















A Centre for Youth (C4Y) and India Water Partnership (IWP) Programme

CAPACITY BUILDING INFORMATION BOOKLET ON CLIMATE CHANGE & WATER SECURITY

Be the change you want to see in this world. - Mahatma Gandhi



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FOREWORD



Dr Veena KhanduriExecutive Secretary - cum Country Coordinator
India Water Partnership (IWP)

Hindon River, a tributary of Yamuna river originates in the Saharanpur District (Uttar Pradesh) from Upper Shivalik in Lower Himalayan Range. The river is entirely rainfed. In the recent past, the river has become heavily polluted due to human error or the other reasons and climate change has also added burden on the river. This is a cause for great concern for both the communities that live in and around the Hindon river basin as well as for the Government.

To revive the Hindon river to flow in its original form with free of pollution, India Water Partnership (IWP) has been involved with various stakeholders from the past three years on Integrated Water Resources Management approach for rejuvenation of the river.

In this process, IWP realized that there is an urgent need to adopt a holistic strategy to bring about change in the attitude and behavior of the people across the basin. Youth are considered to be the most vibrant and dynamic stakeholders who can play a major role in the sustainable water management.

IWP in collaboration with the Centre for Youth (C4Y – an IWP Network Partner)is in the final stages of executing a pilot project on Water and Climate Change Resilient Youth Champions and Communities in Baghpat, Ghaziabad and Saharanpur districts of Hindon River Basin. On successful completion the project will be scaled-up in another district of the Basin.

This Capacity Building Information Booklet prepared by IWP and C4Y is a tool to disseminate critical learnings on water security and climate change among five sets of project stakeholders — teachers, students, youth, women and farmer groups. It has been conceptualized and designed as a succinct handy guide with attractive visual elements in a simple language (both in Hindi & English), interactive activities and games to sustain the interest levels of trainers, participants, and any other resource person who may find this booklet useful. It briefly describes various issues related to water and climate and illustrates how to conduct training modules on these issues in a manner that is easy for both trainers to execute and for stakeholders to understand.

The Information Booklet forms an integral part of the Hindon Rejuvenation Programme as it raises stakeholder awareness and builds their capacities to ensure long term sustainability of the learning imparted by the programme, post-intervention.

IWP intends to take this programme further in the future to other districts of the Hindon basin under the aegis of the Nirmal Hindon Initiative (NHI). It has already taken up pilot projects under NHI on themes related to the revival of the River Hindon such as pilot surveys on Solid Liquid Waste Management (SLWM) in selected Gram Panchayats of Shamli Didstrict, initial investigation into the rejuvenation of ponds and so on. The Capacity Building Information Booklet will complement these ground level engagements. The endevaour is that with effective knowledge sharing on water and climate issues along with coordinated actions with various stakeholders such as the Government, Civil Society, Researchers and Industry, we will one day see a rejuvenated, vibrant, flowing Hindon River which is free of pollution and is restored to its former shape that will provide critical ecosystem services to both human beings and wildlife.

ABOUT THE INITIATIVE



Ms Alka Tomar Chairperson Centre for Youth (C4Y)

The River Hindon or the Harnandi. A River we can trace back to our mythology, the Mahabharat. A River, once the lifeline of those who lived in the seven districts set on its banks but sadly now, a scourge to those very people. The giver of life has become the source of sorrow. Indiscriminate garbage dumping on its banks has sullied its waters. Industries release effluents into its waters, drains empty out their waste. Its floodplains are held hostage to constructions. Who has turned this giver of life into a threat? It is, we, the people, who have destroyed the River Hindon with our unthinking activities.

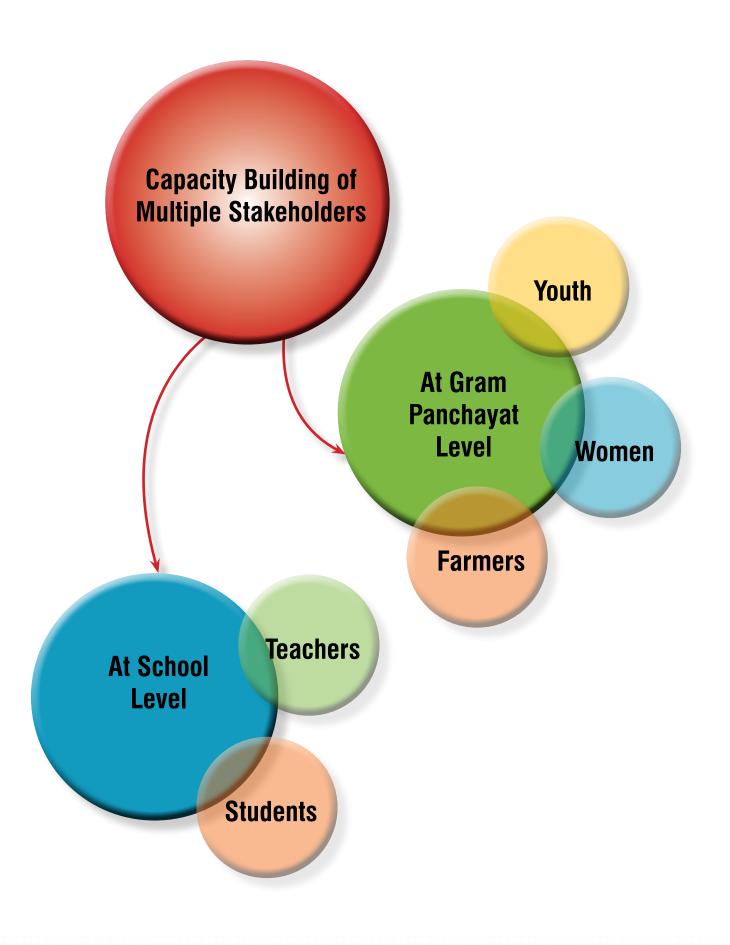
And it is we, the people, who must change our attitudes and behaviours towards it. We must understand that when we pollute the river with our activities we are polluting not just our lives in the present but the lives of future generations by making the water dirty, and scarce.

It is in this context that Centre for Youth (C4Y) has been working in the Hindon basin, since the last three years. It has been supporting civil societies and engaging with educational institutions and gram panchayats in a holistic manner to establish a connect with the River through water literacy communication and revive this traditional lifeline. This programme, Water and Climate Change Resilient Youth Champions and Communities in Hindon River Basin, in collaboration with India Water Partnership (IWP), is thus the natural next step of intervention for C4Y.

The C4Y mandate is to make youth and other stakeholders self-reliant and gainfully employable to enable them to secure a sustainable and self-reliant future for themselves and our nation. This programme, hence, is of high relevance to the C4Y vision. Long term strategies are required to revive the Hindon and galvanise public participation and engagement. The focus must be on raising awareness, generating knowledge and building capacities on Hindon Conservation initiatives. The programme is doing this by engaging stakeholders through a series of interactive capacity building workshops and power sessions for teachers, students, youth, women, and farmers. The workshops impart knowledge based on this visually rich, interactive Information Booklet. The booklet is a handy, go-to manual for the trainers on climate change and water security. It shares knowledge on the two critical concepts in the form of discussions, role plays, games and other activities for maximising the impact.

Along with the stakeholders, the C4Y effort is also to network with and build capacities of civil societies working in the region. Only a concerted effort will have the impact of all stakeholders speaking the same language on reviving Hindon and accelerate a visible and lasting change towards the River. Aligned with this belief, C4Y is supported in this programme by Gramin Paryavaran and Vikas Sanstha (GPVS), Environment and Social Research Organisation (ESRO), and Gram Vikas Samiti Surana. The organisations have been enthusiastic partners in the programme and have harnessed their local networking to make this programme a success.

C4Y is keen to convert this pilot programme into a full scale programme in the Hindon Basin by taking it to a greater number of districts. Towards this, C4Y is keen to join hands with the district authorities of the seven districts in the Basin and to align its programme with the overall Nirmal Hindon Initiative of the state of Uttar Pradesh. An integrated programme bringing together the people, the panchayats, and the local administration is the way ahead to a Nirmal Hindon and healthy, empowered lifestyles for its people.



GENERAL RULES WHEN YOU ARE A FACILITATOR

- Do not judge or criticise any ideas.
- Let ideas flow be imaginative.
- Free wheel build on other people's ideas.
- Go for quantity, not for quality.
- Clarify items. Expand on an idea without evaluating it.
- Record all ideas, no matter how trivial it might seem.
- As soon as all ideas have been listed, assess and evaluate them openly in a facilitated discussion with all brainstorm learners.

FORMAT



Learning Objective:

This section provides the points emphasising why it is important to learn particular topic.



Introduction:

This section contains the background description and resource information of the specific topic. This will help the learner gain subject knowledge on each topic.



Activity for Participants:

This is the interactive part of the information booklet relevant with the topic. The procedure for the activity is given to facilitate the trainers in guiding the participants. After the activity, it is important to give the conclusive notion showing the clear linkage between the activity and the subject.



Knowledge Meter:

This section contains a set of questions, which will be asked to the participants after the completion of each topic. The answers from the participants will reflect if they are getting the information properly or not.



Key Learning:

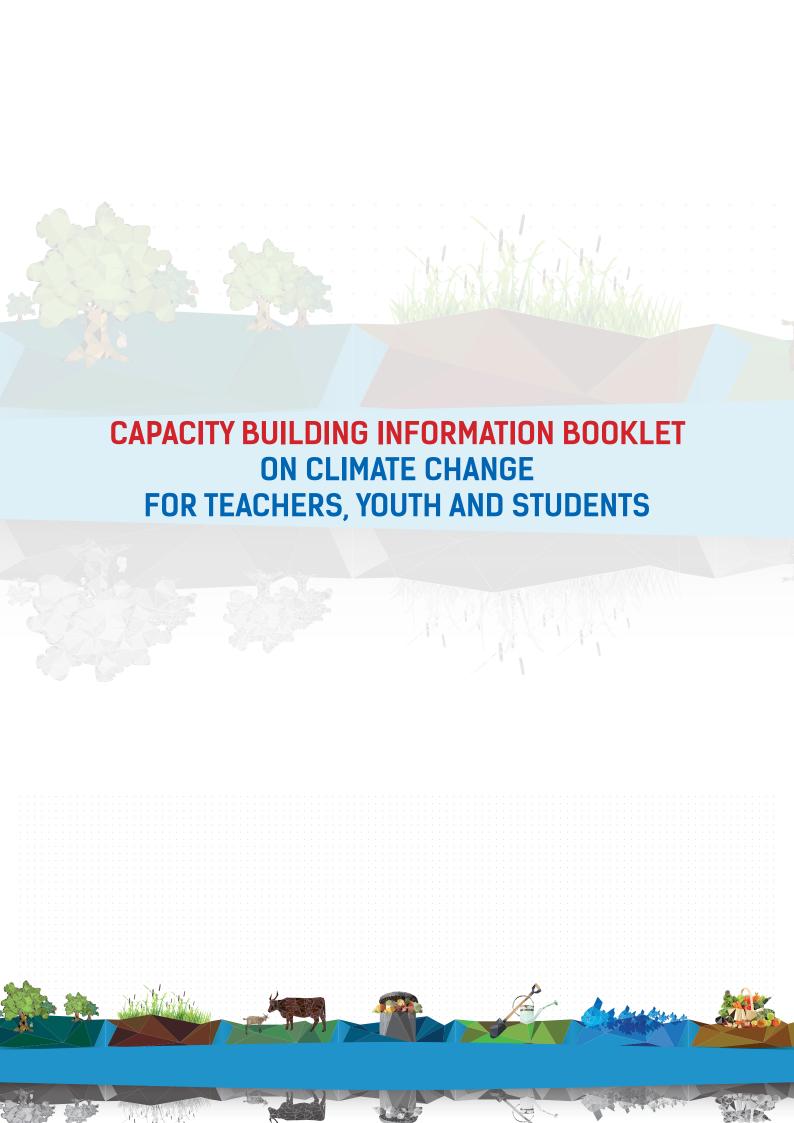
This will contain the main learning of each topic in bullet points. The participants are expected to learn these things.



Mode of Delivery (MoD):

The mode of delivery mentioned against each activity is the interactive manner in which the facilitator will conduct the activity with the participants.

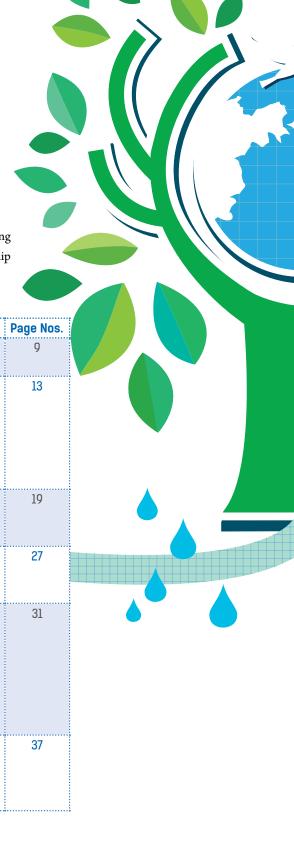




CLIMATE CHANGE SESSIONS

Time Frame: 10 hours of training spread across three days **Methodology:** Brainstorming; Group work; Group Presentation; Role Play; Freshening up games; Video Clips; Storytelling; Discussions and White Board/ Black Board/ Flip Chart/ Chart jottings

Session	Content to be covered	Objectives/ Outcomes	Page Nos.
1	Defining Climate Change	 Raising awareness on climate change 	9
2	Factors which cause climate change – natural and man– made factors	 Showing natural hazards associated with climate change which impact our lives Identifying the human factors responsible for climate change as per local context, too. 	13
3	Effects of climate change on human health, livelihood, lifestyles and biodiversity	 With this change, showing how climate change is a local as well as global phenomenon 	19
4	Adaptation and Mitigation: What we can do about climate change in our areas	Providing concrete doable solutions to adapt to/ mitigate climate change	27
5	Making a Difference: Energy Conservation and Renewable Energy; Natural Resources Conservation with special emphasis on Air and Water; Recycling and Conservation; Waste Management	Showing that actionable solutions are possible.	31
6	River Hindon and Climate Change	 Establishing linkages between human activities related to River Hindon and climate change impacts. 	37





Learning Objective

- Learn to differentiate between climate and weather
- Understand what is climate change

Introduction

MoD:

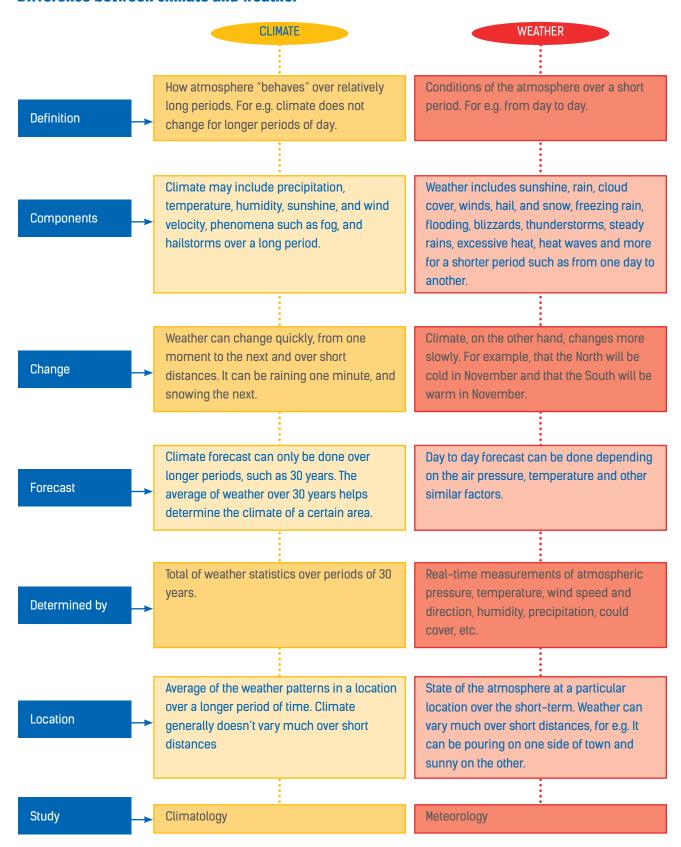
- A round table discussion and brainstorming as per local evidence.
- Ask participants what is weather and climate? See how much they understand.
- Add to the understanding from the information given below.
- Once difference in weather and climate change is clear, ask if they have heard of the term climate change. See how much they know. Add to their understanding with the information given below.
- Ask if they think the climate in their area is changing? Are the rains falling in the same season? Is the quantity of rain in monsoon's lower now? Are summers becoming hotter.

The Earth's climate does not always remain the same. It has and has changed many times as a response to a variety of natural causes. However, before we come to the change in climate, let us understand what is climate? Is it the same as weather?

Why should you know about weather and climate

Understanding and interpreting local weather data and understanding the relationship between weather and climate are important first steps to understanding larger-scale global climate changes. When you study the weather data over a long period, you are able to understand the way the climate of that region is changing.

Difference between climate and weather

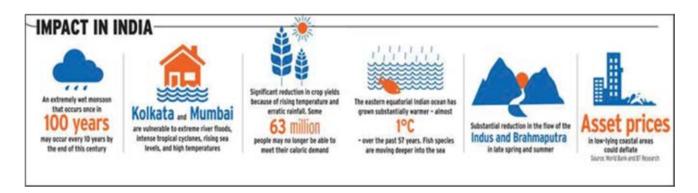


What is Climate Change?

