Episode No.: 42
Radio Serial : Global Warming

Vanishing Glaciers

Time: 27 minutes. **Script: Srinivas Oli**

Characters

Ashok: (Teacher, 55 years)

Mira: (Ashok's wife. 50 years)

Visakha: (Ashok and Mira's Daughter. Student 20 years)

Saurav: (Visakha's brother. Student 10 years)

Dr. Sharif: (Retired Professor. 65 years. Deep, baritone voice)

Signature Tune (Fade out)

Anchor: (Welcome + Recap + Intro). Namaste listeners. Welcome once again to the radio serial on Climate change and global warming. In today's episode we will focus on Melting Glaciers...yes those glaciers that had once paved the foundations of civilizations; glaciers that are the source of many rivers. Why are melting glaciers a cause for concern? To find out let us pay Visakha and Saurav a visit.

Signature Tune

Scene One.

Visakha and Saurav are watching TV in their room and changing the channels frequently.

Saurav (to himself): Yes, this movie appears to be slightly different...it seems alright.

Visakha (voice coming from afar): That's all you do Saurav, watch movies all the time. Why don't you watch the Knowledge channels once in a while? (teasing voice). And now, Papaji will be here shortly and you will pretend to change channels.

Saurav: Oho...Didi, this isn't just any film. This is a fantastic science fiction movie.

Visakha: And how did the Sun rise in the west today?

Saurav: Why don't you come and watch it too...I am sure you will enjoy it.

Visakha (footsteps and voice both come closer): Oh...is that so...let me also see what is so special about it...raise the volume a bit, Saurav.

Saurav: Yeah...sure.

TV...volume increases slowly.

Voice over, with background music

Year 2110....Music...a mysterious bacterial species stunned scientists worldwide...it is believed this bacteria remained buried in the icy Antarctic regions for crores of years. ...as cysts. Music. Now, the melting ice has transported it to the sea and via the seas to human habitations. Stopping this bacteria seems to be an impossible proposition. So will our planet perish.....**suddenly the TV stops broadcasting.**

Saurav: Did the electricity have to fail right now!!! And what if what we hear really comes true?

Visakha : Don't worry Saurav...this was not a news report. It is science fiction...which means it is fiction as well as science...did you get it?

Someone KNOCKS on the door.

Visakha: Looks like Papa and Mummy have come back (Sounds of her foots steps and voice going away from the listeners). Let me open the door.

Saurav: Oh dear. I haven't even packed my bag...will definitely get scolded...let me quickly pack my bag. (Sounds of a zip being opened and packages being placed in a bag)

Mira: (Voice approaches) I hope you have packed your bags. The taxi will be reaching here shortly...so just check your bags again. Be sure to pack warm clothes...the weather in the mountainous regions can be treacherous.

Visakha: Papaji don't forget to take some old photographs...after all it has been 25-30 years since your last visit...who knows what that glacier looks like now.

Ashok: Yes Visakha, it is a timely reminder indeed...I think everything has changed now...the rivers, the hills and the jungles there...everything must have changed.

Saurav: (Excited tones). Papa I cannot believe it yet ...that we are going to see the glacier from close up.

Visakha: Saurav, You should pack your bag first...we can always chat later.

Saurav: It's all done, Didi. I have packed everything...all that is left to do is to leave.

Mira: I hope you two don't squabble when you reach there. (Laughs a little) I will expect a complete report when you return. Remember you have to walk from Gangotri onwards. The trek to Gaumukh is long. Take care.

Saurav: Don't worry at all, Mummy.

Visakha: Yes...we will not trouble Papaji at all and we will look after ourselves. Don't worry.

Car horn

Mira: Ah...the taxi has arrived. Come on...quickly...get the luggage.

Car horn

Ashok: Coming...we are coming.

Footsteps. Sounds of luggage being loaded. Boot being closed. Car starts. Some traffic sounds. Noise on the roads.

Ashok: Don't fret about us. I am familiar with the entire area there so there won't be any problem.

Mira: Take care.

Visakha and Saurav: Bye Mummy.

Mira: Bye children. Take care

Car drives off...sound fades

Scene transition music

Scene II

Trek route from Gangotri to Gaumukh. Sound of a swiftly flowing river and sounds of the wind blowing.

