from the Principal, as the class rooms may be occupied.

All : Yeeeeeeee

The class disburse.

(Music)

**Students are talking, let's go to terrace, eh but where is Joshi Sir?
Oh, there he is....**

Samir: Good afternoon Sir

Everyone: Good afternoon sir

**Professor: Good afternoon, good to see you all. Let's go to the terrace. They
have made seating arrangement there on my request.**

Students: let's go

(Music)

Students are all talking,

**Sneha: Wow, what a view! Madhu can you see the golf club there? Green!!
I love greenery.**

**Madhu: But see this side, all buildings, they are almost touching each
other. My God!! How do people live there? Thank God I stay in
a bungalow.**

Chinmay: Ya, but everyone can't be that lucky Madhu.

Madhu: True, I agree.

**Professor: So, everyone liked the venue? It looks like you have forgotten our
objective to meet.**

**Chinmay: No sir, we want to hear from you about various aspects of
development and also the role of construction materials in
development**

Professor: Good. So, what had we discussed yesterday?

**Samir: Sir you told us about how development also has limitations and
that without control we cannot go on just constructing.**

Professor: Correct

**Anand: But sir, if we plan a city properly, restrict the construction, decide
on the support systems, what is wrong in development?**

Professor: Nothing

Anand: You mean can we then go on and on?

Professor: Anand, what do you like to eat the most?

Anand: ice crème, sir

(All students jeer him, laugh, say eeeee)

Professor: How many ice cremes can you eat? Let's say, you starve the whole day, and eat only ice crème in the evening.

Anand: May be 4 ice cremes

Professor: Why? You planned for it, you starved the whole day, then you should be able to eat on and on

Chinmay: Sir his stomach capacity will not permit him.

Professor: Exactly, so even if you planned for it you still had to stop, Right?

Anand: Right sir.

Professor: yes, you answered it. The cities cannot grow limitless, it will be a burden on the infrastructure.

Chinmay: Sir, is it only the infrastructure?

Professor: No, it also affects the environment to a large extent. The trees have to be cut, to raise the buildings, the flora and fauna of the area certainly get affected.

Aishwarya: yes, so many birds and animals get displaced with construction. Only rodents, who are just destroyers, flourish due to the rising menace of garbage.

Madhu: And so many health issues are also created.

Professor: Right.

Chinmay: But sir, what about the materials?

Professor: yes, I am coming to that. You see, in olden days, the commonly used materials were stone and wood for the simple reason that they were in abundance. Stone has proved to be the most durable material. We can see many of our heritage structures which are hundreds of years old, built with stones.

Sneha: Sir, I recently visited Sanchi, the Stup at Sanchi, built by Samrat Ashok in the 3rd Century is the oldest stone structure in India. It's amazing, its huge and it still looks as if it was built yesterday!

Professor: Yes, it is the oldest structure built by Samrat Ashoka in 3rd BC. Not only that, there are some even older structures in the world built with stones. Even after hundreds of years they are still intact.

Samir: Wow, Interesting.

Professor: These structures were very suitable as it adjusted the temperatures and ventilation kept it cool. But we could not be using the stone due to its scarcity and there was need to find alternates.

Chinmay: Mud houses must have been the first alternative.

Professor: Yes, stone caves were first houses. Then there were mud houses, wooden houses. But both these had limitations. The mud bricks then came in. We still see the bricks made with soil at some places.

Samir: Why some places? Everywhere bricks are that of Mud.

Professor: That was the scene earlier. As the demand for these bricks grew, it was realised that the top fertile layer of the soil is being used to cast the bricks. Then, when they are to be baked, it causes a lot of pollution. Need is the mother of inventions. Even an alternate has been found for the mud bricks. Another shortcoming of these bricks is they are very heavy and add unnecessary dead load to the structures. If we are constructing high rise structures, we must reduce the unnecessary burden on the structures, so that they become safer.

Madhu: But Sir, bricks are used for walls, if the walls are not heavy, how the living inside will be safe?

Professor: Walls are to protect the inmates from outside. If you are given an alternative which is equally effective, why not use it?

Madhu: Yes sir, what is used in place of the bricks?

Professor: These days , there are light weight big sized bricks which are made from some waste materials like fly ash. Also they have found an alternative to the partial replacement of cement.

Students: Alternative to cement?

Professor: yes, earlier, cement composed of lime and some minerals , but now they are using some alternates to complete the concrete formula and achieve the required strength, like the fly ash which is a waste material from the thermal power stations. The ash is processed before it is added to the concrete mixture. It cannot be used without processing. This also makes the cement lighter and more effective. It is called blended cement.

Chinmay: Oh, that's interesting.

Professor: but one important thing about these concrete structures is they cause a lot of damage to the environment, unless built with proper planning for a long term usage.

Sneha: How is that Sir?

Professor: when these concrete structures are destroyed to be redeveloped, all the material generated is waste. It cannot be reused. Only the iron bars are sent for recycling. Rest is just a waste. Even, the sweet water that goes into construction is depleted. We cannot bring it back, it is just getting blocked in cement hydration process.

