Episode No -37

Radio Serial''Global Warming & Climate Change Episode : The Rise of Sea Level and Inundation of Coastal Area

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Characters:

1. **Arjun** -Environmental activist
2. **Amal** -A degree student
3. **Dr. Indira** -A Marine Scientist
4. **Bindu** -President, Grama Panchayath
5. **Joseph** -A farmer,
6. **Principal**
7. News reader, local residents, students, Teachers.

Scene - 1

Dr. Indira's house. Morning 10.00 a.m. Sunday. Dr. Indira is listening to T.V. news.

News reader: A small island of Kerala State in Kollam district is slowly going under water. The local residents are fleening the place one by one. It is feared that they would be joining the swelling ranks of climate refugees.

Dr. Indira : (Exclamation) Oh, no. That is bad. (Door bell ringing) I am coming, Please wait. (She opens the door) (Arjun and Amal are coming in)

Arjun : Madame, good morning. Oh, you are listening to this news. What a coincidence.

Dr. Indira : Coincidence? What you mean?

Arjun : Actually myself and Amal just returned from this small island.

Dr. Indira : I think the island referred in the news is Munroe Island.

Amal : Yes Madame. The situation in that island very bad, especially after the recent flood.

Dr. Indira : There were some paper reports on this issue. Since I was abroad for the last 3 months, I could not collect details.

Arjun : Madame, the 13.4 Sq.Km. Munroe island is no longer hold any promise. 20 years ago the island seemed like an idylle that is what the local people said.

Dr. Indira : Arjun, in the first place why did you go there? Arjun : Sorry Madame, I should have told you earlier. Amal is doing his M.Sc. in environmental science. We went to the Munroe Island in connection with his project work.

Dr. Indira : Amal, what is your project?

Amal : I am trying to do a small project on the impact of recent flood on the coastal eco systems.

SCENE-2

Arjun : Madame, as you know these very small islands were once known for their coconut palms. The land was filled with layers upon layers of silt. But today this Munroe island has neither sand nor coconut trees.

Amal : A recent article in the newspaper 'The Hindu' by Navamy Sudhish highlighted the mystery behind this 'sinking island' and the plight of its residents.

Arjun : Water has become an unwelcome guest for the residents. It just enters their houses almost every day, which leaves the walls damp and turns their yards into a brown pool of filth.

Amal : They fear that their land is being reclaimed by water, and the entire island will be wiped off the map soon.

Dr Indira: Actually Munroe thuruthu, that is how this island is known, is a string of eight islets at the confluence of the Ashtamudi Lake and the Kallada River.

Arjun : Yes Madame. In the article which Amal mentioned, the author says it cannot be easy waking up every day to the certainty that the place you call home is sinking.

Dr. Indira: This is what people of Maldives. Tuvalu and other low-lying island countries fear. But the problem is, the world community has not yet taken the plight of these people seriously.

Arjun : That is what prompted us to come to you. The Department of Environmental Science of our College is organizing a discussion on 'The rise of Sea level and Inundation of coastal Areas'. We came to invite you as a resource person to lead the discussion.

Dr. Indira: When is it?

Amal : Next Wednesday at 11.00 a.m. in the seminar hall.

Dr. Indira: Let me check whether I am tree. (checking her mobile)

Arjun : Your presence is a must, madame.

Dr. Indira Oh, I am free on that day. I shall come.

Amal : We have invited some local residents from the islets and low lying coastal areas to join the discussion.

Dr. Indira: That means it is not just a technical session. I shall prepare accordingly.

Amal : We shall make arrangements for your travel.

Dr. Indira: That will be fine. I have to go to my institute in the morning. So you can pick me from there.

Amal : O.K. Madame, Arjun Sir, shall we move?

Dr. Indira Sorry, I didn't offer even a cup of tea. Please wait (goes inside).

Arjun : Leave it madame.

Dr. Indira: Take this lime juice.

Amal : Thank you madame. That is for the road.