Ashok, Visakha and Saurav are trekking. Footsteps and distant and indistinct sounds of other people trekking on the same route.

Ashok: (huffing and breathing hard from the exertion: Finally, I have succeeded in reaching Gaumukh once again. (Relaxing a little) Seeing the source of the Bhagirathi is a feeling unique in itself.

Sounds of the rushing river.

Saurav (he begins speaking in tired tones but voice normalizes as he continues): You are so right, Papaji. To tell you the truth I was regretting this plan as we were trekking here but now I have no hesitation is saying that not only is our travel plan good...it is actually excellent.

Visakha: (she begins speaking in tired tones but voice normalizes as she continues): All's well that ends well. But Papaji you said that the last time you were here you did not have to walk so far; Gaumukh wasn't quite so far. So has the glacier melted and retreated?

Ashok: Yes, Visakha. The last time I was here, the glacier was about 14 km from Gangotri. Now it is about 18 km.

Saurav: So in just a few years the glacier has retreated four km?

Ashok: Yes Saurav. The source of the Bhagirathi that you see before you is called Gaumukh...it is the snout that you are seeing and the source of the Bhagirathi...like many other glaciers of the world the Gangotri glacier is melting very fast. (sounds of a paper envelope being opened) Here, take a look...these are my old photographs...see how different the glacier looks today.

Visakha: (exclaims) Oh! There is so much snow and ice in these photos (somewhat sadly). It is all changed now. The mountains are shining like silver in these photos...but I can see only bare, black rocks now. So much has changed in just a few years.

Ashok: Yes indeed...such enormous changes in just 20-25 years. The last time I came to Gaumukh we had to cross so many small and large glaciers...the Gangotri glacier that you see before you is a conglomeration of 18 tributary glaciers of varying sizes. Of course, you are witnessing today's dismal situation....glaciers are melting rapidly and becoming smaller and smaller; some have disappeared totally.

Saurav: Papaji, how does it matter if the glaciers melts completely and disappears totally?

Visakah (angry tones): What are you saying, Saurav! Isn't the Bhagirathi visible to you? If glaciers disappear, will rivers last? And what about the dams and irrigation channels on these Himalayan rivers? Electricity. Agriculture. Think about these. Ganga, Jamuna, Sutlej, Indus...these rivers originate from glaciers.

Saurav: Yes Didi...but what I meant was...

Ashok: Let me explain...you know that global warming is a world-wide cause for concern. The Earth's temperature is rising and with that it is expected that there will be consequences impacting the climates across the entire planet...this includes impact on glaciers too. A huge cross section of the populations of India, Pakistan, Bangladesh and China depends on the water that originates from the Himalayan glaciers.

Saurav: Yes!! Makes sense.

Ashok: It isn't as if only the glaciers in the Himalayan region are melting; the rate of glacier melting has increased globally. A report by NASA says that between 2002 and 2016, in Antarctica 125 gigatons of ice melted annually. This made global sea levels rise by 0.35 millimeters per year.

Visakha: I remember reading that if glaciers continue to melt at this arte, globally then within the next 100 years the sea level will rise by 3-4 feet and many coastal cities and villages will be submerged.

Ashok: Scientists estimate that if all the ice covering Antarctica, Greenland, and global glaciers melt, the sea level would rise about 230 feet. That would be catastrophic!

Visakha: This is a scary situation that is unfolding.

Ashok: Yes indeed Visakha. Scientists say that in the next 100 years, more than 30 percent of the world's glaciers will melt away and vanish. The primary culprit behind this is accelerated carbon emission. And we are already paying the price of melting glaciers...you two remember the disaster that struck Kedarnath in June 2013, don't you?

Saurav: Yes...yes...I remember...there was huge loss of life and property.

Visakha: (slightly frightened voice): Look Papaji... a thick blanket of cloud is rapidly approaching from behind those snow peaks....we should think about returning now.

Ashok: You are right, Visakha. The weather changes abruptly in Himalayan regions, especially in the afternoon. Let us begin our return journey. We will stay the night at Bhojbasa and return to Uttar Kashi tomorrow. Prof. Sharif is waiting for us there.

Saurav: Yes Papa, let us return...but do not walk very fast...I am feeling a little tired already.