- Climate change is a change in the usual weather found in a place. This could be a change in how much rain a place usually gets in a year. Alternatively, it could be a change in a place's usual temperature for a month or season.
- Climate change is also a change in Earth's climate. This could be a change in Earth's usual temperature. Alternatively, it could be a change in where rain and snow usually fall on Earth.
- Weather can change in just a few hours. Climate takes hundreds or even millions of years to change.

Is Earth's Climate Changing?

- Earth's climate is always changing. There have been times when Earth's climate has been warmer than it is now. There have been times when it has been cooler. These times can last thousands or millions of years.
- People who study Earth see that Earth's climate is getting warmer. Earth's temperature has gone up about one degree Fahrenheit in the last 100 years. This may not seem like much. However, small changes in Earth's temperature can have big effects.
- Some effects are already happening. Warming of Earth's climate has caused some snow and ice to melt. The warming also has caused seas to rise. In addition, it has changed the timing of when certain plants grow.



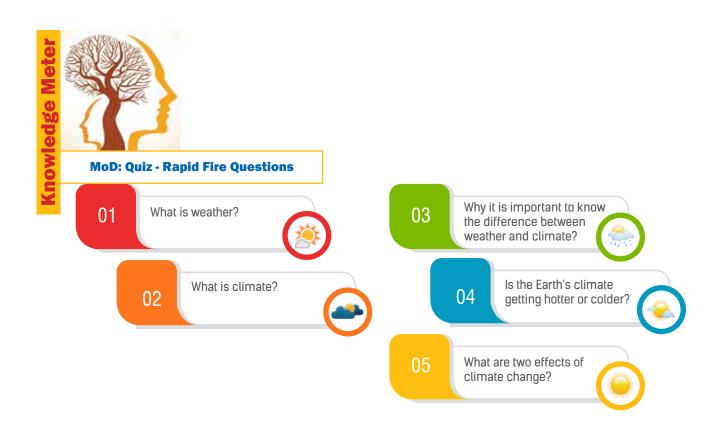


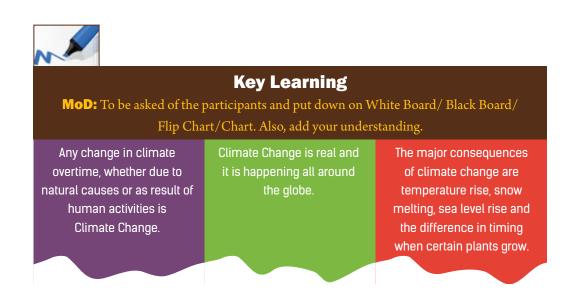
MoD: Story Telling

Activity for Participants

- Divide the participants into group of 5 to 6.
- Ask them if they have heard about the changes in their locality or region, country from their parents or grandparents over a period.
 For e.g. change rainfall pattern, the type of crops that used to be harvested, agricultural calendar (cropping time etc)
- Ask each group to collect information from their home and locality.
 Then ask them to develop a story of their own based on the information they heard or seen regarding changes in the climate.
- Hear stories from them next time.

Notion: Their story will tell the changes observed in local places. Give some examples at regional or global level so that they can know that climate change is happening at global level as well. It will show how big the problem is.









Learning Objective

- Provide concept of greenhouse effect and source of greenhouse gases
- Relate green house effect and global warming
- How humans cause global warming

Introduction

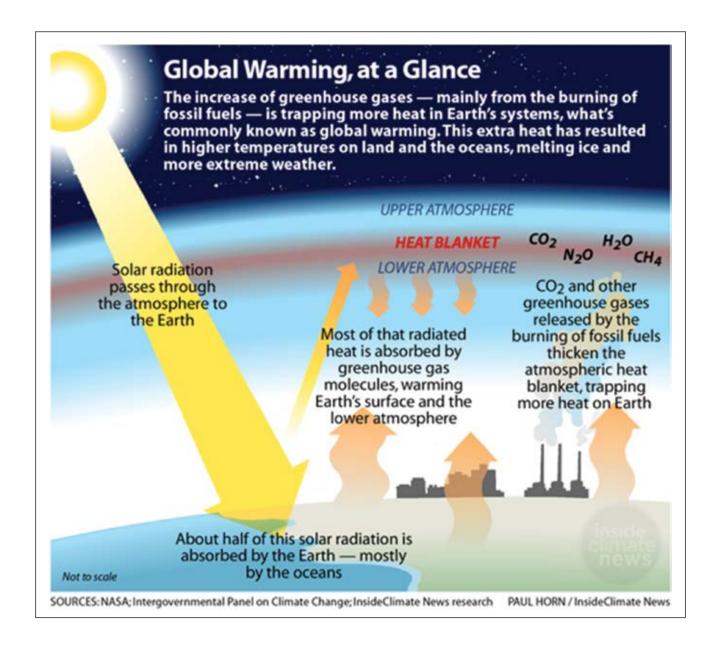
MoD:

- Discussion and brainstorming on the first introduction paragraph.
- Ask what do you think would happen if the Green House Gases (GHGs) did not trap the gases and make Earth warm.
- Explain that apart from natural gases, human activities are releasing more GHGs than is needed into the atmosphere. This is making the atmosphere hotter than required.
- Ask them if they have heard of global warming.
- · Ask if they think, in the light of above knowledge, how global warming is happening.
- Explain global warming.

When the sun's energy reaches earth, most of the energy warms the atmosphere and the Earth's surface. The Earth then radiates some of this energy back into space as infrared rays. Green house gases in the atmosphere trap some of the infrared rays before they escape outside the atmosphere. This leads to the addition of more solar energy and thus heat to the earth's atmosphere.

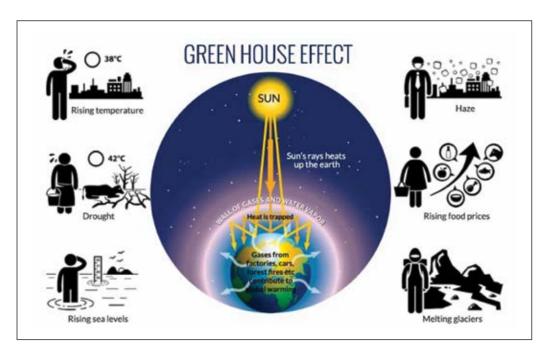
What is global warming?

Global warming is the increase in the average temperature of Earth's near surface air and oceans since the mid - 20th century and its projected continuation. The global warming is primarily by the build-up of human-produced greenhouses gases, mostly carbon dioxide and methane, which trap heat in the lower levels of the atmosphere.



Life is possible on Earth because of Green House Gases (GHGs)

The effect of heat trapping due to increasing green houses gases in the earth's atmosphere is known as green house effect. The earth's "natural greenhouse effect" is what makes this planet suitable for life. Had not there been any Green House Effect, the Earth's temperature would have been $(-180 \, \text{C})$, i.e., below the freezing point. Thus, Earth's natural green house effect makes the life possible.

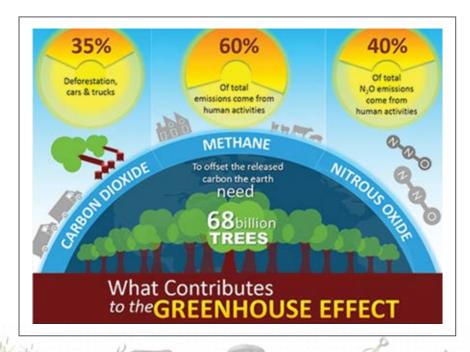


Green House Gases

Carbon dioxide (CO2)	Water Vapour (H2O)
Methane (CH4)	Nitrous Oxide (N2O)
Ozone (03)	Halo Carbons (mostly manmade gases consisting of both carbon
	and at least one of the halogens (fluorine, chlorine, iodine, bro-
	mine). Majority fall into category of Chlorofluorocarbons or CFCs.

Human activities have increased level of GHGs more than is required

However, 60% of total emissions of methane (a potent GHG) come from human activities such as burning of fossil fuels and intensive farming; 35% of carbon dioxide emissions from activities such as clearing of forests and around 40% of nitrous oxide emissions from activities such as agriculture, use of fossil fuels and industrial processes have greatly intensified the natural greenhouse effect, causing global warming. This is the major concern for us.



What are fossil fuels?

Decayed and buried plants and animals, over many years, turn into combustible deposits of organic materials. These deposits get converted to oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years.

MoD: Group work to assess man made causes of global warming – give headings given below and ask how do you think this happens under these headings. Each group member to come out and read answers and facilitator to add to understanding as per description given below:

For Facilitator to fill gaps in understanding of participants



How human activities (anthropogenic activities) cause global warming

Crop burning and Deforestation:

- Forests act as the carbon sink. They absorb carbon. When the forests are cut
 down, the amount of carbon that it has absorbed will be released back into
 the atmosphere contributing to additional green house gases.
- Various types of gases including CO2 are released when fires take place causing smog and air pollution.



Vehicular and Industrial Emission:

The release of harmful gases, especially green house gases through different sources like industries, electricity production, vehicles etc is speeding up green house effect and thus causing global warming.



Mismanagement of Solid Waste:

When the wastes are decomposed in absence of air (oxygen), methane gas is produced. Methane is 21 times more potential in causing Green House Effect than Carbon Dioxide. That means, 1 Methane = 21 Carbon Dioxide



Trash Burning:

When you burn trash, which could include rubber, plastic, garbage, the major gas
emitted is carbon di- oxide, which contributes in a big way to global warming and
thus climate change.



Agriculture:

- According to the Inter-governmental Panel on Climate Change (IPCC) agriculture currently accounts for 10-12% of global greenhouse gas (GHG) emissions contributing to a warming climate and thus climate change.
- GHGs attributed to agriculture by the IPCC include emissions from soils as it degrades due to the use of chemical fertilisers and over extraction of groundwater, GHG emissions from the digestion process of ruminant animals (Livestock such as cattle produce methane as part of their digestion cycle), rice production, crop burning and manure management. Clearing space for agriculture (e.g., deforestation) is also a contributor to carbon emissions and land degradation.



Activity for

Participants

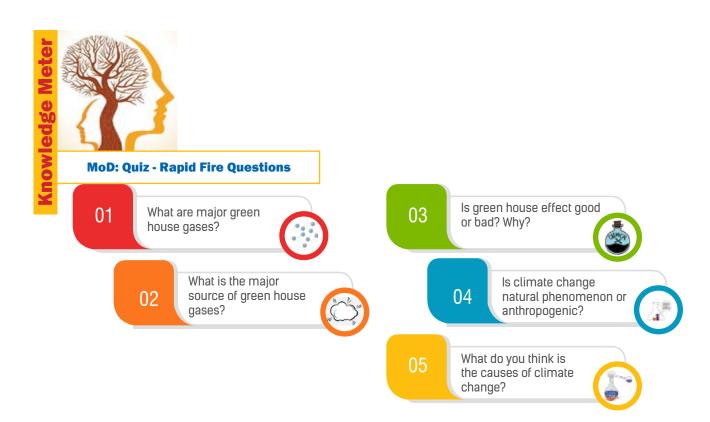
MoD: Role Play

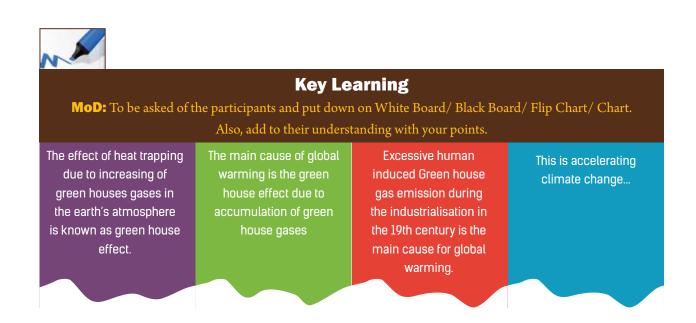
Global Warming

- Before conducting this activity, arrange for 4–5 blankets or thick sheets.
- Ask two participants to volunteer to participate in the activity
- Bring them at the front and let one participant sit on a chair
- Give a blanket/ cloths to the standing participant ask him/ her to cover his/ her friend who is sitting on the chair
- Add on the blanket to the sitting participant one by one up to 4–5 blankets
- Then ask him/ her how he/she is feeling.

Notion: As the blankets are added and added the participants feel warmer and warmer. Similarly, the earth gets warm and warm by the addition of green house gases, which causes the green house effect, and hence global warming occurs. Here, the blanket acted as the Green House Layer and the participant as the earth. Whatever difficulty the participant is feeling, the earth is facing more difficulty.







SESSION 3 EFFECTS OF CLIMATE CHANGE ON HUMAN HEALTH, LIVELIHOOD, LIFESTYLES, AND BIODIVERSITY

Learning Objective

- To study the potential impacts of climate change on different regions of the world.
- To understand impact of climate change specifically in the Intervention Area and on River Hindon and the water bodies in the village.

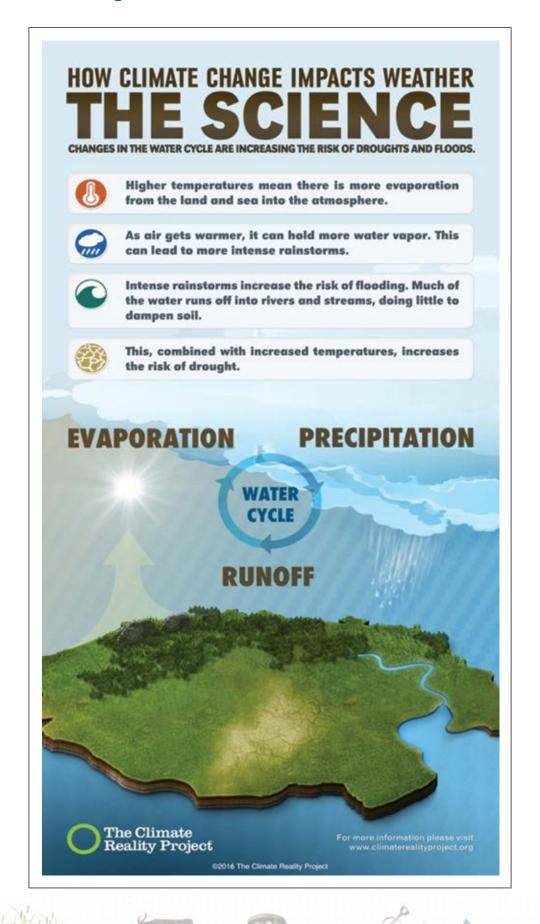
Introduction

MoD:

- Divide into groups. Ask each group to name two impacts according to topics listed here. Once done, ask each group to come up and talk about it. Add to their understanding with additional points.
- On Day 1, give the groups a task for Day 2: Ask them how much water is needed for the following daily activities in their household: Cooking in the kitches, bathing, bathing animals, cleaning the house, and washing clothes. Ask them to write down in a notepad. Then ask them to find out how much do they actually use for the following activities.
- Participants can show the data as given in the table below. They can measure the amount of water in any way: with a bucket or number of mugs or a drum full or the capacity of the tank.

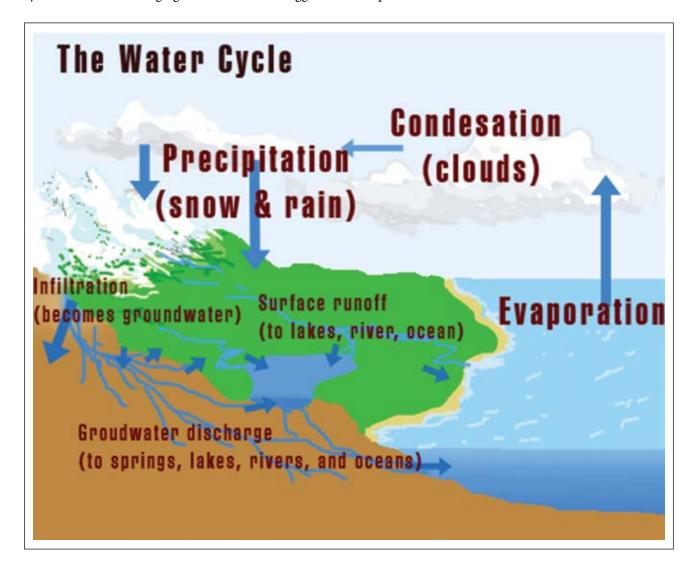
Activity	Water Needed	Water Used
Bathing		
Kitchen (Cooking and washing utensils)		
Washing clothes		
Bathing Animals		
Cleaning the house and floors		





Water Resources

Rapid melting of snow due to global warming has clearly indicated water scarcity in future. The disturbance in the rain cycle as a matter of changing climate will further aggravate the impact.



The overall impacts of climate change on water resources can be described in these points:

Too much water and Too little water:

- Because of climate change, the distribution pattern of rainfall has changed. Some areas receives high amount of rainfall whereas some areas receive very little or no rain.
- Because of too much water in some areas, different problems like landslides, floods etc occur while with too little water the drought intensifies the problem in other parts.

Wrong type of water:

- Drought and erratic rainfall events have been observed in more intense form with longer duration. Such events make the water availability scarce or muddy thus making it unsafe for drinking.
- Those zones with wrong type of water become highly prone to water induced diseases, sometimes breaking out epidemics. This causes loss of life.

Wrong time of water:

- Do you see a shift in the rainfall pattern in your region, such as when we expect rain, we do not get, and when we do not expect we get rainfall in the wrong time. If yes, all this is because of the changing climate.
- Rapid pouring of snow melting from the snowline is accelerating sea level rise.
- Are a threat to some of the islands such as India's Majuli Islands, Assam, which can submerge.