(Sound of starting of bike)

Scene – 3

Munroe Thuruthu Grama Panchayath office. President Smt. Bindu, 2 ward members and Joseph a local farmer are waiting for somebody.

Bindu: Oh, They are coming. (Arjun and Amal are entering into the office)
Arjun Sir, please come. Amal how are you? How is your study going?

Amal: I am fine madame, Hope you are O.K.

Bindu: Joseph Chettan (Chettan = elder bother) is a very senior farmer of this Panchayath. The other two persons are ward members, Thankamma and Rajan.

Arjun: We are glad to meet you. We have come here to tell you about the proposed discussion on rising seas and sinking islands and coastal habitats.

Amal: I want to make one point very clear. We are not going to discuss the problem of island specifically. It is general discussion. We are planning a general discussion on global warming a sea level rise.

Arjun: What we think is that we should have some basic knowledge of global warming , climate change, sea level rise etc. Then only we can tackle local problem.

Joseph: That is O.K. But we are also interested to know about it. At the same time we are trying to draw attention of academics, policy makers, politicians etc. to the environ mental damage caused by global warming, climate change, Tsunami, misplaced developmental projects, pollution etc.

Bindu: The degradation of such very small islands had been discussed in many forums, including in our Parliament. But no concrete action plan has been launched yet. of course the power that be is aware of our predicament.

Arjun I met one environmentalist who has studied the problem of such small islands. He said that a serious problem on this island is the scarcity of drinking water. Is it?

Bindu: Yes, water, water everywhere, but not a drop to drink. During high tide, the public water supply system stops functioning. So water has to be transported in canoes.

Amal: I understand that before Tsunami there was lidal flooding in the island for only two months in a year. But now it happens eight months in a year. Is it so?

Joseph: Yes. The experts say that this island could be seen as the first casualty of global warming in this state creating a band of environmental refugees.

Amal: Uncle, I am going to do a project on sinking of small islands. Since you are a senior citizen of this island you may be able to help me.

Bindu: Joseph Sir knows everything about this island. He can help you.

Joseph: In the not too distant past this island used to be a hub of coconut farming. But over the years saline intrusion has stripped the soil of its fertility.

Bindu: Now coconut trees on the island are mostly barren stumps.

Joseph: The coir industry too collapsed due to shortage of raw material.

Amal: What are the farmers doing now?

Bindu: The only one option remaining for them is aquaculture. The last few years have been the emergence of several fish farms.

Joseph: But the recent floods have wrecked the island's fragile ecological balance. Of course we farmers who have had to bear the brunt.

Arjun: According to the Deputy Director of Fisheries in the Kerala Government the floods had caused changes in the physico chemical parameters of the water. Now water has become less suitable environment for many species.

Amal: Another problem is the change in the salimity level. This led to the vanishing of plankton, which in turn, will affect fish population.

Joseph: There are so many factors that affect the ecology of Ashtamudi lake in general. Global warming and climate change is just one of them.

Bindu: All scientific studies revealed that the small islands of the lake are gradually sink ing. Something has to be done on a warfooting.

Joseph: We want concrete plan of action, short term as well as long term.

Arjun: We shall help you to bring the problems of small islands to the attention of concer ned authorities. Now I once again invite you to attend the discussion on Global Warming, Climate change, Sea level rise and inundation.

Bindu: Yes, we shall come to your college to attend this discussion.

Amal: Madame, now we are going back. I shall be visiting this place often for my project work.

Arjun: Hope to see you in our college.

(going)

Scene - 4

Seminar Hall of the local Government College. Classical instrumental music flows through the sound system of the Hall. People consisting of teachers, research assistants, students, specially invited individuals representing various organisations are gradually coming.

Announcer : Good afternoon everybody. Those of you who remain outside the hall are requested to come in and occupy their seats. We shall be able to start the programme within 10 minutes. Please take your tea and snacks. (People coming in. Sound of chairs being moved)

Arjun : Amal, please go to the Principal's room. Dr. Indira has just arrived there. Since she was busy all through the morning, she may take few minutes fresh up. I have arra-nged tender coconut milk for our special invitees. Please see that all of them are served with.