Sounds of three pairs of footsteps. Sounds of the river...sometimes loud...sometimes faint.

Visakha: Papaji, you mentioned the disaster at Kedarnath...but what connection does it have with melting glaciers? I thought it was because of a cloud burst.

Ashok: There is a connection with melting glaciers too. You see, the Kedarnath region lies in the lower reaches of a glacier called Chorabari. This glacier is the source of the River Mandakini.

Visakha: I am sorry but I fail to understand what you are saying.

Ashok: Let me explain. As glaciers melt and retreat, they leave depressions on the land from which they have retreated. Melt water from the glacier fills up the depressions, turning it into a glacial lake.

Visakha: I see.

Ashok: That is what happened in 2013. A huge lake formed in the lower reaches of the Chorabari glacier. Under natural conditions water would have kept seeping in gradually into this lake but that day there was heavy rain. The water breached the banks of the lake and broke though. This led to the devastation in Kedarnath. However, the formation of glacial lakes is nothing new.

Saurav: So such occurrences linked to melting glaciers must be a common phenomenon, then.

Ashok: Incidences such as this one are on the rise in Himachal Pradesh, Jammu and Kashmir and Uttarakhand. The number of such lakes in Chenab basin has risen from 116 in 2013 to 192 in 2015...and all this can be linked to melting glaciers.

Visakha: And this, is all due to global warming, isn't it Papaji?

Ashok: Absolutely! The primary reason behind swiftly melting glaciers is global warming and climate change. Of course, not all glaciers are melting at the same rate; different glaciers in different regions are melting at different rates.

Saurav: But it snows here in winter...so shouldn't the glaciers grow in volume too?

Ashok: Good point Saurav. You see glaciers melt at a steady rate and their size also increases depending on snowfall. But it is the size difference between the snowfall and the melting that tells us if the glacier is shrinking or not...now glaciers are melting faster than the snow replacing it, causing them to shrink in size. The mass it receives in snowfall and the mass it loses in melting is an indicator of Glacier Mass Balance.

Visakha: I recall our teacher telling us that glaciers moderate global temperatures.

Saurav: How do they do that?

Ashok: Let me explain. When the sun light hits the white icy glaciers, about 80 per cent of it is reflected back. With the shrinking of glaciers and their retreat, the same amount of sunlight now hits bare ground. Dry ground reflects only about 20 per cent of the sun light. This is a cause of increase in temperature.

Saurav: So there are multiple risk factors from melting glaciers. The first is the danger of floods and then, when the glaciers shrink and disappear, river water will not be replenished. So rivers will dry up.

Visakha: The danger is enormous indeed. Can you imagine that the fallout of deglaciation of the Gangotri glacier has impacted an area as far away as the Sunderbans? This danger is compounded by the rise in sea level which is threatening the Sunderban area...the world's largest deltaic region.

Ashok: A little while back you mentioned ten Indus area, Visakha. Well, the Indus River is largely fed by the Nun Kun glacier of Jammu and Kashmir. The fact is that in the last 50 years this glacier has shrunk by 15 percent. Can you imagine what will happen if this rate of retreat goes on? Studies by scientists have shown that over 200 glaciers have disappeared in the last 50 years in the Himalayan region.

Saurav: This is really a very dangerous situation. So why isn't something being done to stop glaciers from melting?

Ashok: It isn't as if nothing is being done. Many organizations across the world are closely monitoring glacier melting. Steps are also being taken to slow down the rate of melting and shrinkage of glaciers.

Saurav: (slightly taunting tone): It doesn't seem apparent to me anyhow that any work is being done in this direction.

Ashok: Tomorrow you will meet Professor Sharif. I am sure he will have answers to all your questions.

Saurav: I will definitely ask him the questions rising in my mind but only if Didi gives me the chance to voice them...

Visakha: (with laughter in her voice) Don't worry on that count. I promise to ask my question only after you finish asking ALL of yours. Happy?

Saurav: Yeah...that is OK. And we have all of tonight. We won't reach Sharif Sir's home before noon tomorrow. Anyway, Papa how far is Bhojbasa from here?

Ashok: Not very far now...I think it is that valley up ahead.