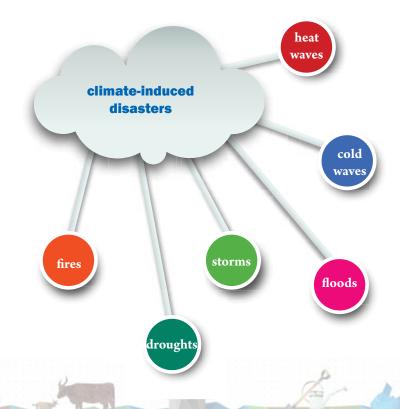
Agriculture

Agriculture is going to be the most critical sector from climate change perspective.

- Our agriculture is largely dependent on the Precipitation. Therefore, the change in precipitation pattern due to climate change brings a decline in the agricultural production.
- Similarly the fluctuations in the temperature, decline in the soil moisture content, wind events and hailstorm affected our traditional mode of agricultural system.
- Floods and drought also reduces the fertility of the soil because of which the agricultural yield decreases.
- Also, new variety of pests and diseases due to climate change hamper the crops.

Health

- Disease and injury due to heat waves, cold waves, floods, storms, fires and droughts are increased as the increase in climate-induced disasters.
- Moreover, in hot areas, the diseases become highly prone to break out. Globally, temperature increases of 2-3° C would increase the number of people who, in climatic terms, are at risk of malaria by around 3-5%, i.e. several hundred million.
- Waterborne infections spread due to climate change impacts such as heavy rainfall. These infections most often cause diarrheal illness and flourish in the wake of heavy rainfalls as runoff from land enters into, and may contaminate water supplies.
- Many pathogens that cause diarrheal disease reproduce more quickly in warmer conditions as well.
- Skin, respiratory, and other infectious diseases become very common.



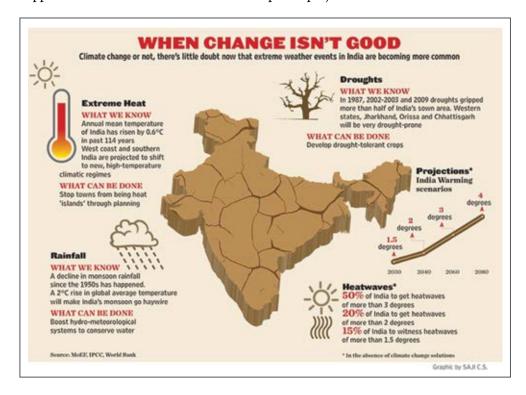
Forests and Biodiversity

Forest fires, deforestation, extinction of tree species are the dangers to forest and biodiversity. Forests are very important and hold high significance, ecologically and economically.

- They act as Carbon Sink as they intake carbon dioxide during photosynthesis thus contributing in reducing climate change impacts to some extent.
- Forests are the habitat of different varieties of Flora and fauna.
- Forest, plants, and animals require good environment with optimum temperature, water, food, and nutrients. They are unable to adjust to the changing climate, which causes their extinction.
- According to a study about 2.4 percentage of the biodiversity is in danger of extinction due to climate change.
- Increasing temperature is reducing the soil moisture and keeping air dry because of which forests become prone to fires.
- Floods, landslides, soil erosion also trigger the forest destruction.
- Cutting down forests also leads to landslides as roots help to hold the soil and prevent soil erosion.
- Forest destruction will directly affect plants, animals, and the people whose livelihood are directly linked with the forests.

Climate Induced Migration

- People who largely depend on agriculture will start moving out of their villages in search of better livelihood opportunities if crops fail, drought persists, there is water shortage due to climate change. Families will suffer. Debts will rise as families when there are no grains to sell.
- Those who depend on forests and their produce for their livelihood will be displaced and lose their land, livelihood and food supplies when forests are cut down for development projects.



All these resulting climate change consequences can lead to a huge disaster.



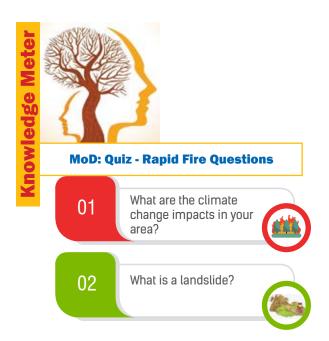
MoD: Role Play

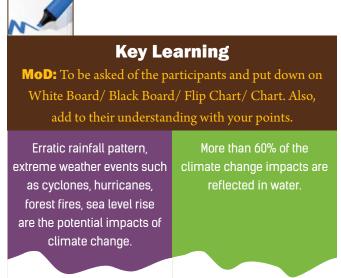
This game is called **Impact Game**, as the participants have to act as per the climate change impact.

Divide the participants in a group of 4.

- Write various climate change impacts separately in separate paper and give that to all the groups. e.g., hurricane, drought, floods, sea level rise, too much rain, landslide etc.
- Brief the participants that they will imagine and fit themselves in the climate change event as given in the paper.
- Each group will then act and speak few words thinking what they will do if they face such situation.
- For e.g., if a group receives the paper chit of landslides, then from
 the group one will act as human, one as plants and wildlife, and
 one as soil or infrastructure or any other thing that is prevailing
 there. The group will compile impact on each aspect and present
 as a group or can do individually as well.

Notion: This activity will help them have thought on other vulnerable people situation and know to extent how climate change is affecting many people around and the completely natural system.





#ClimateChange

WHETHER YOU LIVE IN A...







CLIMATE CHANGE THREATENS YOUR HEALTH

Drought, floods and heat waves will increase.







Vector-borne diseases, like malaria and dengue virus will increase with more humidity and heat.

Basic necessities will be disrupted...



FOOD

Hunger and famine will increase as food production is destabilised by drought.



AIR

Pollution and pollen seasons will increase leading to more allergies and asthma.



WATER

Warmer waters and flooding will increase exposures to diseases in drinking and recreational waters.

Between 2030 and 2050 climate change is expected to cause

250 000 ADDITIONAL DEATHS PER YEAR

due to malaria, malnutrition, diarrhoea and heat stress.







Learning Objective

- Raising awareness on adaptation and mitigation approaches to climate change
- Know how these approaches are important for your area

Introduction

MoD: Discussion and brainstorming. Ask what they think is mitigation and what is adaptation. Add to their understanding with additional points, if needed.

Are there no ways to handle climate change, then? Are we helpless? No. There are two parallel ways to combat climate change:

- Mitigation
- Adaptation



What is Mitigation?

1. Mitigation- "Avoid what cannot be managed"

Example: The causes of climate change are removed by reducing Green House Gases emissions caused by human activities and increasing the carbon stock by activities such as not cutting down forests.

Examples of Mitigation Measures

- 1. Use CFL lights.
- 2. Keep your village green. Plant more trees on the river banks.
- 3. In agriculture, use water efficient practices.
- 4. Do not dump garbage in open areas, or in water bodies. Separate biodegradable waste and learn how to make compost.
- 5. Farmers can reuse animal and plant waste to make compost and use it in fields. It will control emission of GHGs from chemical fertilisers and put an end to water contamination when chemicals from fertilisers leach into the ground. Water is a scarce resource. It should be used wisely.

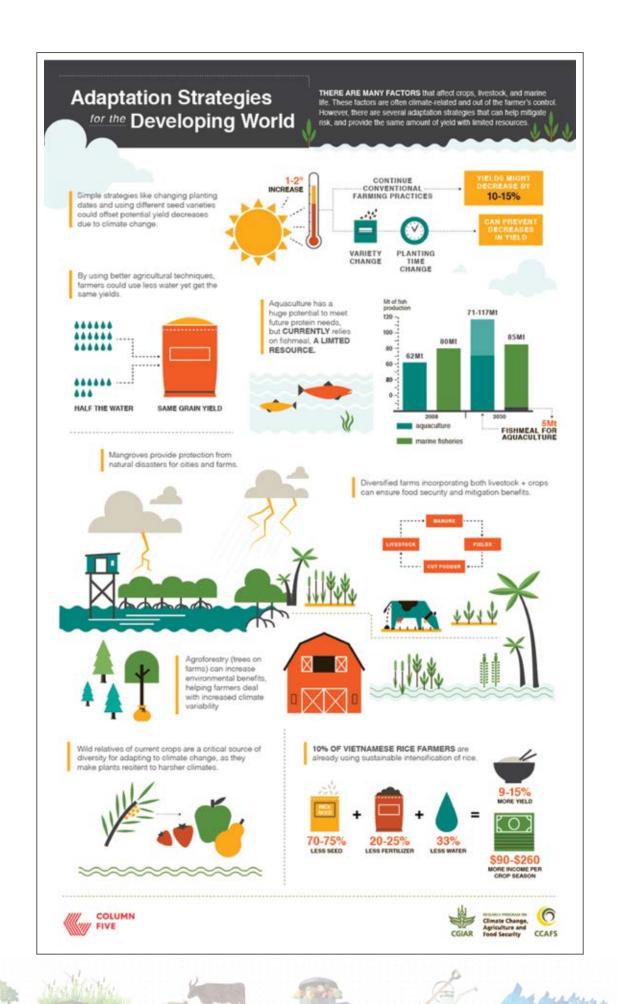
What is Adaptation?

2. Adaptation- "Manage what cannot be avoided"

Example: The effects of climate change are dealt with by coping with their negative impacts by making positive, quick, and flexible adjustments, as per the situation on the ground.

Examples of Adaptation Measures

- Pond construction to collect rainwater and meet water scarcity, Flood control techniques are some of the adaptation measures.
- Increasing the height of the dykes. A dyke is a wall built to prevent the sea or a river from covering an area. It is like a channel which takes water away from an area.
- Introduction of new variety of disease resistant and high productive crops.
- Introducing cash crops like banana in rice field where there is very little rain to support rice plants. If the rice crops
 don't flourish it means low returns for the farmers. Banana is a commercial crop and can be grown and sold for
 profits to help support families who get low returns.
- Intercropping, crop rotation and shifting cultivation.
- Planting more trees.



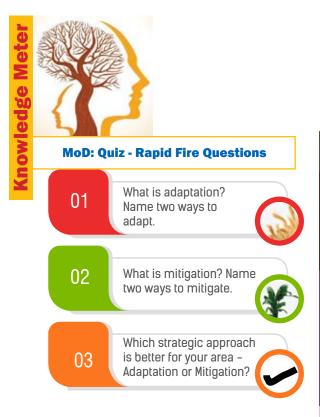


Activity for Participants

MoD: Imagine a situation

- Give participants a situation "their village has high levels of air pollution, major air pollution sources being garbage and burning of crops"
- Ask them what they would do to deal with the pollution
- Also make them categorise which action is adaptation and which one is mitigation with reasons.
- If they cannot understand the terms, give them examples such as: Adaptation: so climate change has happened. There is water scarcity. What must be done? Water must be conserved. How? Install a tank to store water; do not use submersibles indiscriminately; use a bucket and mug to bathe animals; revive water bodies such as ponds; do not dirty the water bodies; do rainwater harvesting. Mitigation: Rainwater harvesting is an adaptation and mitigation measure as it manages water scarcity (adaptation) and avoids water scarcity (mitigation) by conserving rainwater and recharging aquifers. Not using chemical fertilisers is also mitigation; stopping flood irrigation and shifting to micro-irrigation is also mitigation.
- · Hear from the participants.

Notion: Wearing a mask while being exposed to the polluted environment is a form of adaptation. In this, we manage the unavoidable. While reducing the emission directly by waste management is mitigation approach. In addition, planting trees are a form of mitigation because they absorb carbon dioxide, a green house gas. Forests act as the carbon sink.





Key Learning

MoD: To be asked of the participants and put down on White Board/ Black Board/Flip Chart/ Chart. Also, add to their understanding with your points.

Adaptation is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploit beneficial opportunities.

Mitigation is a human intervention to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks.



ENERGY CONSERVATION AND RENEWABLE ENERGY; NATURAL RESOURCES CONSERVATION WITH SPECIAL EMPHASIS ON AIR AND WATER; RECYCLING AND CONSERVATION; WASTE MANAGEMENT



Learning Objective

- Discover the ideas and information how you can help to combat climate change
- Follow and share learning with family, friends, and others.

Introduction

Since we are almost coming to the end of the training, it will be good to recap all that we have learnt till now.

MoD: Divide into groups. Ask them they **why** is climate change a very serious issue, **who** is doing it and **who** can handle and how can it be handled? **What** can we do? Add to their understanding with additional points, if needed.

Why?

Climate change is a very serious issue, which is affecting every sector and each aspect of our life. Its impact is going to last for long. We are already in the tipping point of climate change though we are not in the point of NO RETURN. We can bring the change.

Who?

- Each individual from his or her side can contribute in making our environment sustainable and liveable for our future generations.
- · Youths and children can make a huge difference in this long run.

How?

- Each of our choices can make a difference, either going Green, saving water, not throwing garbage or ignoring it.
- It is necessary to do situation because we are in the tipping point. There is no choice.

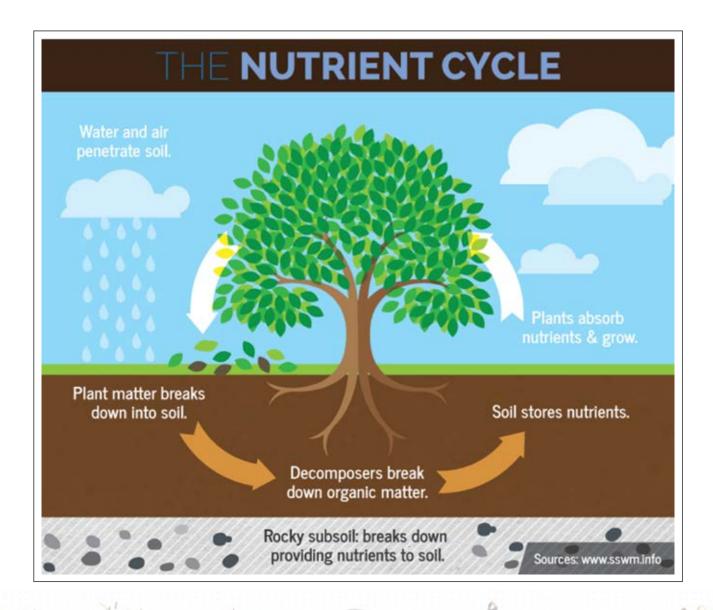
What Can We Do?

Save energy

- Switch off fans, lights, when not in use.
- Do not use submersibles irresponsibly. Store water in a tank. Save electricity.
- Do not let water from tanks overflow. Use a water alarm to tell that the tank is full. This helps to reduce electricity usage. It also saves water, a scarce resource which will get stressed due to climate change.
- Try to use more CFLs and LED lights.
- You can save energy by riding a bicycle, or walking.
- Do not use diesel generators.
- Use solar lights

Plant and save trees

- Trees absorb carbon dioxide, a greenhouse gas, from the air.
- They provide fresh air and shelter to the wildlife.



Learn about climate change

- · Learn yourself first and then talk what you have learnt to your friends, family about climate change
- Start what you can do, from today

Change your consumption pattern

- Eat and buy seasonal fruits and vegetables.
- Eat and cook as much as you want. Do not throw away or waste food.



Reduce Reuse Recycle

You can Reduce

- Carry a big bag while going for shopping and ignore extra polythene
- Do not throw waste in drain or in water bodies.
- Put waste food and vegetable and fruit peels into a compost bin.
- Segregate biodegradable and non-biodegradable waste.

You can Reuse

- The bottles
- The plastic

You can Recycle

- Recycle kitchen water, bath water for toilet flushing
- Use both sides of the paper for writing and printing.
- Paper is recycled. It can be used to make packets.
- When you recycle, you send less trash to the landfill and you help save natural resources, like trees, oil, and elements such as aluminium.

Go Green

- Install Rain water harvesting at your home and school
- Start composting

Reduce your carbon footprint

- Walk where possible
- Pedal your cycle

Can I stop climate change? Of course, you can!

We have learnt that our actions cause more GHGs to be released into the atmosphere. These GHGs make the atmosphere warmer than it should be, and this is what causes climate change. Climate change, as we have learnt above, means erratic rainfall, floods, drought, scarcity of food, more diseases, change in how our plants grow, and lots more. All this will add up to a difficult life for all of us. So, can we do anything at our level to stop climate change? Of course, we can. Every small little action counts. Never think that what you do will not matter. Every drop makes an ocean. Every small action will together mean a million actions, which can help to make a cooler and cleaner atmosphere. Here are some of the things you can do at home:

- 1. Carry your own cloth bag when you go shopping or to buy vegetables. Plastic bags clog the soil.
- 2. Do not leave your mobile phone plugged in if it is fully charged.
- 3. Use CFL bulbs. LED bulbs are even better. It helps to save energy.
- 4. Walk more often, wherever you can. Alternatively, cycle. Using less mechanical vehicles means lower carbon emission and helps to stop the atmosphere from warming up.
- 5. Recycle paper, plastic, glass, and metal. Reuse, mend, and repurpose things to save money and divert waste from your local landfill.



