

Episode -12
We want a Green Earth not a Greenhouse Earth

(This script deals with Human Activities Leading to Carbon Emissions)

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Characters:-

Arnab and Akash: Class Six students
Suraj: Arnab's father
Tara: Arnab's mother
Dadu: Arnab's grandfather
Nani: Arnab's grandmother

Sound of school bell. School gets over. Sounds of kids rushing out. Rickshaws and cycles ring bells. Car horns. Heavy sounds of traffic. General sounds of a busy road.

Sounds fade.

Arnab and Akash are walking home.

Arnab: I am so excited. We are going to my grandfather's farm during the vacations. Where are you going, Akash?

Akash: We have a new SUV. My father says he wants to take us on a trip and has booked us a resort too. It is near the sea, and we are all going on a cruise.

Arnab (wistfully): I have never seen the sea before.

Akash (matter of fact tone): And I have never stayed on a farm...laughs.

Music to indicate change of scene

Railway station. General sounds. Chai, garam chai.

Announcement over public address system: Himalay Kanya Express will depart from Platform Number 1.

Sounds of people settling in...sounds of a train moving.

Tara: Arnab, please settle down.

Arnab: Ma, I want to sit near the window...please remove the basket from there.

Mother: That is food. I do not want to keep it on the floor.

Father: Wait, I will shift it...ok Arnab come and sit near the window and observe the scenery...be careful I will quiz you about what you have seen...it is only right seeing what a fuss you made about a window seat.

General laughter.

Arnab: Papa, papa...what is that tall chimney-like thing belching thick black smoke? Oh...you have to hurry....it is gone....oh look there is another one...and another one...and yet another although this one looks somewhat different...(in surprised tone) Papa, what are these things? Are these factories?

Suraj: The first two you saw were brick making kilns and the other one...the one that was bigger and looked different was a power plant. You will see quite a few power plants as we cross the boundary of Delhi.

Arnab (amazed tones): Power plants? You mean these make power...I mean ...electricity?

Tara: Yes dear, usually coal is used to boil water to create steam. This steam under high pressure is used to spin turbines. These spinning turbines interact with a system of magnets to produce electricity which travels via wires to our homes.

Arnab (agitatedly): But did you see the smoke and the ash...isn't this pollution?

Suraj (quickly diverting Arnab's attention): And of course you will see many brick-making kilns too...the city is expanding. More people are moving in. Everyone needs a place to stay. Houses are made of bricks...so the demand for bricks is high. Cement and steel too!

Arnab: I have already counted twenty six brick kilns and three or four power plants...and from all these I saw a lot of smoke polluting the air.

Tara: Good observation...now please take charge of your rucksack...we have to get down at the next station.

Sound of train slowing down and stopping. General noise of a train station.

Music to indicate change of scene

Tara: All settled in? Driver ji, let's go.

Arnab: Driver Uncle: Your car is emitting so much black smoke...you should have it checked. It is polluting the air.

Suraj: Hush Arnab....Let us go.

Sound of a car starting...moving.

Tara: I remember this area being so much more green when I was a child...even the last time we were here...they have cut down huge swathes of woods. How sad!

Look there is a factory coming up in the clearing. Soon it will belch hot smoke and pollute the air.

Arnab: In school they told us that trees and plants absorb carbon dioxide and during photosynthesis aided by sunlight convert it to food with oxygen as a by-product. We need trees to keep the Earth cool and green. But everyone is busy chopping down trees...at this rate there will be no trees left!

Tara: I am glad you pay attention in school.

Arnab: (Protesting tone) Ma!

Tara: Just teasing you dear. But you should know that a carbon sink is a carbon reservoir. Forests, grasslands, oceans, soil, photo-synthesizing plants all act as carbon sinks because these remove carbon from the atmosphere and incorporating it into biomass.