Amal : Don't worry Sir. I shall see to it.

Announcer : Hope all of you had your tea and snacks. Our special guests are on the way to this hall. Immediately after they take the stage, we shall be able to start this very important discussion.

(Dr. Indira, Bindu, Joseph etc. arriving the hall. Audience receive them with a clap) Respected diginitaries and friends, Namasthe. We are starting the programme. I kindly request our chief guest Dr. Indira to occupy her seat in the dais. Smt.Bindu, President Onamthuruth Grama Panchayath and Joseph Veteran farmer of the locality are requested to be in the dais. Now I invite Dr. Arjun to welcome the gathering.

Arjun : Good afternoon ladies and gentlemen. We have assembled here for an important discussion on sea level rise, global warming, climate change and related problems. Dr. Indira an authority on marine science is here to initiate the discussion. I am very happy to welcome her to our midst (clap). Smt. Bindu, President of our Grama Panchayath has come here to participate in this programme. Madame, we are happy to welcome you (clap). Mr. Joseph, is a father like figure among the local farmers. We have to learn a lot from his practical experience. I am happy to welcome to him. Last not the least, may I offer my warm welcome to each of you to this programme (clap).

Announcer : Now I humbly request Dr. Indira to start the discussion.

Dr. Indira : Before I go into the details of Global Warming, climate change, sea level rise and inundation, I invite few questions from the audience on the basis of their knowledge about this subject. Anyone can come forward.

One listener : I am a farm worker. My question is, is it true that sea levels are rising?

Dr. Indira : Very good question to start with. Satellite data reveals that since 1993, sea level has been rising at the rate of 3 mm per year. This rate of rising is significantly higher than the average during the previous half century. Studies show about a 7 cm. accelerating rise in sea level from 1993 to 2017.

‘’ **One student:** How are climate change and rise in sea level related? Dr. Indira : The sea level rise is linked to three factors. Amal, can you tell me one factor? Amal : Yes Sir, Thermal expansion. Dr. Indira : You are right, Amal. When water becomes hot it expands. You all know it. Almost half of the past century’s rise in sea level is attributable to warmer oceans occu-pying more space. Who can tell me, the second factor? One student : Melting of glaciers and polar ice caps. Dr. Indira : She is correct. I want Dr. Arjun to explain this factor. Arjun : Yes Madame, Persistently higher temperatures have caused higher than average melting of glaciers and ice caps in the polar regions. Dr. Indira : Moreover, snow fall has diminished due to delayed winter and early spring sea-son. This has resulted in a significant imbalance, causing level to rise. Now there is one more factor? Arjun : Ice loss from Green land and West Antarctica. Is it not madam? Dr. Indira : Yes, Increased heat is also causing ice sheets, covering green land and West Antarctica to melt. Also higher sea temperatures are resulting in massive ice shelves that extend out from Antarctica to melt from below. This also adds to the rise in sea level.

Amal: Madame, I have a doubt.

Dr. Indira You are welcome to raise your question.

Amal: Is it possible to project future sea level?

Dr. Indira Projecting future sea level has always been challenging; due to our imperfect understanding of many aspects of the climate system. As climate research leads to improved computer models, projections have consistently increased.

Arjun: Can you give an example?

Dr. Indira : Yes. In 2007 the high end of Intergovernmental Panel on climate changes ie IPCC projections through 2099 was less than 0.61 m. But in their 2014 report the high end was considered to be about 0.91 m. A number of later studies have concluded that 2.0 to 2.7 meters rise in this century is physically plausible.

Bindu: Madame, As far as common man is concerned, they don't know the importance of such predictions. In the first place they don't reach them. Such scientific information remains within the scientific institutions and they don't tickle down to us.

Joseph: We are not properly informed about the precautions which have to be taken in the event of a calamity.