Saurav (mumbling to himself): Uff...keep walking...keep walking ...nothing else to do and no way out either...so let's keep walking.

Roar of the river. Sounds of footsteps. Fades away.

Scene transition music

SCENE-III

Fairly deserted street. Infrequent sounds of a car or a bike's horn. Muted conversation sounds.

Ashok: I think Dr. Sharif's house is here somewhere.

Visakha: You have been here earlier, haven't you Papaji?

Ashok: Yes, but that was many years ago. In the interim between then and now even a small settlement has grown to become a town.

Mobile rings

Saurav: Must be Mummy ringing from home.

Phone keeps ringing.

Saurav: Papa, please answer the phone.

Ashok: Hello.

Mira's voice comes over the phone

Mira: How are you all? Where have you reached? I was unable to reach you on the mobile and was so worried.

Ashok: Why did you worry? We reached Uttarkashi by noon today. We are on our way to Prof. Sharif's home.

Mira: Prof. Sharif?? He was the HOD of the Geology Department in your college, wasn't he? He's retired now I recall.

Ashok: Yes, yes...you have recognized him. I thought this would be a nice opportunity to meet him again and the kids could also gain some knowledge during the interaction.

Mira: That's great! Take care of the kids. Actually yesterday I heard on the news that there is forecast for heavy rains in your area... I had been trying to contact you since then.

Ashok: There is nothing to worry about. Suddenly the phone disconnects.
Beep. Beep sounds

Ashok: There! No connection and your Mom just searches for an excuse to worry.

Visakha (light heartedly): And you better search for Sharif Sir's home, Papa.

Ashok: Yes...I remember now...it was here...it is that house there.
Footsteps. Traffic sounds fade.

Visakha: Let's ask someone.

Ashok: No, no there is no need. I recall perfectly now. THIS is definitely his home. A lot has changed here and I have come after a long gap.

Footsteps. Doorbell rings.

Dr. Sharif (sound comes from inside the house): Come on in...I am here.

Door opens. Footsteps.

Sharif: Arre, Come in Ashok ji...Come in. There was no phone call from you...

Ashok: Namaste Sir. We reached today and were having trouble with the mobile connection...so could not contact you but came straight to meet you in your home. (Laughter) And I brought my kids along...Saurav and Visakha.

Saurav and Visakha: Namaste Sir.

Sharif: Welcome to both of you. So how has your trip been so far?

Saurav and Visakha: It has been nice, thank you, Sir.

Sharif (sounds of chairs being dragged): Come, take a seat all of you. Sit...sit. I had been away to a DRDO workshop in Delhi. I returned just yesterday...in the evening.

Ashok: Well it is a good thing you returned yesterday. The kids wanted to meet you.

Visakha: Sir, Saurav has an entire list of questions that he wants to ask you.

Saurav: (laughingly) Indeed I have many questions that I want to ask...but only if Didi gives me the opportunity to do so.

All laugh.

Sharif: So...how did you like the Gangotri glacier. Saurav, I hope you did not get too tired.

Saurav: No Sir, I am fully rested now. Besides, just seeing such a lovely glacier is enough to dissipate any tiredness.

Sharif: Good job kids...you know don't you that the glaciers are slowly disappearing?

Saurav: Yes. Papa told us that you have done a lot of research on the glaciers in Ladakh and the Himalayas. The situation there must have changed a lot too.

Sharif: It is not just the Himalayan glaciers that are melting. This is true for all the glaciers in the world. The reason is climate change and rapid global warming.

Saurav: The glacier we saw was pretty big but there must be glaciers bigger than this one in the world.

Sharif: (Laughs slightly) Yes of course there are. But this is not an issue about small or large glaciers. The point is the rate at which these are melting away or vanishing. Outside of the Polar Regions, the Fedchenko Glacier is considered to be the longest glacier in the world. It is 77 km long. The next is the Siachen glacier in the Himalayas.

Saurav: Yes we hear about the Siachen glacier from time to time.

Ashok: Scientists are monitoring these glaciers and closely scrutinising their rate of melting. There are around 10,000 glaciers in the Indian Himalayan regions and these are the source of water in the Himalayan rivers.

Saurav: It must be pretty difficult to keep an eye on so many glaciers.