Suraj: You know Arnab, the trouble begins when enormous amounts of carbon dioxide are released thanks to our activities and there are not enough trees to take it in. You see, large tracts of trees act as carbon sink! It has been estimated that Asian forests absorb about 5 tonnes of carbon dioxide per hectare each year. Forests have long served as a critical carbon sink, consuming about a quarter of the carbon dioxide pollution produced by humans worldwide.

Tara: Grasslands and oceans are also good carbon sinks.

Arnab: So, a carbon sink is any system that takes carbon out of the atmosphere.

Tara: Hmm...yes.

Arnab: (excitedly) Look....there is the pond...we have reached.

Tara: Driver ji, please turn left here...and drive in through the main gate....Ah! Here we are!

Sounds of a car stopping. Barking of dogs.

Dadu: Welcome...welcome all of you...Arnab...come here and give your grandfather a hug. I have not seen you for two whole years...how tall you have grown!

Arnab: Yes, Dadu. I have missed you too. Where is Nani?

Dadu: She is in the greenhouse picking fresh vegetables for you.

Arnab: But Dadu, I did not see any green coloured house as we came...everything is lime washed and white.

Tara (laughs): A greenhouse is not green in colour. It is made of glass, with glass walls and glass roof. The glass allows sunlight to enter but the heat is trapped inside. So,

it is warm inside a greenhouse. It stays warm even during winter because the heat is retained.

Dadu: And so, we can grow flowers and vegetables in a greenhouse; otherwise the cold outside would make it difficult for the plants to thrive.

Suraj: It is quite chilly here; Delhi was hot when we left. But then, Delhi is an urban area with many vehicles, houses and factories all emitting carbon in some form or the other.

Tara: Yes, but as a child I remember October being much colder here...the entire Earth is like a greenhouse now.

Suraj: (Sad voice.) You are correct; it is really a dangerous situation we are heading towards if we cannot arrest it; soon.

Arnab: The Earth is a greenhouse...because we grow vegetables in its soil? Why is this, a bad thing, something that needs to be arrested?

Dadu: Oh Arnab...the Earth behaving like a greenhouse is not good news...you will understand when you grow up.

Suraj: It may be too late by then! Since you have raised this question Arnab, let me answer you in simple terms. You see when the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space...so the Earth does not heat up dangerously

Arnab: What happens to the rest of the heat?

Dadu: The rest is absorbed and re-radiated by gases that are collectively called greenhouse gases. What is retained makes the Earth comfortably warm.

Suraj: And before you ask....Greenhouse gases include water vapour, carbon dioxide, methane, nitrous oxide, ozone and chemicals such as chlorofluorocarbons that used to be once used in refrigerators.

Arnab: Oh! I see...these gases retain the solar heat...keep the Earth warm...that is why we have compared the effect to a greenhouse. But why is it bad news, Papa?

Suraj: Excess of anything is bad. The issue now is that human activities – particularly burning coal, oil and natural gas, agriculture and chopping down trees to clear land have led to increased concentrations of greenhouse gases in the atmosphere.

Arnab: (with dawning realization in his voice) Papa...if the greenhouse effect increases our Earth will become unbearable hot!!! Why isn't anyone doing anything about this?

Sounds of someone entering the scene...deep breathing...as an elderly lady enters huffing and puffing.

Nani: Welcome children. I am sorry I am late. I heard you come....the train journey must have been tiring. I have heated water for you, why don't you wash up. Tara, take Arnab and Suraj inside. (Suddenly and loudly) Ramdeen....Ramdeen....take the suitcases to the rooms.

Tara: Yes, Ma...(stops suddenly) Ma , what is this? Are you still using fire wood and coal to cook? You know the smoke is not good...it is not good for the atmosphere nor for your health.

Nani: But we do have a large supply of stored firewood from the trees that were chopped down recently and animal waste...biomass fuel ...it seems a shame to waste it.

Tara: But Ma, you know it is not a good idea to burn biomass fuel.