Ama:l Yes, there is a communication gap between scientists, policy makers, bureaucrats and common people.

Dr. Indira I accept your criticism. Yes, to a certain extent, still research scientists are considered as ivory tower dwellers. But we are trying our best to decimate scientific information to stake holders.

One teacher : How much each of the 3 factors which you mentioned contribute to sea level rise?

Dr. Indira : The contribution to sea level rise since 1993, based on 2018 figures, divide into ocean thermal expansion - 42%, melting of temperate glaciers - 21% Greenland -15% and Antarctica - 18%.

Bindu : Madame, will the sea level rise be the same at every location of the Earth? Dr. Indira : Arjun, what you say? Arjun : Sea level rise will not be the same at every location on earth, with some location seven getting a drop in sea levels. One student : Why? Arjun : Local factors include tectonic effects. Subsidence on the land, tides, currents and storms influence sea level rise. Amal : Who are the major victims of sea level rise? Dr. Indira : Sea level rises can considerably influence human populations in coastal and island regions and natural environments like marine ecosystems. Arjun : Wide spread coastal flooding would be expected if several degrees of warming is sustained for millennia.

Dr. Indira : Yes, for example sustained global warming of more than 20C relative to the pre-industrial levels could lead to eventual sea level rise of about 1 to 4 meters.

Joseph : How society can respond to sea level rise?

Dr. Indira : Good question. In 3 different ways. Retreat, accommodate and protect.

Amal : Will they go hand in hand?

Dr. Indira : Sometimes. But other times choices have to be made between different strategies. Ecosystems that adapt have to rising sea levels by moving inland might always be able to do so, due to natural or manmade barriers.

Amal : How far the understanding of past sea level rise is important for the analysis of current and future changes.

Dr. Indira : History is very important to study any current issue. Same is the case here. In the recent geological past changes in land ice and thermal expansion from increased temperatures are the dominant reasons of sea level rise.

Arjun : I understand that, the last time the Earth was 20C warmer than the pre-industrial temperatures, sea levels were at least 5 meters higher than present.

Dr. Indira : This was during the last interglacial, when the Earth warming was caused by the slow changes in the orbital forcing.

One student : Madame, what is orbital forcing?

Arjun: I shall explain. Orbital forcing is the effect on climate of slow changes in the tilt of the Earth's axis and shape of the orbit.

Dr. Indira : These orbital changes change the total amount of sun light reaching the Earth by upto 25% at mid-latitudes.

Arjun: The warming was sustained over a period of thousands of years and the magnitude of the rise in sea level implied large contributions from the Antarctic and Green land ice sheets.

Joseph: Even though I am not able to follow your scientific discussions, one thing is clear to me. This Earth is just one entity. Changes, even if they are small happening far away Antarctica and Green land have their effects on our locality.

Dr. Indira : Joseph, you are absolutely correct. We have only one Earth to live. Since the last glacial maximum about 20,000 years ago, the sea level has risen by more 125 mtrs. With rates varying from less than 0 mm per year to 40 mm per year as a result of melting ice sheets over Canada and Eurasia. Rapid disintegration of ice sheets led to so called 'melt waterpulses' periods during which sea level rose rapidly.

Arjun: The rate of rise started to slow down 8. 2 thousand years before present. The sea level was almost constant in the last 2500 years before the recent trend starting approximately in 1850.

Bindu: How do they measure sea level?

Arjun : Since the 1992 launch of TOPEX/Poseidon, altimetric satellites have been record-ing the changes in the sea level. Another important source of sea-level observations comes from the global net work of tide gauges.

Joseph : We are eager to know about the impacts of present and future climate change on coastal systems.

Amal : Yes. This is the area I am also concerned.

Dr. Indira : Impacts include increased coastal erosion, higher storms surge floodings inhibition of primary production processess, more extensive coastal inundation, changes in surface water quality and ground water characteristics.