REDUCE

+



REUSE

+





- 6. Put food waste, vegetable peels, fruit waste, wood shavings, and paper into an earthen pot to create your own compost at home. Teach children to do this. It will help to reduce the garbage on the empty spaces outdoors and on river banks.
- 7. In your plate, serve or take only as much food as you want. A little less is best. If you need more, you can take a second helping. Do not waste food.
- 8. Do not use aluminium foil. It is not biodegradable. It clogs the soil and kills the plants. It also prevents water from seeping into the soil which means aquifers are not recharged and there is more run off.
- 9. Use glass or plastic bottles to store water. Stop using plastic bottles. Plastic like aluminium is non-biodegradable.
- 10. Share what you learn with our family and friends.

How your actions are linked to climate change

- Throwing garbage outside emits harmful GHGs causing climate change.
- Excessive use of vehicles/ diesel generator leads to air pollution caused by the emissions and thus climate warming;
- More extraction of water is related to irresponsible use of natural resources, which will be stressed due to climate change without adequate measures to replenish.
- Cutting down forests means that all the CO2 that the trees absorbed is released back into the atmosphere making it warmer.
- Cutting forests also means destroying carbon sinks which leads to a warmer atmosphere.



How Green Are You?

This activity is called "How Green are you?" Direct the participants in collecting the required pictures showing environmentally careless behaviour, before doing the activity. In case, collection of pictures in difficult, same activity can be done by explaining the situation mentioned or drawing it on a board or flip chart or a simple chart.

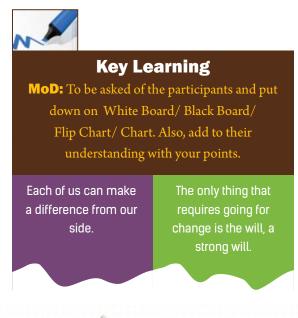
- · Collect the pictures
- · Stick it on the wall of the classroom
- Call each participant from each group divided to come at the front, where pictures are pasted.
- Ask them to explain what is wrong in the picture and why, one by one
- Also let them explain how they can improve such careless behaviour

Pictures showing careless behaviour could be:

- Throwing garbage near water bodies and in the drains.
- Creating heaps of garbage in an open field or unoccupied plot.
- Defecating/Urinating in the open.
- · Leaving the fan/lights on when there is no one in the room.
- Riding a scooter, which is very noisy and leaves a lot of smoke.
- Using a bike to a place close by which you can walk to.
- Leaving the submersible on and wasting water indiscriminately
- · Cutting down forests.
- A child playing outside leaving TV on inside the room

Notion: The participants will find out those behaviours, which can affect our environment and resources. They can relate those actions to their real life. Also, the discussion on how they can improve such behaviour and what they can do will help them internalise their own behaviour. This way, they will be encouraged to take simple yet important actions and initiatives from their individual level.





SESSION 6 HINDON AND CLIMATE CHANGE

Learning Objective

- How human activities are polluting and depleting River Hindon.
- How Hindon and Climate Change are linked.
- How it affects our lives.
- Simple solutions.

Introduction

MoD: Discussion and brainstorming on how participants think they are polluting Hindon and causing climate change. Take inputs on erratic weather phenomena in their villages and point out climate change linkages. First, take their inputs and then add your points to widen understanding.

The River Hindon is largely a rain-fed river and "used to be fed partially by its shallow groundwater aquifers." (*Terragreen, July 2017*). Owing to human activities such as deforestation the level of groundwater aquifers is falling? Why is this? This is because when trees are cut off, the rain falling on the ground runs off as there are no trees whose roots will absorb the water into the ground. When no water is absorbed into the ground, then the underground aquifers are not recharged. Naturally, when the partial source of River Hindon, the underground water aquifers are dry, the river also starts to run dry. Along with this, the smaller water bodies such as lakes that take water from the Hindon also dry up.





Discussion points in local context:

- As their villages lie on the River Hindon, what examples of pollution can they see?
- Do they see garbage being dumped on the banks of River Hindon?
- Why do they think garbage is being dumped there?
- Are animals being bathed in river water?
- What do they think will happen if humans use the same water?
- This contaminated water leaches to ground water and the same is pumped out through hand pumps and submersibles.
- Have they seen erratic weather phenomena in their village?

1. Construction continues on Hindon Floodplains

Constructions continue unbridled in the river's floodplains that had thick forest earlier. That forest has already been cleared.

2. Lesser forests means fewer trees and a warmer climate

- 1000- 1500 trees will absorb 22000 kg 33000 kg of carbon dioxide from atmosphere. Single tree absorbs around 22 kgs of carbon/year. Hence, trees are a powerful natural system to mitigate/ adapt to climate change. If we clear forests, then we are removing a very powerful carbon sink.
- Also when we cut trees, all the CO2 they have absorbed is released back into the atmosphere leading to an increase in GHGs.
- Trees also help to lower temperatures by transpiring water and shading surfaces. They thus help to mitigate global warming.

3. Warm climate means more water evaporation

A warmer climate causes more water to evaporate from both land, rivers and oceans; this can cause increased precipitation and runoff, leading to increased flooding.

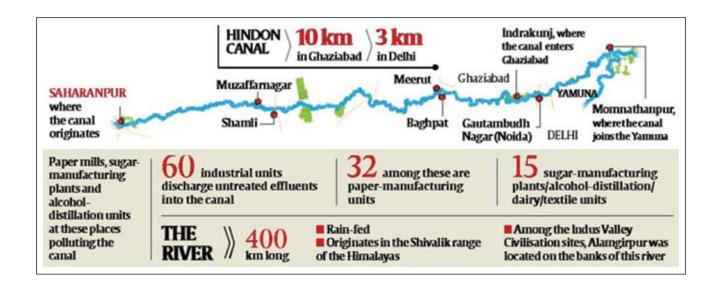
4. Dumping solid waste on Hindon Banks

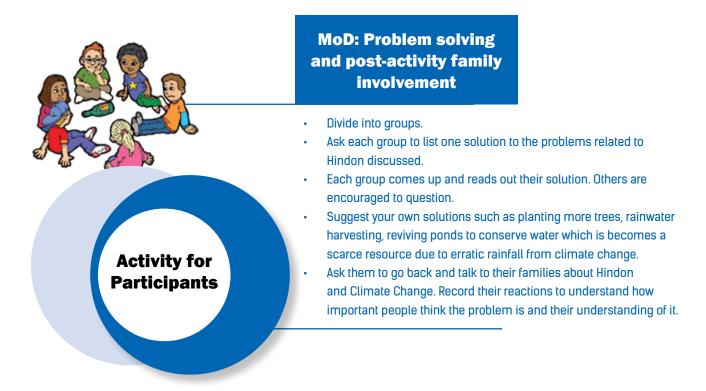
Indiscriminate dumping of municipal solid waste and its continuous burning leads to emission of harmful greenhouse gases into the air, which causes warming, and hence, climate change resulting in erratic and extreme weather phenomena.

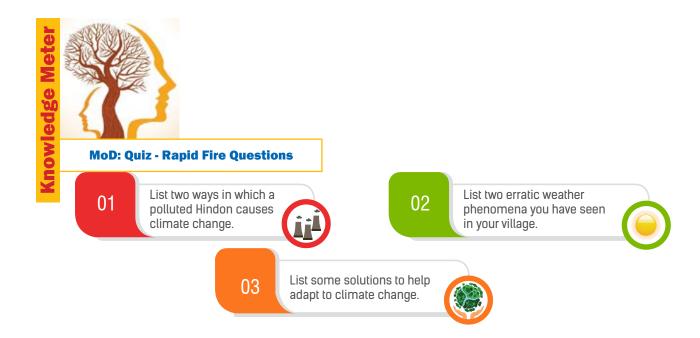
5. Submersibles become source of diseases

Polluting river banks and general dumping of garbage means pollutants seep underground. Since the communities rely on submersibles, which rely heavily on ground water, any contamination of ground water will seriously impair the availability of water for a large number of households. Over extraction of groundwater will affect an already stressed natural resource - water. Climate change causes erratic weather phenomena due to erratic monsoons and droughts and so water security is impacted.

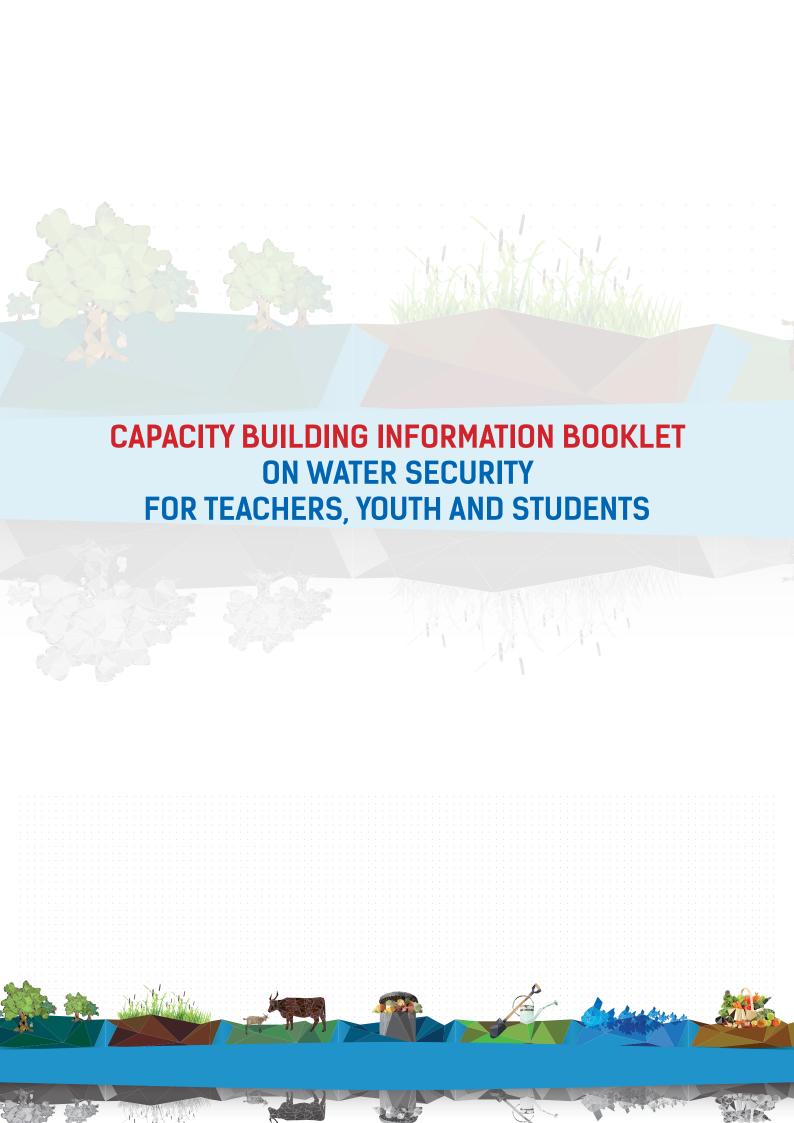
Climate change also leads to various diseases and mostly, an increase in water-borne diseases.











WATER SECURITY SESSIONS

Time Frame: 10 hours of training spread across three days

Methodology: Brainstorming; Group work; Group Presentation; Role Play; Quiz

Session	Content to be covered	Objectives/ Outcomes	Page Nos.
1	What is freshwater	 To understand what is freshwater Why it is important for our survival How much freshwater does India have for it to use 	43
2	What is water stress and causes	 To understand what is water stress Why is India water stressed Solutions to achieve water sufficiency 	49
3	Impact of water stress and pollution	• How does water stress impact our lives	55
4	Solutions to deal with water pollution and water stress	 What solutions are available to us to reduce water wastage, pollution and achieve water security 	61
5	Hindon, water and lives of the villagers: A perennial link	 To understand how the well-being of River Hindon is linked to the well- being of the community 	69







Learning Objective

To understand what is freshwater, why it is important for our survival, and how much freshwater does India have for it to use.



MoD:

- Ask what they think is the meaning of the term freshwater?
- Bridge the understanding with points below.
- Talk about how much freshwater India has and how much it is using up.
- Freshwater is getting polluted. Ask them if they think humans are polluting it. How?
- Discussion and brainstorming with the group on the information given.

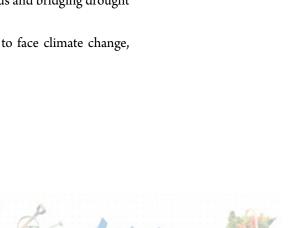
What is freshwater?

Do you know what is freshwater? Take a guess. Well apart from your answers, here is what fresh water is. It is naturally occurring water on Earth's surface in ice sheets, ice caps, glaciers, icebergs, bogs, ponds, lakes, rivers and streams, and underground as ground water in aquifers and underground streams. The source of almost all fresh water is precipitation from the atmosphere, in the form of mist, rain and snow.

Importance of freshwater

Now you know that freshwater is available in ponds, lakes and rivers, and underground also. So why do you think it is important to us (*Get answers from the participants*). Here are some more reasons.

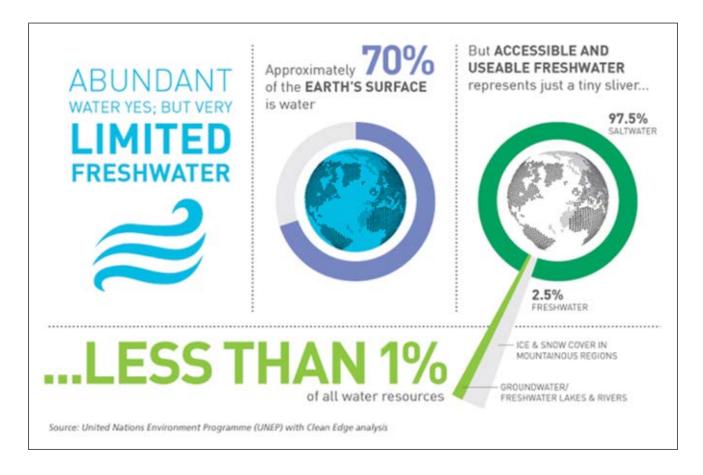
- Freshwater ecosystems such as wetlands, rivers, aquifers and lakes are indispensable for life on our planet. They are the sources of drinking water, water for food and industry including energy, habitats for aquatic life.
- 2. They also act as natural solutions for water purification and buffering floods and bridging drought periods, among many others.
- 3. If we keep them clean, nourished and manage them well, they help us to face climate change, disasters and conflict by ensuring water security.



How much freshwater does the world have?

Freshwater makes up a very small fraction of all water on the planet. 70% of the world is covered in water? Out of this, what per cent do you think is freshwater? How much do you think we can use?

- Only **2.5 per cent** of it is fresh. The rest is saline and ocean-based.
- Only 1 per cent of our freshwater is easily accessible, with much of it trapped in glaciers and snowfields.



How much freshwater does India have?

With 2.5% of global landmass, **India has 4**% of the world's freshwater resources. Overall, every year, precipitation in the form of rain and snowfall provide over **4000 cu km or 4,00000,00000 litres** of freshwater to India. Of this, **2047 cu km or 2,04700,00000,00000 litres returns to oceans** or is precipitated. A small percentage is stored in inland water bodies and groundwater aquifers.

From where does India's get its freshwater?

Much of the freshwater comes from rains during its monsoon seasons (June to September). The north and north east receive far more rains than India's west and south.

Other than rains, the melting of snow over the Himalayas after winter season feeds the northern rivers to varying degrees. The southern rivers, however, experience more flow variability over the year. For the Himalayan basin, this leads to flooding in some months and water scarcity in others.

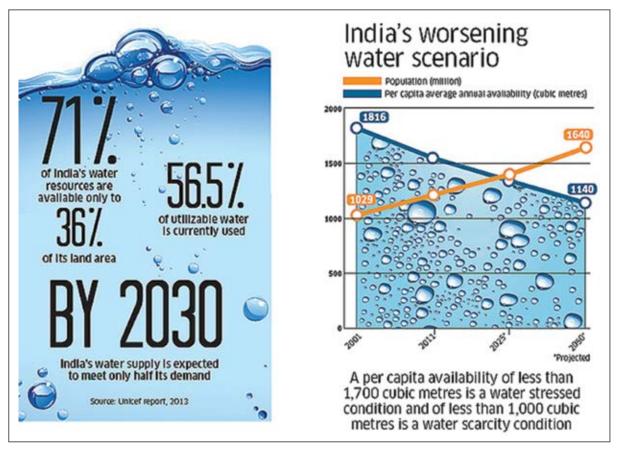
How much freshwater are we using up and how?

India harnessed around 20 per cent (761 cubic kilometres (76100,00000,00000 litres) of its water resources in 2010. Part of this came from unsustainable use of groundwater.

Where and how much water did India use?

The water that India got from its wells and rivers was used like this:

- **Irrigation:** 68800,00000,00000 litres
- Municipal and drinking water applications: 5600,00000,00000 litres
- **Industry:** 1700,00000,00000



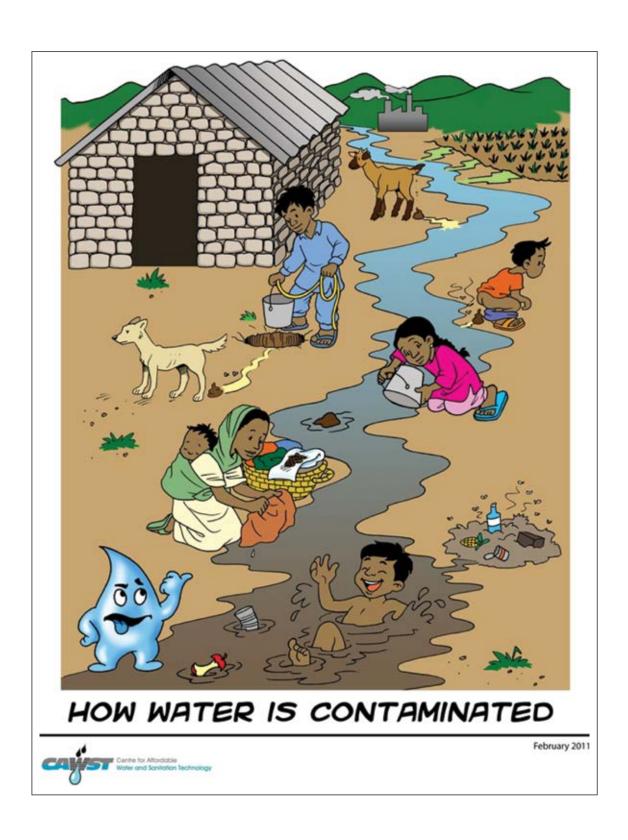
Courtesy: The Economic Times

How we are polluting freshwater?