Dadu: For that matter even burning fossil fuel is a bad idea... Burning coal or oil makes carbon combine with oxygen in the air to make Carbon dioxide. Of all the fossil fuels, coal produces the most Carbon dioxide.

Suraj: Yes you are correct. Every tonne of coal burned, produces about 2.5 tonnes of Carbon dioxide. Coal is responsible for more than 40 per cent of Carbon dioxide emissions from fossil fuel use. One study found that without the emissions from burning coal and oil, 13 out of the 15 warmest years on record would not have happened. But we still use coal in homes railways, power plants...don't we?

Nani: There you go quoting facts and figures... freshen up first.

Arnab: Wait...wait..Nani...Dadu what did you say? Fossil fuel...fossil...like dinosaur fossils?

Tara (Half exasperated. Half laughing): This boy will kill me with his questions. Arnab, fossil fuels are remains of organic matter that turned into coal, oil and natural gas over millions of years. Fossil fuels we use today were formed before the first dinosaurs.

Arnab: Ma...that means coal and oil take an eternity to be formed.

Tara: Yes, that is why these are called Non-renewable resources. Once we use them up it is not likely that fresh supplies will be available immediately. Electricity, transportation and industry use fossil fuel in bulk...plus the domestic sector is a consumer too.

Arnab: (panic stricken) Oh!...So we must find alternatives...otherwise what will we do when all the coal and oil is finished...there will be no electricity...no cars....or buses or aeroplanes or ships... Ma what can we.

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Tara: (cuts Arnab off in mid-sentence): You and your questions. Wash up now. Your face, hands and feet are all dirty. Scrub well.

Sounds of water being poured.

Dadu: (raises his voice because Tara and Arnab are a little far away) Tara, don't scold the boy.

Arnab comes rushing in, sounds of a chair being dragged. He sits down with a huffing sound!

Arnab: Dadu, how bright the stars are. I cannot remember the last time we went up to the terrace back in Delhi. I go to my room, Papa goes to his room to work on his laptop and Ma watches TV.

Dadu: Three people in three rooms...and I guess there are three Acs all guzzling electricity and emitting hot air? No wonder the carbon footprint is so large.

Arnab: You guess right Dadu, every room has an AC...but don't worry about my footprint. I washed up clean. Ma made me scrub.

All laugh.

Dadu: Yes dear. But it is not your dirty feet that we were talking about. Carbon footprint is a concept.

Suraj: It is the total amount of greenhouse gases produced directly and indirectly by human activities in a given period, say, a year.

Tara: Greenhouse gas emissions are usually expressed in equivalent tons of Carbon dioxide...so saying carbon footprint also makes sense.

Arnab: You mean Carbon dioxide produced when we breathe.

Dadu: Oh dear me....my boy ...carbon is just a way of including all the different greenhouse gases that contribute to global warming and footprint is a poetical way of meaning impact. Reducing your carbon footprint means that you reduce the amount of carbon dioxide that is emitted due to your daily activities. So you don't have to stop breathing to reduce carbon footprint...

Everyone laughs

Suraj: It is so nice to sit here under the open sky. But, many trees have been chopped down. We noticed when we drove here.

Dadu: Yes, the woodland behind our farm has been sold. The new owners cut the trees. I hear that a cement factory is going to be set up here. Apparently the steel plant, a few hours drive from here, and this new cement plant will work in tandem to meet the fast growing needs of our rapidly growing economy...you know more houses, more industry...more progress.

Tara: The sad truth is that as we are progressing, becoming significant contributors to the global economy...we are also impacting nature in a big way. Take for example, deforestation. We have to clear land to make space for new industries. But chopping down trees is adding to carbon emissions and in the long run, this has such an impact on global climate.