Arjun : There would be increased loss of property and coastal habitats, increased flood risk and potential loss of non-monetary culture resources and values.

Dr. Indira : We can expect impacts on agriculture and aquaculture through decline in soil and water quality. Also there will be loss of tourism, recreation, and transportation func-tions.

Bindu : From your talk, what we gather is that many of these impacts are detrimental especially for the poor people who depend on agriculture and aquaculture systems.

Arjun : Well said. River deltas and small island states are particularly vulnerable to sea level rise.

Dr. Indira : Globally tens of millions people will be displaced in the latter decades of this century if green house galves are not reduced drastically. Many coastal areas have large population growth, which results in more people at risk from sea level rise.

Joseph : From my experience I can say that rising seas pose direct and indirect risk. Unpro-tected homes can be flooded; that is the direct risk indirect threats of higher storm surges, tsunamis and king tides.

Dr. **Indira** : You are a people's representative. I can very well understand your feelings 10 percent of the world's population live in coastal areas that are less than 10 metres about sea level. Further more two thirds of the world's cities with over 5 million people are located in these low lying coastal areas.

Joseph : That means future sea level rise could lead to potentially catastrophic difficulties for shore-based communities in the next centuries. Is it not?

Arjun : You are right. Atolls and low lying coastal areas on islands are particularly vulner-able to sea level rise. Maldives, Tuvalu, and other low lying countries among the areas are among the areas that are at the highest level of risk.

Amal : I read that at the current rates, sea level would be high enough to make Maldives uninhabitable by 2100.

Dr. Indira : Geomorphological events such as storms tend have larger impacts on reef island than sea level rise; example Marshal islands.

Principal : I was just listening to your discussion. I foresee one more danger. In the case all islands of an island nation become uninhabitable or completely submerged by the sea, the states themselves would also become dissolved. Once this happens, all rights on the surrounding area of the sea are removed. Any resources such as oil, minerals and metals within this area can be freely dug up by anyone and sold without needing to pay royalty to the island state, dissolved.

Dr. Indira : Yes, it is a very important point coastal eco-systems are facing drastic changes, as a consequence of rising sea level.

Joseph : All these expected calamities are mainly due to global warming and climate change. Experts say we should reduce our carbon foot print. But the places are inhabited by the poorest of the poor people. Their carbon emissions are not even enough to sus-tain their lives. Still they are the primary victims of global warming and climate change. This is criminal injustice.

Principal : Yes, they are punished not for their fault.

Bindu : So, the polluters should take all the responsibility for rehabitation. They should provide technologies and capital for adaptation.

Announcer : I am very sorry. A very serious discussion on a very critical subject is going on here. But it is time for us to wide up. But it is not the end, it is just a beginning. I invite Dr. Indira to have her concluding remarks.

Dr. Indira : I think we have a useful discussion. In fact I learned a lot from it. Now we know that, climate induced changes and other less-understood anthropoginic changes will be super imposed on other impacts resulting from human activities such as over fishing, pollution, damming of rivers and habitat loss in coastal areas, island nations, islets etc. We have to find solutions to this problem. For that more studies are requi-red. As was said by some our friends the poor people should not be the victims for none of their faults. This is a typical case involving global thinking and local action.

Joseph : Please excuse me for interrupting you, madame. I am an ordinary farmer. But I have lot of experience. When we think of any action planned to mitigate our sufferings, it should be discussed with people of the locality. They should be taken into confi-dence. Massive awareness campaign should be planned before implementation of any project. What we want is people's active involvement in any development project. Am I correct? (Clap)

Principal : These are golden words. The power that be should hear it.

Dr. Indira : Joseph, your suggestions are well taken. Now Amal is going to do a project on the problems of your small island. He should discuss it with you people and you should co-operate with them.

Bindu : We are ready to co-operate. It is the question of our existence.

Announcer : Thanks - Now I invite Amal to give vote of thanks.

Amal : I express our sincere thanks to all you have assembled here to participate in this discussion.

Announcer : Let us disperse.

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