- Water in 320 of the country's 640 districts is contaminated by chemicals like fluoride, arsenic, and heavy metals like chromium and lead. Contaminated water affects 6 lakh habitations directly.
- Five diseases caused by polluted water have claimed lives in seven years.

Pollution is caused by nature and by human activities.

- Chemicals such as fluoride and arsenic are largely pollutants caused by nature. When we draw excessive groundwater, it leads to increasing concentration of toxic elements such as fluoride, arsenic and salinity in several areas.
- Some industries also produce these chemicals and pollute water through the effluents they release into water bodies.
- But the water problem is caused largely by overexploitation. Some of these chemicals cannot be treated with available technologies."





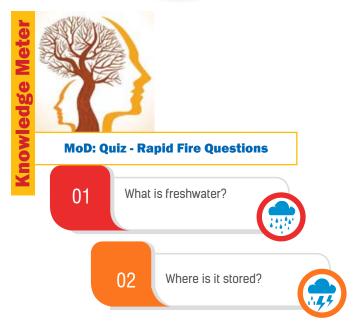
Activity for Participants

MoD: Role Play

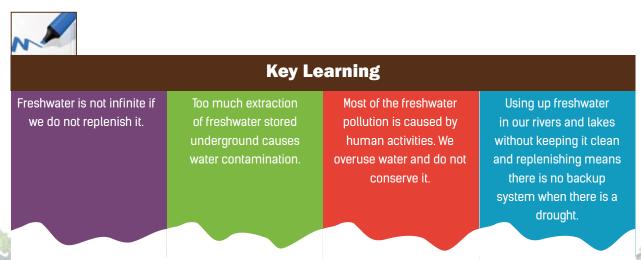
Now you know which are the major sources of freshwater and how much freshwater we have. The ministry of water resources says that with the growing population and unequal distribution of water, the availability of fresh water will decrease alarmingly. So what will happen if one day there is no water for our daily work?

Method: Divide participants into groups. Give them 10 minutes to prepare on the spot on given topics related to water:

- · When there is no clean water at home
- Nothing to eat as the farmer cannot grow crops as there is no water
- What will happen if I have to buy water for everything











Learning Objective

To understand what is water stress, why is India water stressed, and solutions to achieve water sufficiency

Introduction

MoD:

- Ask them if they understand the term "water stress." Listen to the differe
- Add your own from the text below to bridge the gap.
- Share the levels of water stress in India.



Essentially, water stress happens when "the demand for water exceeds the available amount during a certain period or when poor quality restricts its use."

Water stress in India

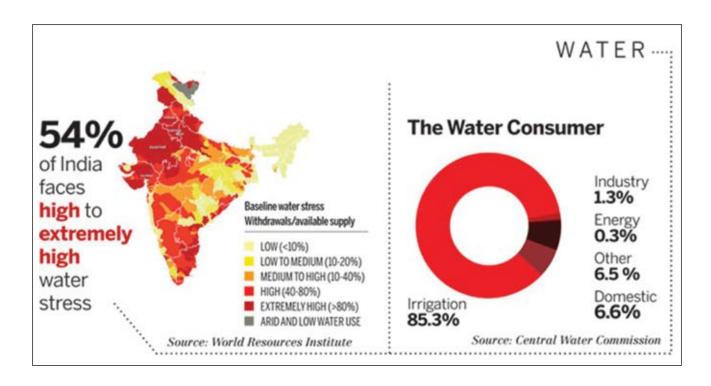
India is home to about 16% of world population and the distribution of freshwater is not equal across India.

An estimated 1,00,000 Indians die from water-related diseases each year and experts have predicted that by 2030, our water supply will fall short of demand by 50 per cent.

A UN report ranked India 120th of 122 nations based on its water quality, and over 50 percent of the country is likely to face high-to-extremely-high water stress.

75% of available water resources in the country do not meet the World Health Organization water quality standards because of pollution caused by rapid industrialisation, urbanisation, and poor farming and irrigation practices





In around the next 60 years, there will be no water left for our children.

Rising Water Demand in India

- Demand for water in India is expected to rise drastically to about 833 billion cubic metres (BCM) in 2025 and 899 BCM in 2050. At present, water demand stands at 712 BCM.
- Water is getting scarce because of growing population, water pollution and water wastage.

Years	Population (in millions)	Per capita average annual availability (m3/year)
2001	1,029	1,816
2011	1,210	1,545
2025	1,394 (projected)	1,340
2050	1,640 (projected)	1,140

Source: Water in India: Situation and Prospects-2013, UNICEF

Reasons for Water Stress

Unsustainable water use: A fundamental reason for water stress in India is that we're using more water than can be replenished. Unsustainable water use and a reliance on groundwater have meant that our sub-surface water levels have dropped by as much as 54 per cent in the last seven years. Over 60 percent of our agriculture is rain-fed and depends on groundwater, making any shortage a serious issue for farmers and food security.

Climate change impact: A warming climate is likely to play havoc with the Himalayan glaciers which are the source for some of India's most important rivers such as the Indus, Brahmaputra and the Ganga.

Untreated sewage: A 2013 report found that India produces over 40,000 million litres of sewage daily but just about 20 percent of it is treated and the rest is discharged into rivers. The waste then contaminates the groundwater. The net result is that 70 per cent of the country's water is polluted by sewage waste.

Electric pump (submersible) revolution: This has permanently depleted groundwater reserves in several areas as people are using up too much groundwater. Excessive water extraction of water from the ground has also led to increasing concentration of toxic elements such as fluoride, arsenic and salinity in several areas. Fluoride and arsenic are pollutants largely caused by nature and come into the water if you dig borewells beyond 30 metres.

Using too much groundwater for agriculture: In rural areas, regions away from river systems, or disadvantaged by the scarce availability of surface water bodies such as ponds and tanks, farmers are constrained to fall back on groundwater for agricultural expansion, as in large parts of western, central, and peninsular India. This has led to massive, unsustainable exploitation of deep aquifers.

Rainfall wastage: 65% of rainwater runoff goes into the sea, which is a major wastage considering that over 70 per cent of country's farming is rain-fed. The runoff also causes soil erosion, river flooding and siltation of water bodies.

Poor sanitation: 6.4% of India's gross domestic product (Rs 328,500 crore) worth of economic opportunities was lost in 2006 because of poor sanitation. Poor sanitation results in water contamination that leads to widespread diseases and wastage of public resources.

Depleting groundwater: 210 billion cubic metres is the amount of groundwater extracted in India annually, which is the highest in the world. Groundwater today provides for more than 60 per cent of net irrigated area. As a result, over 60 per cent of districts in the country are facing problems relating to poor quality and shortage of groundwater, says the mid-term appraisal of the 11th Five Year Plan.

Polluting water bodies: The water bodies in the villages like ponds – Johads are the major source of discharging waste water of the households (drains are linked to these water bodies), dumping garbage, encroachment etc.

Water woes in India Decades of population growth and uncontrolled urbanisation have created a water crisis in the country Population: Baseline water stress 1.2 billion Low Less than 10% of annually available ► 54% of the surface water is country is used every year faces high Low-medium = 10-20% used to extremely Medium-high = 20-40% used high water High # 40-80% used stress Extremely More than 80% high DELLI Ahmedabad Mumbai • Hyderabad More than 100 million people live in areas National with poor water quality supply Chennai predicted to fall 50% Water levels in more than below half of 4,000 groundwater demand wells decreasing by 2030 Source: Water Resources Institute/UN





MoD: Role Play

Make a Water Chain

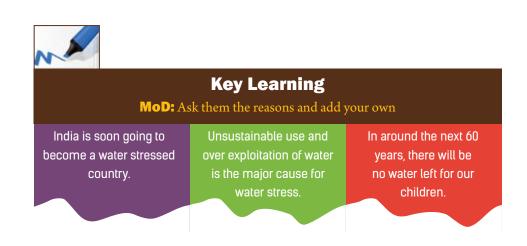
What is a water chain? A water chain depicts the process of household water collection from the water source to water disposal. It acts as a useful tool for participants to think about potential water contamination at every point of water use. How can water contamination be prevented at each point in the water chain?

- 1. Ask participants to form a chain.
- Start asking questions and seek the answers from them. It is mandatory for each one to give an answer. The answers should not be too long. Give them 2 minutes to think of an answer. At the end of the activity, ask everyone to clap for themselves on having done a task well. Ask them if they have any doubts and answer their queries.
- · What is the source of water for your village?
- · How does it reach you?
- How do you use it directly from a submersible or store it in a tank?
- How and where do you bathe your animals? Where does the water qo?
- When you wash areas such as courtyards or school premises, where does the water go?
- · Where does the water from your toilets go?
- Where do you throw the garbage from your homes?
- What do you think happens when you throw it on the river banks?
- Do you think it pollutes the water?
- Do you think defecating outdoors has any relation to water pollution? If yes, how.

Notion: What this will do: This will help them to think, and try and find out how they use water, how they pollute it, and how contaminated water affects their health. The gaps should be filled in to strengthen the understanding down the water chain. But primarily participants have to answer as it triggers thinking.







SESSION 3 IMPACT OF WATER STRESS AND POLLUTION

Learning Objective

How does water stress affect our lives, agriculture, what we eat, our livestock, and our forests, which sustain us.

Introduction

MoD:

- Discuss with the participants what examples of water stress have they seen around themselves, at their homes, seen on television or read in the newspapers. See what they understand.
- Ask them what kinds of water pollution they have seen around them such as throwing garbage in water bodies, bathing animals in water etc.
- Do they know of illnesses that can happen if you consume contaminated water.
- Introduce the points below for discussion.

We contaminate water through the various activities that we do. When we throw garbage on empty land, or water bodies or defecate in the open, pollutants and bacteria seep underground and contaminate the water. We draw the same water up borewells, handpumps etc. and the germs and bacteria, along with the pollution present in water enters our body when we use the contaminated water. Also, when we dig borewells below 30 metres, pollutants naturally present under the soil such as fluoride and arsenic enter the water and cause illnesses in human beings. That is why digging too deep is a harmful practice. Also, over extraction without replenishing the groundwater aquifers means that we are reducing the quantity of water underground. Which in turn means that we will have less water for our daily activities? In times of less rainfall and drought, the water underground will further reduce. The result: a life without water and a life with contaminated water, both harmful to our well-being.





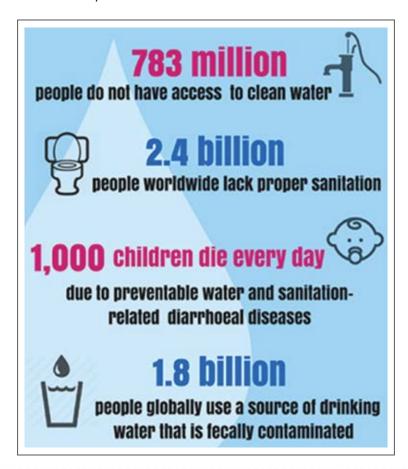
Courtesy: Times of India

Impact of water stress

- Between 85 and 90 per cent of all water consumed in India is used by the agricultural sector. Farmers seeking
 alternative water sources to the seasonal monsoon have become reliant on groundwater.
- Farmers extract groundwater at rates faster than the source can replenish itself. Because of this, and approximately half of all groundwater blocks are now no longer "safe" meaning they have become too saline or polluted for human or agricultural consumption.

- Agriculture accounts for 80% of all freshwater usage. Farmers in India have been traditionally practicing flood
 irrigation which results in huge wastage of water. It causes severe soil erosion, leaching of fertilisers, increases the
 infestation of pests, diseases and weeds and suppressing of the crop yields.
- Farmers at the tail end of major command systems receive delayed and deficient supplies, while those upstream uses the grossly underpriced water wastefully.
- Excessive use of fertilisers in agriculture, industrial effluents is also contaminating water creating water use stress.
- A struggling agricultural industry means the threat of unemployment for approximately 50 per cent of India's workforce.
- With bore wells being dug deeper into the ground (where the risk of dangerous chemicals and poisons contaminating the water is high) and locals having no choice but to access sources of water known to be polluted, health levels have deteriorated.
- It is reported that over 70% of the water consumed by rural population in India does not meet the WHO standards.
- It has been reported that 80% of rural illnesses, 21% of transmissible diseases and 20% of deaths among children in the age group of 5 years, are directly linked to consumption of unsafe water.
- Due to global warming water requirement for crops will increase due to higher evapo-transpiration.
- The rivers emerging from the Himalayas, are prone to heavy floods and subsequently face severe water shortage, thereby suppressing agricultural production.
- Cutting down of forestlands and wastelands across the country has resulted in land not being able to retain rainwater.

 This means that aquifers are not giving recharged.
- Rivers which emerge from these mountains where forests have been cut are unable to sustain the flow of water throughout the year. There is heavy soil erosion because of deforestation. This causes floods.



What happens when safe water is not available

So we have seen that water is getting contaminated largely because of human activities. So it is not safe to use? What happen when safe water is not available? Water-borne disease is a constant threat to health.

- It results in poor health of workers and less productive hours.
- Unsafe habits such as dipping fingers in drinking water, keeping it uncovered, defecating in the open, dumping garbage in water sources makes water unfit unhealthy for drinking and causes diseases.
- Digging borewells below 30 metres means that natural pollutants such as fluoride and arsenic enter water making it unsafe.
- When there is no safe water and sanitation, people are more vulnerable to powerful or wealthy individuals and groups that threaten their security and resources as they are able to create a monopoly over water availability and accessibility.
- Communities affected by disaster either natural or man-made, are more resilient if they have access to safe water and sanitation.
- Communities with safe water have healthier members, whose bodies are more resistant to illnesses that come with disaster and displacement.

Illnesses caused by contaminated water

Transmission Mechanisms	Diseases (examples)	Preventative Strategy
Water-borne	Diarrhoea, Cholera, Typhoid	Improve water quality prevent casual use of other unimproved sources
Water-washed	Roundworm (Ascariasis)	Improve water quantity – improve water accessibility improve hygiene
Water related Insect-vector	Malaria	 Improve surface water management Destroy breeding sites of insects Decrease need to visit breeding sites Remove need for water storage in the home or improve design of storage vessels



Activity for Participants

MoD: Role Play

With the help of the following two activities we can easily make the participants aware about the harmful impacts of polluted water and gauge their reaction to it:

Materials needed:

- 4 plastic bottles with clean water and a large measure of salt
- If bottles are difficult to obtain, you can also use glass tumblers.
- 1 plastic bottle or glass with water; one long hair (or other long thin object like a blade of grass)
- · Cow dung sample or mud but tell the participants it is cow dung

Part One of the activity: Salty Water-Clear but Unpleasant

- 1. Show the participants the two bottles of water, one with dissolved salt in it. Ask them to look closely and see if they can tell any difference between the two. Take a couple of responses.
- 2. Ask for two volunteers to come forward. Show the two bottles again one at a time (salty and not salty) to the participants and ask them to raise their hands if they think the water in both bottles is "safe" to drink. Ask why.
- 3. Pour some of the salty water in two glasses. Now ask the volunteers to drink. Have the participants watch their faces.
- 4. Reinforce the point that although water may appear clean, clear, and safe, it can contain things that you can't see that can make people ill.

Part Two of the activity: Clear but Contaminated

- 1. Tell the participants that they are going to continue to look at water and possible ways it can become contaminated but still not look harmful.
- 2. Place the sample of the faeces/cow dung where everyone can see it. Hold one end of the hair, thread, or blade of grass in each hand and run it through the faeces/cow dung. Put the hair (or blade of grass) into the glass of water and then remove it.
- 3. Ask for a volunteer to drink the water—only to see their reaction. DO NOT ALLOW ANYONE TO CONSUME THIS WATER. Conduct a discussion of the group's reaction and stress that although the water looked clear, it is, in fact, contaminated with faeces/cow dung and that this is the reality in many of our communities—the water looks clean and clear (from the well, river, borehole, tap), but it has faeces/cow dung in it.

Then lead a discussion about local sources of water.

- · Where do most families get their water?
- Could there be contamination even if the water appears "clear and clean"?
- What might be some of the community sources of contamination?
- · What are their observations about how significant problem diarrhoea is?





Key Learning

MoD: Ask them what they have learnt and add your own

Water stress means low agricultural production which will impact food security.

Water stress is largely due to human behaviour such as cutting down forests, polluting water bodies, over-extraction of groundwater, too much use of pumps, chemical fertilisers etc.

Water-borne illnesses raise the cost of living in a family as well as impacting the social well-being.