- Suraj:** I know some say the land is being cleared to grow crop plants. But although the crops that replace the trees also act as a carbon sink, these are not as effective as the forests of big, tall leafy trees.
- Dadu:** Similarly iron and steel manufacturing and cement production are the backbone of industrial growth...but these are also the biggest contributors when it comes to emissions. These industries consume huge quantities of heat energy to convert raw materials into products...you can imagine the quantum of fossil fuel used.
- Suraj:** It is not just the fossil fuel directly burned. To create steel, iron is melted and refined. This process creates Carbon dioxide too. On average, 1.9 tonnes of Carbon di oxide are emitted for every tonne of steel produced.
- Tara:** Cement production ranks third in Carbon di oxide emission. This sector is just behind transport and energy generation sectors. This sector also produces Carbon di oxide in two ways: First as a bye product of burning coal, to generate the necessary heat. Secondly, as a result of decomposition of calcium carbonate in the process of producing cement clinker.
- Suraj:** Yes. Production of one tonne of cement results in 780 kg of Carbon di oxide.
- Nani:** Not a joke considering how much cement we use...think globally!
- Arnab:** Yet without steel, without cement, and without electricity can we have progress? I cannot think about life without electricity!
- Suraj:** Actually our changing lifestyles, the progress we have made is and the global population explosion are all contributory factors. Over 85 percent of all carbon dioxide emissions due to our activities come from the burning of coal, natural gas and oil. We really need to develop sustainable alternatives.
- Dadu:** Yes...see in cities...why only cities... in towns and villages too... we have vehicles that run on petrol and diesel. But while we pay attention to the emission from the exhaust pipe and update our pollution under control certificate for the car, we forget to factor in all the emissions that have taken place, both during and after, the oil was extracted from the bowels of the Earth.
- Suraj:** Don't forget the emissions during its shipping, refining into fuel and during transportation to the petrol pump...and then we must also add the emissions caused by producing and maintaining the car. Like emissions when the car parts were manufactured and the automobile itself was transported to its point of sale!
- Tara:** Families often have multiple cars. We have two; one for me and one for Suraj. And when Arnab turns 18, he will ask for a car of his own. Our needs multiply and emissions do too.
- Arnab:** Really? You will give me a car when I turn 18. Yippeee.

Everyone laughs

Arnab: I don't think in villages every child gets a car on their 18th birthday. So I suppose your emission levels are low.

Dadu: Hmm. Well, to be honest...the rice we grow and the animals we keep contribute to the emissions too. Domesticated animals such as dairy cows, buffalo, goats, sheep, camels, pigs, and horses; all emit methane.

Arnab: Methane is a greenhouse gas!

Suraj: I did not know that. From where does the methane come?

Dadu: I understand it is the by-product of digestion. The gut bacteria cause enteric fermentation of food leading to release of methane. Also the decomposition of animal manure releases methane.

Arnab: And you mentioned rice cultivation...how does that lead to methane emission? (In perplexed tone) The rice does not eat anything....so from where is the gas coming?

All laugh.

Dadu: Paddy cultivation is thought to contribute about one-fifth of global methane emissions from human activities. This is because soil micro-organisms in flooded paddy fields decompose organic matter and produce methane.

Tara: Fertilizer manufacture and the refrigeration sector, are big emitters of greenhouse gases too. The bacteria that act on nitrogen fertilizers are largely to blame in this regard. According to one estimate soil bacteria release about one kilogram of the greenhouse gas for every 100 kilograms of fertilizer.

Arnab: So be it Industry or Agriculture...all release greenhouse gas?

Suraj: Transport does too...air travel in particular. Big cars that guzzle fuel are culprits as well. A study of cruise ships has shown that vacationing at sea emits 12 times more Carbon dioxide than vacationing on land.

Arnab: My friend Akash is driving down to the sea on a new SUV and then they will take a cruise on the sea...that carbon footprint will be large. I will tell him when we meet.

Dadu: Don't forget the individual. You and I are contributors too.

Arnab: (In aggrieved voice) Now what did I DO!