Sharif: Quite right. It may be difficult but it is also necessary. Some glaciers are continuously monitored. The Ministry of Earth Sciences in our country has taken steps to closely and continuously monitor six glaciers in the Chandra Basin of Himachal Pradesh. A close watch is kept on the mass and hydrological balance of these glaciers and data is collected regularly. Have you two heard about the HIMANSH Research Centre?

Visakha: No Sir...we have not. What is this Centre?

Sharif: HIMANSH, is India's Remote, High-Altitude Station set up at an altitude over 4000m to study the effect of climate change on glacier melting. It is in the Spiti area of Himachal Pradesh.

Ashok: And with this we must include the launch of the National Mission for Sustaining the Himalayan ecosystem.

Sharif: Indeed, this national mission is instrumental in effecting steps to safeguard the Himalayan environment. Tremendous emphasis has been placed on involving the local communities to ensure management such that effective environmental conservation strategies can be put in place and implemented. Training is imparted on the sustainable practices involving water and forest resources.

Ashok: Absolutely Sir. It is when the local communities engage effectively that such steps yield fruit. It is essential that the public...the local populace come forward to take active part and play an active role.

Sharif: The role that HIMANSH is playing in collecting data on glaciers is considered to be crucial. It was set up by the National Centre for Antarctic and Ocean Research. There are some other governmental agencies involved in the study of glaciers too. I can mention the Geological Survey of India, Snow and Avalanche Study Establishment, National Institute of Hydrology and Space Application Centre.

Saurav: But it can't be easy to acquire data on glaciers.

Sharif: I agree. That is why these agencies cooperate with each other and they also use many novel techniques.

Visakha: What sort of techniques are used, Sir?

Sharif: Satellite imagery is used to collect data on glacier melting. It is important to authenticate and correlate the results revealed in these images. Field research thus becomes necessary.

Saurav: What sort of work is done during field research on glaciers?

Sharif: Well, the volume of a glacier...i.e., its mass is measured. Think of it as the glacier's thickness. Glacier mass balance is normally measured by using a stake.

Saurav: Stake?!

Sharif: Think of it as a flexible, stick-like device inserted into the glacier's body. This is an easy way to measure the mass of a glacier. Stakes can be used to keep an eye on the temperature in the interior of the glacier.

Saurav: (surprised): Do you mean the glaciers get warm?

Visakha (slight laughter in voice): No Saurav. Measuring the temperature means we check how cold it is. Right, Sir?

Sharif: Yes indeed. You are quite right. And that is why thermistors are inserted deep into the glaciers by drilling into the glaciers. This helps to determine the glacier's temperature profile. These provide data on the melting rate, movement rate and size of the glacier.

Saurav: Oh! All this sounds very difficult. More so than I had thought. I had thought satellite imagery would be enough.

Ashok: The glaciers are crucial and monitoring these is not an easy task. Glaciers are not just chunks of ice you know.

Sharif: You know, glaciers are like a unique laboratory; a natural laboratory that can give us clues to many interesting results.

Saurav (exclaims): Natural lab?

Sharif: Yes, a natural lab that makes us aware about the reality behind global warming. As temperatures show an upswing, glaciers shrink and retreat. E should not view these glaciers merely as part of scenic landscapes. We should realize that these glaciers impact the planet. They impact everyone; humans and non humans alike.

Saurav (fear in his voice): Didi, I am afraid that news about bacteria may come to pass.

Visakha: Forget fiction, Saurav. Just think...if we cannot stop glaciers from melting, we may soon lose our beautiful coastal cities because of a rise in sea level. Mumbai, Chennai and even, Kolkata may be inundated as a result.

Sharif: Rightly said Visakha. If we do not change our lifestyles to a more sustainable way, then preventing the total melting and complete vanishing of glaciers maynot be possible. In such a case, these Himalayan rivers will perish and so will the populace living on their banks.

Saurav: Papaji, I will not insist on a separate AC in my room.

Visakha: That's a good beginning...at least you have learnt something.

Transition Music

Anchor. So, ladies and gentlemen, the swift melting of glaciers is indeed a cause for grave concern but just worrying will not help. We still have time to save the glaciers by paying attention to the suggestions of researchers. This episode ends here. We will be back with another interesting episode on climate change. Till then, Good Bye. Namste.