Anand: Yes, I have seen it when a building was destroyed recently in our neighbourhood.

Professor: As against this, the steel structures are beneficial. Even when destroyed, the material can be reused. They are easy to build and can be recycled. So the salvage value of a concrete structure is nil while that of a steel is substantial.

Rehman: Yes I have seen many bridges are built with heavy steel may be that's why they last long.

Professor: Yes, it the steel structures also have some limitations like the initial capital cost is very high. It lacks fire resistance unless insulated. And the biggest challenge is to tackle the corrosion. but when we are talking about durability, a lot depends upon the quality control at site during construction. Actually, it's a team work. The Architect must give a proper design first.

Sachin: What is a proper design?

- Professor:** The plan of the structure must fulfil all the legal provisions. It should be in accordance with local building bylaws. Then the structural engineer must work out structural design complying to prevalent codes of practice.
- Madhu:** Code? Which code?
- Professor:** Just like other Indian standards, even the designer has to follow the code defined by the Bureau of Indian standards. Then the site engineers must adhere to the strict quality control at site. He must study all the drawings given to him and check the construction accordingly. And the most important responsibility is that of the occupants.
- Rehman:** Why residents sir? They come to stay when the building is ready.
- Professor:** yes, the most important part starts after that, the maintenance. If a building is maintained properly, it will surely last longer.
- Chinmay: S** ir these days they talk of green buildings, what are those? And why should we have such green buildings?
- Professor:** Wa, good question. Now I will tell you why I told you all to come the terrace. Look around. You appreciate the lush green golf course. But as I said, we must also appreciate the concrete jungle as it is catering to the needs of our ever growing population but at the same time we must take precautions. Green buildings are those buildings where environment protection is paid some attention to and are energy efficient.
- Anand:** But sir how can they do it?
- Professor:** There are many ways. We begin with planning. The architect must make a maximum use of natural light and ventilation. At least during the day we should be able to switch off the lights. We should not promote those big boxes of glass that need lights and air conditioning twenty four hours. We must think of reducing the carbon foot prints. Moreover, where ever possible make use of the solar energy. In short, we should not have a system blocking the natural light and ventilation.

Sneha: Yes I like the fresh air and bright light during the day. I have seen solar panels on top of many high rise structures these days used for water heating and light. But is that all?

Professor: No, that's the beginning. We should discourage the use of façade glass, it adds to energy consumption. We should also consider a minimum disturbance to the natural landscape, have more open spaces. Where ever possible, plant useful trees.

Madhu: the trees and gardens attract many birds, this will help in achieving a good environment.

Professor: Yes. During construction also alternate materials should be considered. Like the light weight bricks we discussed, they provide thermal insulation such that temperatures can be maintained. Cement can be made with fly ash but major problem is with sand and the aggregates. Sand is dredged out of rivers disturbing the ecology on a large scale. These days they are trying to use the waste generated from the destroyed structures. Uncontrolled quarrying of natural material like stone, sand, minerals is yet another big problem.

Sachin: Yes, I don't like those cut hills. I enjoy trekking.

Professor: We face scarcity of water these days. Recycling of water and rain water harvesting is also required.

Samir: how can we recycle the water?

Professor: Water used for washing, bathing, cleaning can be reused for gardening and flushing by collecting and treating it. Rain water may be collected in underground tanks or recharge pits. And when the building is occupied the biggest menace is that of the garbage. We must segregate the green waste and compost it in the society premises. The compost can be used for gardens. And the dry waste can be sent for recycling. But the residents must follow these instructions.

Chinmay: We do it in our society. The manure generated from the compost pits is very fertile, we use it for kitchen gardening. We got such good crops of tomatoes and some vegetables.

Professor: Oh, that's really great. You must teach it to others. Waste management is a big problem.

Samir: We also have a zero-garbage society. But the compost is given to the residents, they may use it for their small garden or gift it.

Sneha: Vermiculture is quite interesting and useful. We also have a compost pit.

Professor: In fact every building must have a compost pit. Three R - Reduce, reuse and recycle is the mantra for sustainable development. We should follow it even during the construction process. We should reduce the use of unnecessary materials. We should promote reuse of certain materials and yes try to recycle.

Sneha: Unnecessary materials?

Professor: Yes, for example if full glass is used in external cladding for building , it requires extra energy for air conditioning. We can use minimum glass and allow maximum natural light and ventilation. The steel removed from the destroyed structures can be sent for recycling. Thus, even recycled construction materials have a great role to play in the development. We think of big buildings but we don't think of the materials that have gone into making them. Yes, we need development but it should be sustainable. We can divert the population to smaller cities, may be by shifting the businesses such that only one big city does not have to bear the burden of the ever growing population. But all this requires a through planning.

So, in nutshell, we need development which is sustainable , which can be enjoyed by the citizens and by the environment, equally.

(Everyone claps)

Professor: I think, we should stop now. We had a lot of discussion. I hope everyone is satisfied.

Chinmay: Thank you sir, we were really happy, with the discussion and with your selection of the meeting venue. We really got to learn a lot.

Everyone: Thank you sir

Professor: It was my pleasure. Lets meet again.

Thank you.

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