All laugh

Suraj: Your Grandfather means...the individual's choice impacts the carbon footprint too. So when you live in West Bengal and eat oranges from Darjeeling; transport emissions are lower than those incurred on shipping in oranges from

say, Egypt. If in Delhi, you eat the apple grown in Himachal Pradesh transport emissions are lower than those imported from abroad.

Dadu: Even better...here drink this hot milk...straight from our own cows.

Sounds of spoon and cup.... all laugh.

Nani: You know it is not just production ...of steel, paddy or even milk from cows...have you thought about the emissions from the leftovers of production? Of the stuff that is left over after we consume something.

Tara: What do you mean, Ma?

Arnab: I think Nani means garbage!

Nani: Smart boy. Have you seen a landfill, Arnab?

Arnab: Yes there is a huge one near Ghazipur in Delhi and I remember when we flew to Kolkata last summer. En route to the hotel we passed a really enormous landfill site called Dhapa.

Nani: There are landfills in every city. Multiple ones in big cities. Now, when garbage is buried bacteria act on it. Little or no oxygen is present. This is called anaerobic decomposition.

Tara: Yes...and the process releases emits methane plus some carbon dioxide. The methane eventually reaches the surface of the soil and escapes into the atmosphere.

Arnab: Ma, is it only human activity that has led to the release of so much greenhouse gas and responsible for almost turning the Earth into a greenhouse.

Tara: No, there are some natural factors too...for example volcanic eruptions. Grasslands sequester most of the carbon underground, but forest trees store it mostly in woody biomass and leaves. When wildfires happen, burning trees release the stored carbon back to the atmosphere. But even in burning grasslands, the fixed underground carbon fixed tends to be retained in the roots and soil,

Suraj: But we cannot deny responsibility. In one report of the Intergovernmental Panel on Climate Change, a group of 1,300 independent global scientific experts concluded that it is more than 95 per cent likely that our activities over just the past 50 years have contributed to the greenhouse effect.

Arnab: Just the last 50 years, Ma? You and Papa are younger than that...so it is in less than a generation that the balance has tilted so badly.

Suraj: Just...how quickly the natural balance can shift is the alarming reality.

Nani: It is now time for not just every country, but every human being on Earth to contribute, howsoever slightly, to re-establish the proper balance. Our very existence will depend on whether we can do it. Managing and reducing carbon footprints must be part of a low carbon strategy.

Arnab: But Nani, I understand that the government and the countries have to take ecologically correct decisions but is there something I can do as an individual...a student?

Nani: Why not? Everyone can. For example, your parents can make your home energy efficient by buying energy-efficient appliances. You can all sit in one room and do your work, so you need just one AC. Or

Dadu: You can choose to walk, cycle, car-pool or take public transport to work. Or hold a video-conference or phone call instead of flying somewhere for a meeting. Not taking just one round-trip transatlantic flight each year would cut your CO₂ emission by 1600 kilograms. Not using a car will reduce emissions by 2400 kilograms.

Suraj: Drying clothes on a line under the sun instead of in the drier makes a lot of difference too. Instead of using lights during the day, we can open the windows and let sunlight come in.

Arnab: Nani, what about me? I am just a child...what can I do?

Nani: You can eat local produce which cuts down on transportation costs. You can reuse things. You can unplug electronic devices and switch off fans and light when not in use. You can walk up the stairs instead of using a lift. You can plant a small garden...even on the rooftop terrace! Print sparingly; use both sides of the paper. There are a million small things each one of us can do.

Arnab: So governments and counties will take the big steps and we, the individuals will take many small steps.

Dadu: Yes, countries will explore alternative energy sources such as wind, hydro (water), and solar power. They may consider switching from high-carbon coal with low-carbon gas. They may employ Carbon capture technology to prevent the carbon from burning fossil fuels from being released into the atmosphere. And we, the citizens will take care to minimize our carbon footprint.

All together: Together we can make a difference.

Music