Learning Objective

What solutions are available to us to reduce water wastage, pollution and achieve water security. Learning about simple solutions we can implement ourselves to achieve water sufficiency.



Introduction

MoD:

- Introduce the topic, discuss, ask for solutions .
- Ask have they implemented any or seen such solutions being implemented.
- Add your own to their understanding.

While the consumption of water in India will increase by over 50%, the supply will increase only by 5-10% during the next 12-15 years. This will lead to water scarcity situation and most of the people, particularly those who are dependent on agriculture and living in poverty will suffer the most. Water scarcity will affect the food production, biodiversity and the environment. Environmental degradation will accelerate global warming, which in turn will accelerate water crisis.

Solutions

Increasing water storage capacity: Activities such as farm ponds, rejuvenating ponds – Johads percolation tanks, water reservoirs and construction of small and medium size dams and rivers can retain more surface water, while increasing the ground water recharge.

Efficient irrigation practices: Stopping flood irrigation, promotion of micro-irrigation systems and involvement of water users' group for water distribution would significantly help in improving the water use efficiency and reducing the cost of agricultural production. A time-bound plan to bring the entire cropped area under controlled irrigation (sprinklers, underground pipes and other water conservation devices) should be undertaken.





- Increase in yield (30 90%)
- Saving in Fertilizer usage (40%)
- Cultivation in saline land possible.
- Status in India
 - 1.6 million ha under Drip Irrigation
 - 2.3 million ha under Sprinkler Irrigation
 - By converting 1 lakh land area under micro irrigation
 - Total water saving is 347 million Cu. Meters / annum.
 - Fertilizer saving of Rs. 105 cores
 - Saving of 271 lakh KWH of energy per year worth Rs. 7crores by pumping less water.



Crop	Increase in yield %	Water Saving %
Tomato	25-50	40-60
Sugarcane	50-60	30-50
Okra	25-40	20-30
Potato	20-30	40-50
Cabbage	30-40	50-60
Brinjal	20-30	40-60
Chilli	10-40	60-70
Bottle Gourd	20-40	40-50
Cauliflower	60-80	30-40

Courtesy: National Committee on Plasticulture Applications in Horticulture

	Crops Suitable for Drip Irrigation System		
1.	Orchard Crops	Grapes, Banana, Pomegranate, Orange, Citrus, Mango, Lemon, Custard Apple, Sapota, Guava, Pineapple, Coconut, Cashewnut, Papaya, Aonla, Litchi, Water-	
		melon, Muskmelon etc.	
2.	Vegetables	Tomato, Chilly, Capsicum, Cabbage, Cauliflower, Onion, Okra, Brinjal, Bitter	
		Gourd, Ridge Gourd, Cucumber, Peas, Spinach, Pumpkin etc.	
3.	Cash Crops	Sugarcane, Cotton. Arecanut, Strawberry etc.	
4.	Flowers	Rose, Carnation, Gerbera, Anthurium, Orchids, Jasmine, Dahilia, Marigold etc.	
5.	Plantation	Tea, Rubber, Coffee, Coconut etc.	
6.	Spices	Turmeric, Cloves, Mint etc,	
7.	Oil Seed	Sunflower, Oil palm, Groundnut etc.	
8.	Forest Crops	Teakwood, Bamboo etc.	

Response of Different Crops to Drip Irrigation System		
Crops	Water saving (%)	Increase in yield (%)
Banana	45	52
Cauliflower	68	70
Chilly	68	28
Cucumber	56	48
Grapes	48	23
Ground nut	40	152
Pomegranate	45	45
Sugarcane	50	99
Sweet lime	61	50
Tomato	42	60
Watermelon	66	66

Courtesy: National Committee on Plasticulture Applications in Horticulture

Capacity Building of Farmers is Important: Capacity building of farmers should be initiated simultaneously along with efficient irrigation practices. Farmers should be enlightened about the importance of water conservation and judicious uses, which are needed for achieving sustainability.

Afforestation: More trees need to be planted on river banks to facilitate soil conservation, recharging of ground water and preventing flooding of rivers and siltation of water reservoirs.

Bioremediation: The process of using plants and microbes in contaminated water bodies to improve water quality should be promoted. There are 130 plant species that can be used for the process.

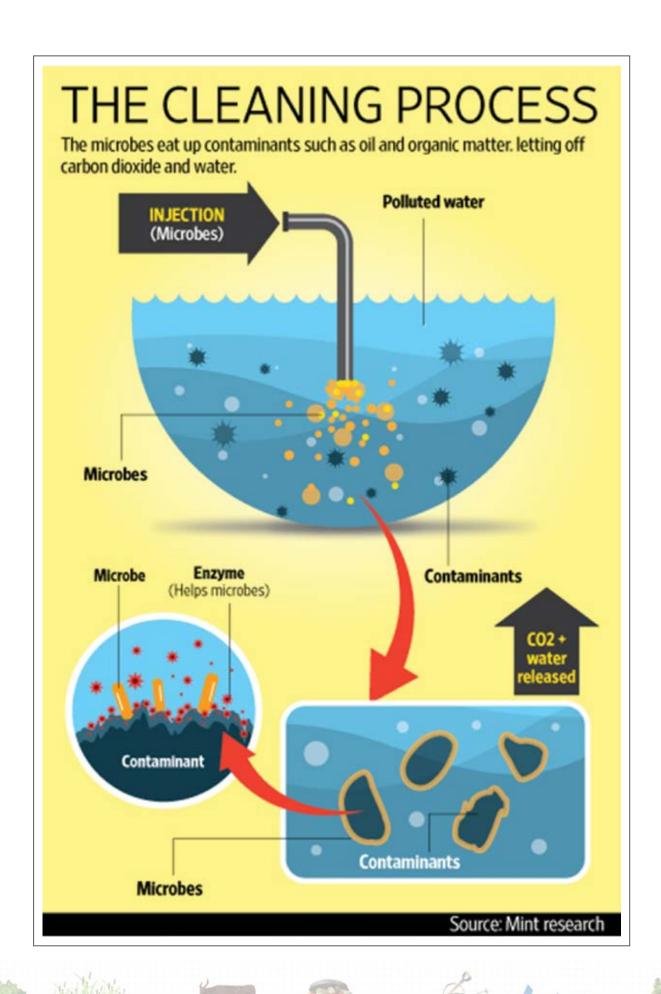
Composting: Drop vegetable peels, biodegradable waste in a separate waste bin and make your own compost. If this can be done on the level of the whole village, farmers can use the organic compost which will increase the fertility of the soil. Using organic compost also means having to use less water in their fields.

Examples of biodegradable waste:

- Human and animal waste.
- Plant products, wood, paper, food waste, leaves, grass clippings.
- Remains from the death of living creatures.

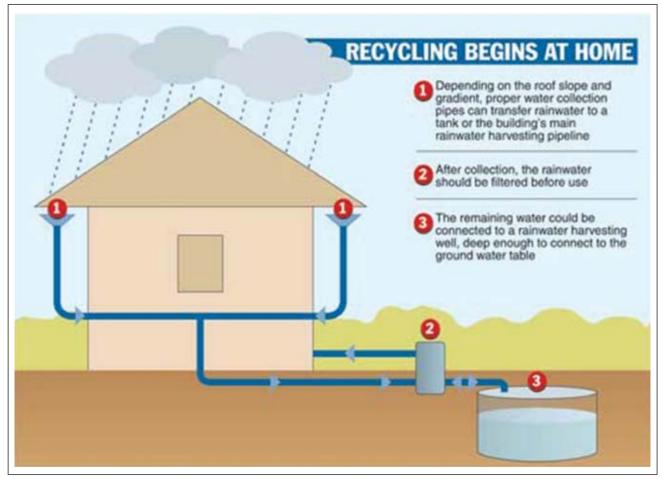
Reviving traditional water bodies such as **johads**, ponds, farm ponds and tanks and traditional water management practices like building step wells, underground tanks and even bamboo drip irrigation to ensure a consistent water supply.

For e.g. 1,700 farm ponds in villages in Northern Karnataka collect and store precipitation throughout the year and have the capacity to irrigate a five-acre land growing four short-term crops over six months. They have enabled farmers to boost both production and income as well as stave off the devastating effects of drought.



Construct lakes and sand pits: In one of the driest parts of Andhra Pradesh, four lakes and 25,000 sand pits capture every drop of rainwater that falls in the region. Whenever necessary, percolated water is retrieved from the sand pits using bore wells. The entire area is surrounded by trees and crops, turning it into an organic farm that is self-sufficient in water.

Rainwater harvesting: India is using only 35 per cent of the rainwater it receives. If rainwater harvesting projects are effectively implemented, 65 per cent of the rainwater which is wasted can be used. Rainwater provides a safe, and underutilised, alternative to traditional ground water sources. The latter can easily be contaminated by human, industrial and animal waste or unusable due to salinity, arsenic, or fluoride. Rainwater harvesting systems deliver a clean and reliable source of drinking water in the rainy season when diarrhoeal diseases are endemic, and if managed properly, a rainwater storage tank will serve as a dependable drinking water source throughout the dry season.

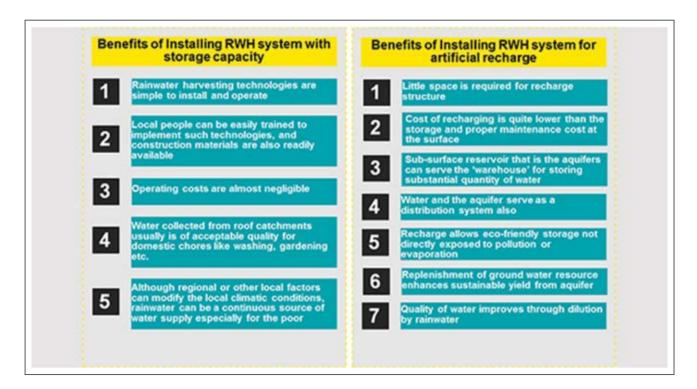


Courtesy: The Telegraph

Benefits of rainwater harvesting

- Helps participants adapt and mitigate early to a changing climate.
- Prepares them to handle water-stressed situations.
- Gives a connect with water.
- Will help to recharge aquifers.
- This will result in raising groundwater levels

- Setting up a rainwater harvesting facility in the school will have water sufficiency even in the dry seasons as aquifers are recharged.
- A model will be available for the community to emulate for water sufficiency.
- Water would be available to set up or expand the vegetable garden.
- An additional hands-on activity of learning to design and implement a water harvesting model.





Activity for Participants

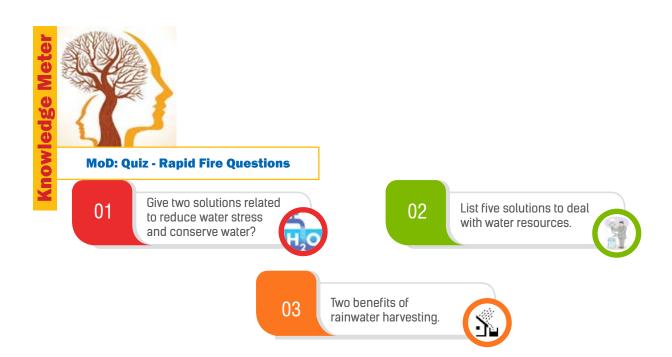
MoD: Role Play

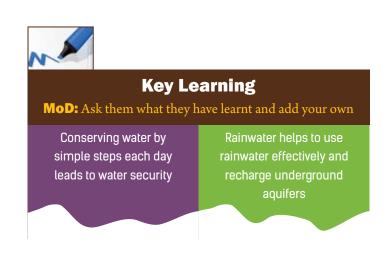
Situation 1

Taps are leaking in your school. Dry season is approaching and you notice that the school authorities have not solved the problem yet. In your role play, come up with a solution to this problem. Make sure to include such pertinent characters the headmaster, teachers, and other students.

Situation 1

Rainwater harvesting tanks are installed in your school and you have been enjoying the water for several months. Recently, the tap is broken on two of the tanks and no one has come to do repairs. In your role play, come up with a solution to this problem. Make sure to include such pertinent characters as the headmistress, other students, members of the parent-teacher association, etc.







SESSION 5 HINDON, WATER AND LIVES OF THE VILLAGERS: A PERENNIAL LINK

Learning Objective

To understand how the well-being of River Hindon is linked to the well-being of the community; How it is being polluted; How it can be kept clean

Introduction

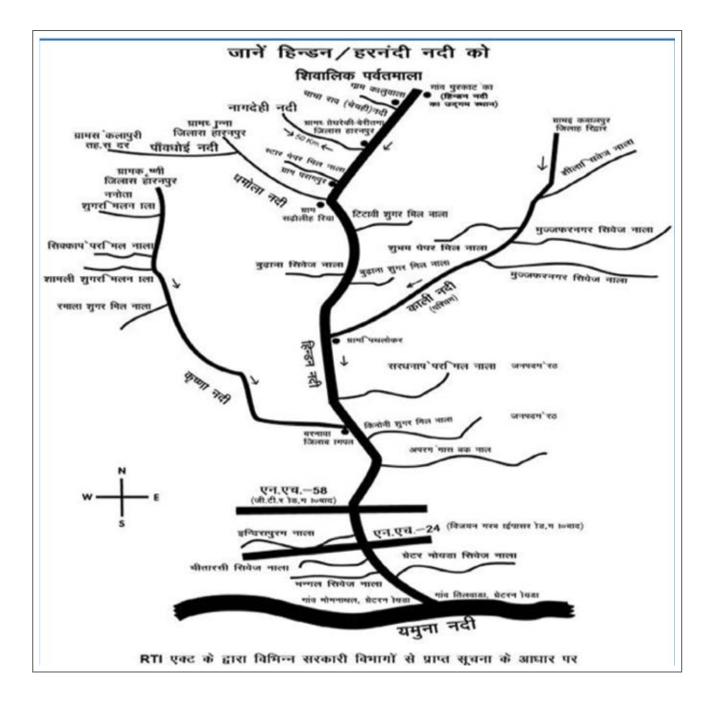
MoD:

- Ask people how do they think the River Hindon is polluted. List their answers on a White Board/ Black Board/ Flip Chart/ Chart. Share your points below.
- Put them into small groups. Ask the group to list two ways in which the polluted river is impacting their lives. Give them 5 minutes to come up with the answers. Each group must come up and read out their answers. Share your inputs from the notes below.
- Ask if they know any traditional songs related to the river. If yes, ask them to sing it. If not, give
 them an exercise: go back home and talk to your elders and ask if there any festivals related to the
 river. What are the traditional songs of that festival or in general, do their grandparents, aunts know
 any traditional river songs.
- Ask them to learn and share it with their learning groups.

Much of the upper stretch of the 400 km River Hindon is dry. The Kali and Krishni rivers, highly polluted tributaries of the Hindon, have been reduced to *nallahs*. The river gains in volume only after receiving waters from the Upper Ganga Canal, but the discharge of municipal and industrial wastewaters downstream makes it highly polluted.

According to the State Pollution Control Board stations in the area, around 98000 kilo litres of waste is dumped into the Hindon directly in addition to 85000 kilo litres of waste being dumped in its tributaries Krishni and West Kali rivers every day. The Hindon in turn pours this colossal amount of waste daily into the Yamuna.

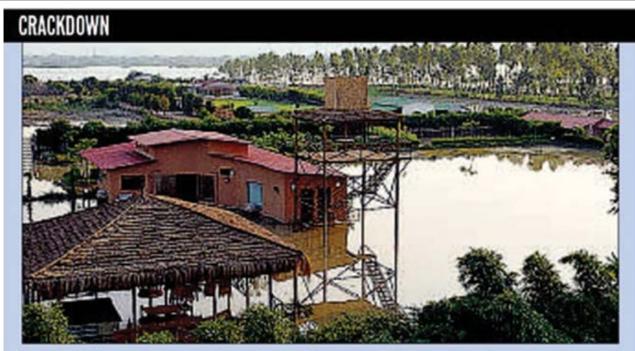




How Hindon is getting polluted

- Around seventy major polluting industries paper, sugar, distilleries, chemical industries and slaughter houses -draw large amounts of water from the River Hindon.
- They discharge untreated wastewater into it as well its main tributaries the Kali and Krishni.
- Illegal stone cutting on the banks of the River also adds to the pollution.
- Municipalities that fall in its way discharge untreated sewerage in these rivers. No wonder some refer to the Hindon as a 'trunk sewer of the urban towns'.
- Indiscriminate dumping of municipal solid waste and debris on the Hindon floodplains and burning of garbage is a major source of Hindon's pollution.
- The floodplain of the river is stuffed with unauthorised constructions.

- The croplands in the chemical based agricultural areas in the Hindon's catchment bring pesticides along with the runoff flow.
- Where population density is high, organic pollution dominates and where industries are more, heavy metal and inorganic ions load is more.
- The Star Paper Mill Drain right at the emergence of the river is particularly polluted.
- River waters are supposed to be restored to a level fit for bathing purposes but there is very little oxygen in the Hindon's waters
- A study indicates that the pollution figures for Hindon are way above permissible levels. It indicates a very high organic load in the river water, which makes it highly unsuitable for even bathing purposes.



Most of the farmhouses on the floodplains of the Yamuna and Hindon were submerged on Wednesday when the Yamuna swelled up and crossed the danger mark at 207m.
SUNIL GHOSH/ HT

September 19, 2012 The Uttar Pradesh govt directs then Gautam Budh Nagar district magistrate MKS Sundaram to demolish 319 farmhouses built illegally

October 22 State PWD minister Shivpal Singh Yadav is directed to take action against the farmhouses

May 20, 2013 The National Green Tribunal (NGT) directs the Uttar Pradesh, Haryana and Delhi governments to clear all concrete structures built illegally from the notified no-development zones on the NCR floodplains

June 22 Uttar Pradesh chief secretary Javed Usmani directs the Noida authority and the irrigation department to clear all kinds of encroachment by July 5

THE EXTENT OF ROT

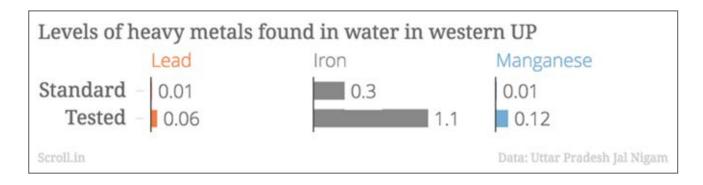
124 hectares still occupied by farmhouses on the floodplains

 IPS, IAS and politicians have farmhouses in the flood zone

The authority is giving notices of seven days to farmhouse owners

Problems in groundwater

- Groundwater in the area too is contaminated.
- Samples from handpumps in villages in close proximity to the Kali River (East), a tributary of the Hindon, identified heavy metal contaminants within both the river water and groundwater.
- Levels of chromium within drinking water supplies at Kudhla Village, Meerut district, are found to be 140 times the maximum permissible limit for drinking water set by the Bureau of Indian Standards for this heavy metal.
- Groundwater is used in these industries, but then, polluted liquid waste is dumped into the river, which causes it to be absorbed by the ground itself. This results in poor groundwater quality here.
- Thus, National Green Tribunal (NGT) had ordered sealing of handpumps in six western UP districts including Ghaziabad, Shamli, Saharanpur, Meerut, Baghpat and Muzaffarnagar.



Health concerns due to contaminated water

- Commonly observed illness include cancer, neurological disorders, digestive disorders and skin lesions and respiratory afflictions.
- These being caused due to heavy metal and pesticide poisoning.
- Heavy metal pollution is impacting aquatic life.

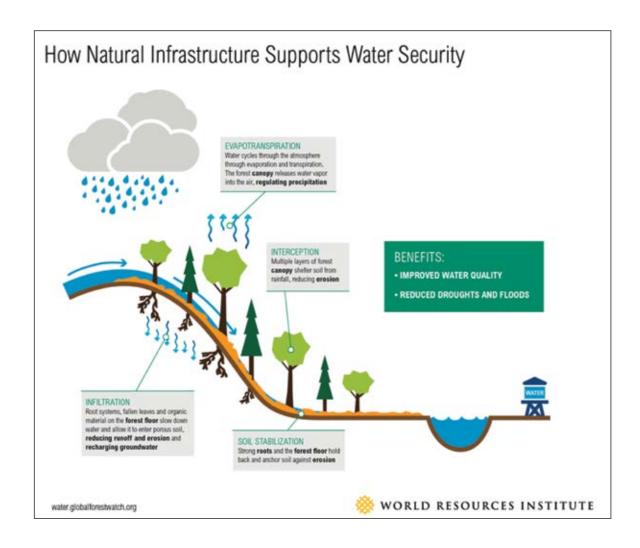
What are the solutions?

- Plant trees on river banks to create a natural filtration.
- Stop constructions on floodplains as it is a groundwater recharge zone.
- Houses must treat waste at local levels. Separate biodegradable waste at home and create your own compost.
- Farmers can use agricultural waste and animal waste to create compost at their own level and stop using chemical
 fertilisers. Organic waste ensures soil fertility for longer times and creates conditions where less water is used for
 crops.
- Water efficient farming methods such as drip irrigation and sprinklers must be encouraged.
- Flood irrigation must be stopped.
- Free use of submersibles must be stopped as it draws on groundwater.
- Do not use submersibles indiscriminately whenever needed. It leads to extra consumption of energy. Install a tank as per needs. Fill it up with water from the submersible. Then use water from the tank. This reduces energy usage and also prevents water wastage. Use an alarm to know when the tank is full.
- Do not use water submersibles to bathe animals. Use a bucket and mug or tank.
- Do not bathe animals in the river water. It release harmful germs in the water, and contaminates groundwater too. When people draw the groundwater harmful bacteria enter drinking water and cause water-borne diseases.

- Free river areas from encroachment.
- Separate the river and sewage.
- Reuse of treated water for agriculture.
- Local drains falling into the Hindon require periodical water quality testing.
- Put reports in the public domain.

How can these solutions be implemented?

- 1. Show the villagers via continuous communication campaigns that human activities such as bathing animals in the river, dumping garbage is causing the river to die and contaminating water.
- 2. Raise water literacy among people continuously by showing them how a polluted Hindon is causing water shortage and illnesses in their lives.
- 3. Make them understand how the illnesses mean more expense for the family, stress on the family members.
- 4. How the polluted water is lowering the quality of crops.
- 5. In the agricultural sector, build capacities of farmers to raise awareness how use of chemical fertilisers and pesticides is decreasing soil fertility and crop quality.
- 6. Get the people, children, youth and the community to plant more trees on rivers banks as they help keep the water clean naturally, recharge groundwater, stop soil erosion, lower the surrounding temperature and provide clean air.



- 7. Involve spiritual leaders in all these solutions as they are key influencers in rural India.
- 8. Revive emotional connect with river by brining kirtan mandlis to gather the community on the banks of the river.
- 9. Revive traditional river songs and involve women and community in the singing of such songs in schools during festivities.
- 10. School children can present dramas in school based on River Hindon, how it was the lifeline and how because it is polluted, it is making their lives terrible due to water-borne illnesses, water scarcity etc. The school plays should also highlight the suggested solutions.

Activity for Participants

MoD: Group activity, presentation, discussion

- Divide your participants into groups.
- · Give your participants 15 minutes.
- Ask each group to write down the names of two illnesses in the last one year that has happened in the family or neighbourhood.
- Ask them how much was the approximate cost incurred on the treatment.
- Let each group come and read out their answers.
- Discuss the reasons for the illness.
- Explain how illness increases the cost of living in a family.
- Ask them solutions on how they think it can be stopped.
- Supplement with your own solutions. Show linkage between healthy Hindon and healthy lives.







Key Learning

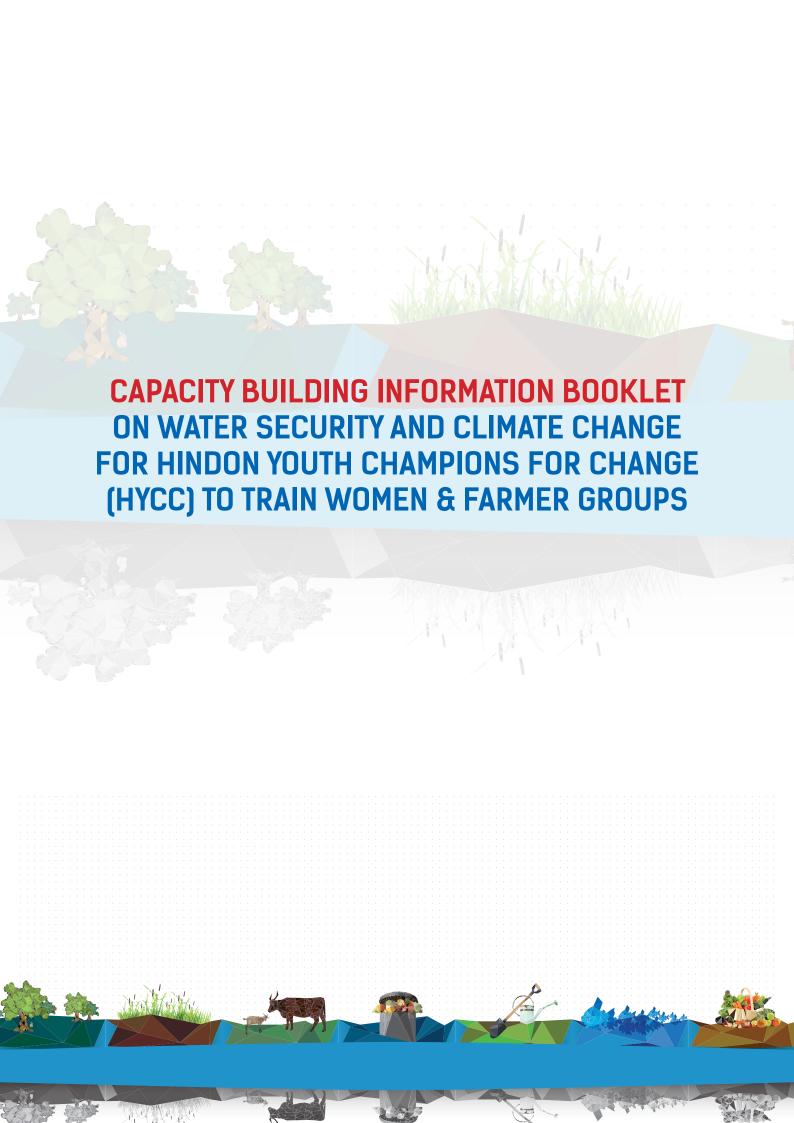
MoD: Ask them what they have learnt and add your own

Human activities such as wastewater from industries, construction on floodplains, stonecutting on river banks, bathing animals in the water, too much groundwater extraction is polluting the Hindon.

A dirty River Hindon is the cause of diseases such as cancer, skin and breathing problems, liver problems in the people.

We can take simple steps such as planting trees, reviving traditional bodies such as ponds, not throwing garbage in the river, using water efficient agricultural methods to revive the Hindon.





HYCC SESSIONS FOR WOMEN AND FARMERS

Session	Content to be covered	Objectives/ Outcomes	Page Nos.
1	Climate Change, Water	To show women and farmer	79
	Security and River	groups how climate change	
	Hindon	and water security issues are	
		closely linked to their lives,	
		the River Hindon, and the	
		solutions to these concerns.	

Learning Objective

- How climate change and water security are linked
- How both are affected and aggravated by human activities
- The solutions to deal with climate change and conserve water

Format

- A total of eight sessions with the two stakeholder groups of 40 minutes each totalling 240 minutes or four hours
- Breakup: Three sessions with farmers of 40 minutes each (40x3 = 120 minutes or two hours); three sessions with women of 40 minutes each (40x3 = 120 minutes or two hours)

Introduction

MoD:

 Discussion on the topics either as a round table group discussion or dividing participants into small groups and asking them to discuss and talk about the outcome of their discussions on the topic.





Climate change due to global warming will impact all areas of our life. Most importantly, it will impact the water cycle and the availability of water.

What is Climate Change?

- Climate change is a change in the usual weather found in a place. This could be a change in how much rain a place usually gets in a year. Alternatively, it could be a change in a place's usual temperature for a month or season.
- Climate change is also a change in Earth's climate. This could be a change in Earth's usual temperature. Alternatively, it could be a change in where rain and snow usually fall on Earth.
- Weather can change in just a few hours. Climate takes hundreds or even millions of years to change.
- Many human activities such as burning crops, cutting of trees, dumping and burning garbage, burning fossil fuels such as coal cause climate change.

What is Water Security?

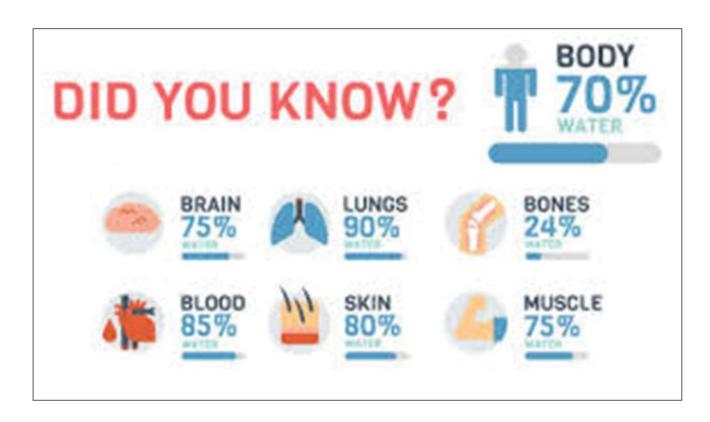
Water security means having access to sufficient quantities of safe water to be able to carry out our daily tasks such as cleaning, washing, cooking, bathing, using in our farms, and for all our work, which depends on water. Water that is consumed should be such that it does not cause us diseases.

How Climate Change and Water Security is Linked

Fresh water is very important for our survival because almost all our activities are dependant on water. But this precious resource is expected to become increasingly scarce in the future, and this is partly due to climate change.

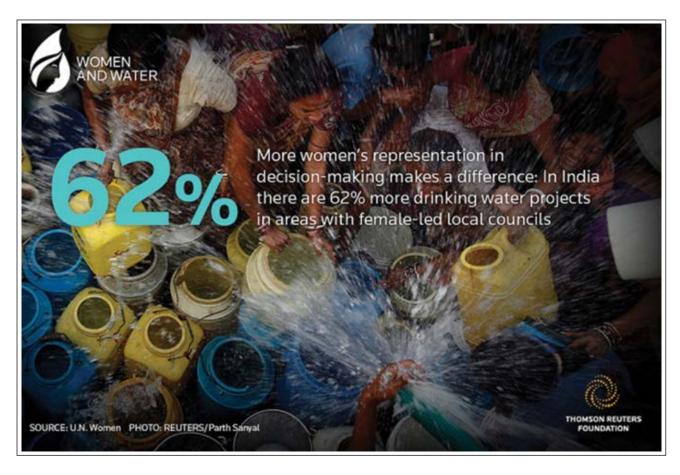
- When we cut trees, we release harmful CO2 into the air which makes the atmosphere warm and causes climate change. If we dump garbage, it releases harmful Greenhouse Gases into the atmosphere causing warming and climate change. If we use too many cars, they release harmful CO2 into the air causing warming and thus climate change. Industries release harmful smoke into the air causing climate change.
- Due to a climate change, monsoons become erratic. Sometimes there will be too much rain, sometimes too little. The River Hindon is largely a rain-fed river and is partially fed by groundwater aquifers. When there is too little rain, the groundwater aquifers are not recharged and the source of Hindon becomes dry.
- The smaller water bodies such as lakes that take water from the Hindon also dry up.

- Another effect of global warming and climate change is the increase in the amount of water that the atmosphere
 can hold. More water in the atmosphere leads to heavy rainfall. We do not have the ability to store and use so much
 water, immediately. The result: floods.
- Floods carry the pollution on the ground into the water bodies. We dump so much garbage around. We use chemicals in our fields. So during a flood, all these harmful chemicals and garbage go into the Hindon river making the water unsafe for use.
- Also, because we have cut down trees, the surface water does not get absorbed into the ground by the roots of the trees. So the water we get from the rain is wasted as run-off and groundwater is not recharged.
- Thus, our groundwater aquifers are drying up. We use the submersible very freely. Submersible pulls up water from the ground. What happens? Groundwater level falls further.
- Floodplains help to naturally recharge groundwater. But there is so much construction on the Hindon floodplains
 that the groundwater is not being recharged.
- We are not taking care of our traditional water bodies such as the johads and ponds. Due to climate change, when droughts occur, there will be no backup water in these water bodies. If there is water, it is so dirty that we cannot use it
- When we dig more than 30 metres deep, natural contaminants in the earth such as fluoride and arsenic are released into water polluting it. The result: skin and liver problems.



HYCC Train Women on Climate Change and Water Security

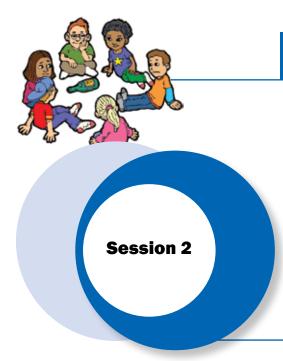
Objective: Establish the linkage between *Nadi*, *Neer* and *Nari* (River, Water and the Woman)



For Women

Women and Water

- Women are responsible for maintaining basic household hygiene and keeping themselves and their children clean without contaminating the stored water they need for drinking and cooking. Water scarcity affects women the most.
- Water-related illnesses at home increases the burden of responsibilities on the woman as she is the primary care
 giver.
- Access to enough good quality water is vital to protecting pregnant women from serious diseases such as hepatitis
 and sepsis.
- Women can manage water at home best. So, teaching a woman about climate change, its impacts on their life and its impact on water availability means that the training will be passed on to the child.
- The result: The child grows up to be an aware individual or a farmer.
- In India, there are 62 per cent more drinking water projects in areas with female-led councils. Women's involvement in the planning, financing, and upkeep of community water projects makes the projects six to seven times more effective.
- If women are water and climate change literate it creates an aware and empowered future generation on climate change and water concerns.



Activity 1: Role Play or Discussion

Situation 1: There is no water at home. As a woman, there are so many tasks related to water.

Group 1: How will you manage the day? What problems can arise?

Group 2: What will happen when your husband returns home and there is no water?

Group 3: What will happen when your children return from school and there is no water. Since there was no water, did you manage to cook food for the family?

Group 4: Your child has diarrhoea and there is no water at home. What will you do?

Group 5: You take the child to the doctor. What does the doctor say? What are the reasons your child has diarrhoea? Is it linked to a water-related infection?

MoD: One group, 30 women

- Divide the women into groups
- Explain that due to climate change, there is water scarcity. Monsoons did not happen on time. When they did, there was very little rainfall. There is no water coming from the submersible because the underground aquifers have dried up due to poor rainfall and so many people drawing water from the underground.
- The water in the tanks and ponds is very dirty. Many ponds are also dry because of poor rainfall.
- They cannot take water from River Hindon because it is very dirty. Garbage is dumped in the river and ponds. Animals are bathed in that water.
- No source of water is available.
- Ask them to act out the situations based on the understanding that there is no water.

Add your inputs and strengthen their solutions

- Later supplement with your inputs that they could buy water from the market. This means that their expenditure increases
- They can borrow water from a neighbour who has a water tank and has saved the water. This is what they should do in future install a tank instead of simply switching on the submersible.
- They can save water by bathing animals with a bucket and mug instead of always switching on the submersible.
 Doing this will also mean using less of the underground water and thus helping to maintain underground aquifer levels.
- The surrounding water is contaminated with garbage. There is someone in the village who segregates biodegradable
 and non-biodegradable waste and does not dump it in water bodies. This is a way to make compost at home and
 keep water bodies clean.





Activity 2: Illnesses related to water and how to keep drinking water safe

- Divide the women into groups
- Ask the women's groups to list down the illnesses they have had in their families or have seen in their neighbourhoods.

Discussion point 1: Once done, start a discussion on this topic:

- How many similar illnesses have there been in the neighbourhood?
- Can they see a pattern?
- Do they think the illness was caused by dirty water or contaminated water?

Discussion point 2: Safe drinking water

- How do they think they should keep the water they drink safe?
- What traditional methods do they know of keeping drinking water safe?
- What modern methods do they use to keep water safe to drink?
- Do they use RO Filters?
- Do they know if an RO filter is required for the type of water they get?
- Tell them that some RO filters take out all the essential minerals the body needs. Just because they drink RO water, it does not mean that it is the best quality water.
- Tell them that before installing an RO filter, they must ask the company executive to come, test the water, and see if an RO filter is really needed in their house.

Give them a task for the next day: Ask each one of them to talk to the elders at home and find out three things. **The task** is mandatory.

- 1. Have the monsoon months changed? If yes, what are the change months now?
- 2. Is the rainfall now less or more than earlier times?
- 3. What do the elders say? Why has this change happened? What has been the impact of this change?



Session 4

Activity 3: Carry over from previous sessions task on the three questions

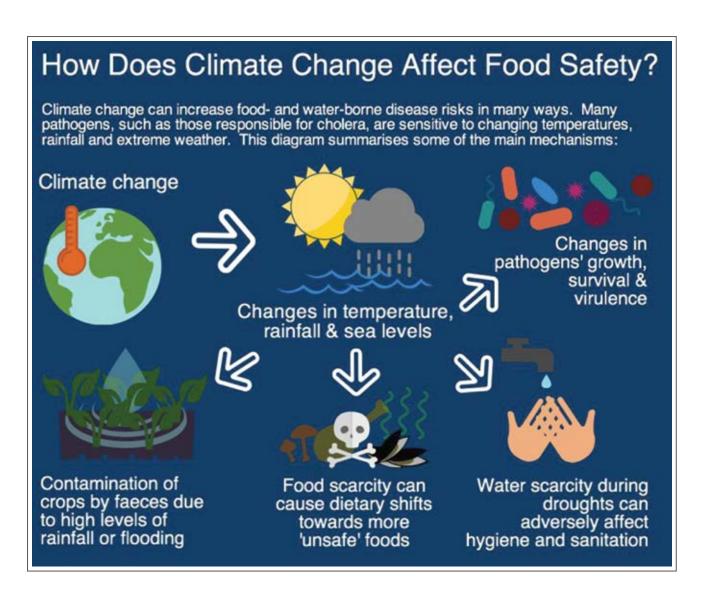
- Ask each woman to come up and share her findings.
- Next, divide the women into groups.
- Ask them to discuss why they think this has happened in the light of the background on climate change discussed with them.
- Next, ask them to suggest what they can do to adapt to such changes or mitigate such changes.
- Share solutions based on your knowledge of adaptation and mitigation.

HYCC Train Farmers on Water Security and Climate Change

For Farmers

Session 1: Climate Change, Water and Agriculture

- Agriculture contributes about 14 per cent of global annual GHG emissions and indirectly accounts for another 4–8 per cent from forest clearance. CO2 is generated by fossil fuels used in cultivation, transport, crop processing; pumping irrigation water; and in the production of nitrogenous fertilizer. Inefficient and excessive use of artificial N-fertilizer generates nitrous oxide (N2O), a short-lived but more damaging GHG. Methane, another potent GHG, is generated by ruminant livestock and wet rice cultivation.
- Climate change will significantly affect agriculture by increasing water demand, limiting crop productivity and by reducing water availability in areas where irrigation is most needed or has comparative advantage.
- Emerging competition between the environment and agriculture for raw water will be much greater, and the matching of supply and demand consequently harder to reconcile.
- Agriculture is the primary water guzzler. It swallows 85% to 90% of all water consumed in India
- Flood irrigation is used mostly in India and takes up lots of water. Water efficient practice is the need of the hour.





Session 2

Activity 1: Organic farming

The main objective of a brainstorming session is to introduce new topics and to discover new ideas and responses very quickly by having the group describing the topic or idea by listing an exhaustive list of related characteristics and conditions.

Why: Manure is decomposed organic matter from both plants and animals. It contributes to the fertility of the soil by adding organic matter and nutrients such as nitrogen. There are three types of manure. These are: a. Animal manure; b. Compost manure; and, c. Green/ Plant manure.

Decomposed matter is also a good way to create bio-gas. A good fuel alternative, bio-gas can also be produced from food waste, decomposable organic material and kitchen waste. It consists of methane, a small amount of carbon di oxide. This bio-gas can be used as an alternative fuel for cooking gas (LPG). By creating bio-gas, we ensure that the waste material is not thrown away as garbage. The digested slurry from the bio-gas unit can also be used in the kitchen garden to grow healthy plants with eco-friendly manure.

Benefits of Organic Manure

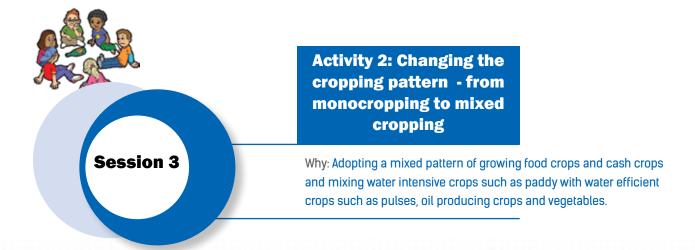
Livestock Manure Animal manure has been used for centuries as fertilizer for farming because it improves soil structure (aggregation) and holds nutrients and water. This improves soil fertility. Animal manure also encourages soil microbial activity, which promotes the soil's trace mineral supply, improving plant nutrition. It also contains some nitrogen and other nutrients that assist the growth of plants.

Unlike chemical fertilizers, **compost manure** have proven useful in sustainable agriculture as a means of climate change adaptation. Manure improves soil structure of the top soil through the supply of organic matter.

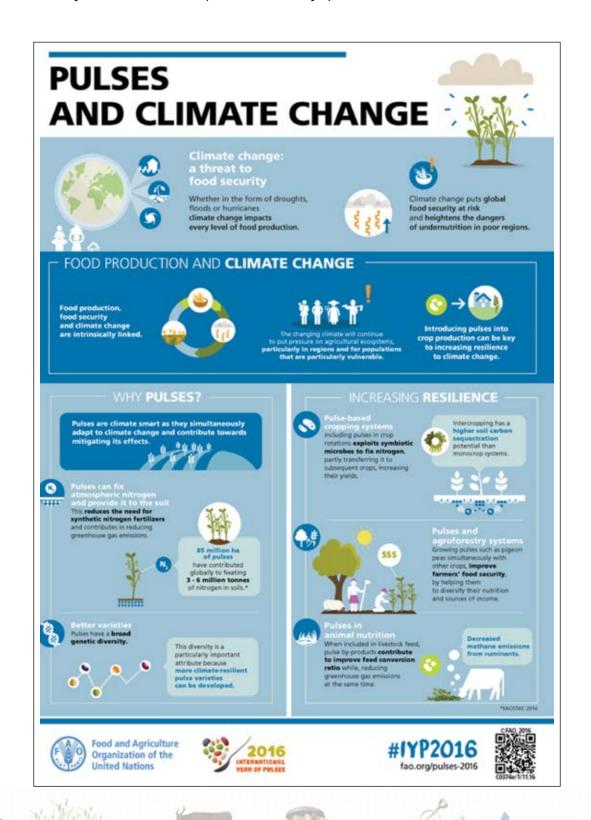
This in turn: a. Improves root penetration b. Improves permeability c. Improves water retention capacity d. Improves resistance to erosion e. Improves aeration f. Reduces leaching of soil nutrients g. Improves soil microbial activity.

Activity

- Ask farmers what kind of fertiliser they use in their fields.
- What drawbacks have they observed
- List down on chart/ paper
- Ask if they know of an alternative/ or how did their forefathers fertilise the fields
- Ask if they have heard about organic fertilisers
- Ask if they know how to get it, or make it
- Ask if they know its benefits.
- Share with them benefits of organic manure



- Tell that using such manure also means having to use lesser amount of water in fields, improving soil fertility. So it is related to water security and climate change.
- After this, ask them if they would be interested in knowing more about organic farming.
- Note down their queries.
- This can be shared with the gram pradhan who can then initiate composting in the gram panchayats and benefit the farmers. This post intervention activity can be followed up by HYCC.



Story of inspiration 1:

Mixed cropping for greater profits, Trichy:

Thirty-year-old S Kalaiselvan of Kovil Veerakkudi village in Pudukkottai district has been struggling to reap success in farming on his seven acres of fertile land. Due to persistent drought, groundwater levels had been falling. Climate change from global warming will make droughts and floods occur more often. Therefore, farmers need to be ready with a solution. What did Kovil do? He abandoned paddy cultivation. Instead of relying on paddy crop to make ends meet, he shifted to a mixed cropping system. The result: Eight times higher profit and food sufficiency for his family.

His method:

- Groundnut (moongfali) was taken as the major crop and inter-cropped with pulses like red gram (arhar), cowpea (lobiya), and mung dal in the field. Sesame (til) was also grown.
- Small onion (shallot) was also cultivated on the irrigation bunds.
- To avoid cattle from feeding on the cultivated pulses, sesame crop was grown around the standing crops to act as
 fence since cattle would not consume the crop owing to its sticky nature.

Benefits:

- Weed growth was suppressed in the mixed cropping system due to multiple cultivation occupying more space, thus
 resulting in the reduction of farm labour required for weeding.
- Problem with pest was also minimal when compared with the monocropping system of paddy cultivation.
- Since there was more space to cultivate other crops, he introduced cotton too.
- Mixed cropping system contributed food products such as pulses, small onions and oil extracted from groundnut
 and sesame for the family needs.
- In mixed cropping, if one crop fails, the loss can be compensated with other crops. Such assurance and risk reduction component are missing in the mono-cropping system.
- Mixed cropping system completely covered the entire field from direct sunlight and helped retain soil moisture of the field for longer time.
- Mixed cropping benefited him more than monocropping, from which he could get only paddy and rest of the food
 items he had to purchase from retail shops. Mixed cropping, on the other hand, contributed with the production of
 variety of food products for his own family and his day-to-day needs.

How he used the mixed crops

He was able to harvest eight bags of groundnut, out of which four bags were milled for oil for personal needs. In addition, 25 kgs of sesame was also crushed into oil and pulses. Onion and greens took care of his family requirement plus his income.

Profit comparison: Monocropping and Mixed cropping

According to him, the net income from mixed cropping is around Rs 59,700 from around 32000 sq ft, whereas the net profit from monocropping with paddy is only around Rs 7,315 from 17000 sq ft.

Water efficiency in mixed cropping

The biggest gain for him in mixed cropping system is the reduced number of days and time for irrigating the crops.

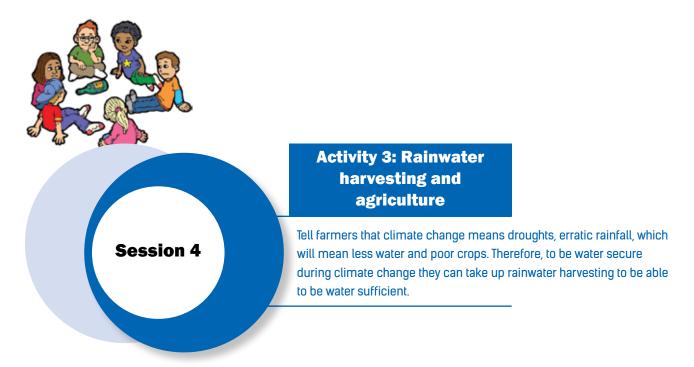
For the monocropping system with paddy he used to irrigate water once in four days if he had little rain, otherwise he has to irrigate once in two days and each time two-and-half-hours of irrigation for the paddy crops.

In mixed cropping system, irrigation is required once in 15 days. If there is little rain, irrigation is required once in a month and each time for five hours. Thus, he is able to save more of the water available in the well, which is the only water source.

Discuss with Farmers:

- 1. What is their experience with monocropping?
- 2. What problems do they experience with monocropping?
- 3. Have they tried mixed cropping?
- 4. What is their comparative experience, if they have tried?
- 5. If they have not, would they like to try mixed cropping?
- 6. If not, what are their apprehensions?

Note for Trainer: Record their answers, their apprehensions, their solutions to understand their responses



Story of inspiration 2:

Share this story with farmers as an inspiring example: Rainwater Harvesting

In one area of Madhya Pradesh, the Collector had a dream. It was a simple idea but within a year, it had proved to be very effective. He suggested farmers give over a tenth of their land to build a pond, which would capture the water in the rainy season and save it for the dry one.

Those who took up the plan benefitted almost immediately. Now they can grow crops in both seasons and are seeing good returns for their investment.

Such schemes are arising all over India but many farmers are reluctant to develop ponds on their precious land and cannot afford the structure.

Farmers need financial and technical support to overcome these hurdles.

In West Bengal the Mahatma Ghandi National Rural Employment Guarantee Scheme (MGNREGS) is being used to build *hapas* - small reservoirs to store rainwater. These have contributed to increased livelihoods.

Story of inspiration 3: Share this story with farmers as an inspiring example: Farm Ponds

Raghunath Singh Tomar of Harnavda village in Madhya Pradesh's Dewas district had to single-handedly construct a one-hectare (ha), two-metre deep pond to irrigate his farm. His brother was not ready to help; he thought the irrigation model was a waste of time. In a year the pond irrigated 15 bighas (one bigha equals 0.16 ha), yielding 350 kg of soybean per bigha compared to the average 150 kg yield earlier. This earned Tomar twice as much money as spent on building the pond (Rs 52,000). The feat won over the brother and the village.

Tomar had learnt the benefits of farm ponds years ago at a water management workshop organised by a non-profit in Rajasthan.

This small success story of 2004 had a ripple effect that has transformed the once-parched district in the state's Malwa region into a lush green area. Since 2005, about 6,000 farm ponds of sizes varying from a quarter to five ha have been dug. They have changed the agricultural landscape of Dewas where water crisis had affected crop cultivation. Water levels, which had dropped to 150 metres below ground, are now up, in some areas at less than 15 metres.

Today, the 300-odd family village of Dhaturia in Tonk Khurd tehsil has 150 ponds, all constructed after 2006. Every farmer in the village has paid back his loan within two years. "The entire landscape has changed," enthuses Jalodia. "We grow moong (Vigna radiata) and urad (Vigna mungo) along with soy and grains in the first crop. In the second, we grow chana and chandoshi wheat (fine quality, water intensive traditional wheat). We also grow potato, onion, and chilli. During summers, we grow vegetables through drip irrigation," Jalodia adds. "As for cattle, we used to buy fodder earlier, but now we sell it. Only the old folks play cards now," he adds.

Milk production has also increased with the rise in fodder supply. "The number of dairy cows in our village has risen by 100 heads since we started digging ponds," says a resident of Bhairwankhedi. This village of 70 families has few and small land-holdings, where the main source of livelihood are milk. The village has 18 ponds, and 10 more farmers are in queue for subsidy. What's more, the ponds have become a haven for buffaloes, the most popular dairy cattle in Dewas. They provide the cattle a good wallowing place. "Most of the buffaloes are yielding half to one litre of extra milk daily," says a farmer in Bhairwankhedi.

With assured water supply, many farmers are opting for orchard crops. In Chidavad village, which has 500 houses, 70 ponds have been dug. Several farmers have planted orchards of oranges, sapodilla (chikoo) and drumsticks.

Discuss with farmers:

- 1. Do they think something like this is possible here?
- 2. Will it work?
- 3. What obstacles do they foresee?
- 4. Would they like to take this idea to the gram pradhan.
- 5. HYCC can take this up as a sustainable effort post intervention based on feedback from farmers.

Note for Trainer: Record their answers, their apprehensions, their solutions to understand their response.

Understanding linkages

Throw an open question. Ask them to raise hands to answer.

- How do you water your crops?
- Do you think the water of the River Hindon is dirty?
- Do you think it affects the water you use to water your crops?
- Do you think the underground water used to irrigate crops is contaminated?
- How does it affect you as a farmer?
- Does it affect your crops and their quality?
- Do you think the quality of crops due to dirty water can cause illnesses in people

Note for Trainer: Record their answers, their apprehensions, their solutions to understand their response.



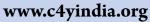






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