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# Pani Prasad and Friends

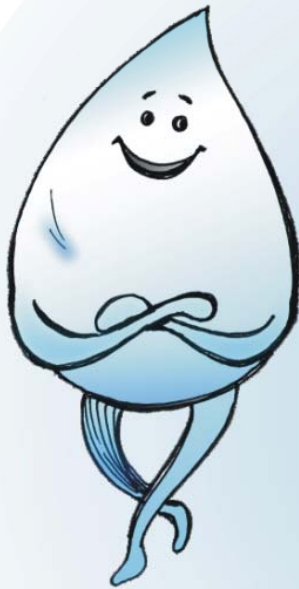


OFF TO THE HIGH ALTITUDE WETLANDS



WWF Nepal  
2009

# ***Pani Prasad and Friends***



**OFF TO THE HIGH WETLANDS**



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## ... We are Back!!!

Hello Once Again My Friends,

After a gap of many months, Pani Prasad is back again to take you on another exciting journey, full of adventure, fun and knowledge. During this time, I am sure you have been busy trying out new ways to save water, reducing water pollution in your house, school and community and also teaching others about the importance of water. Now, wouldn't you also like to know what our old friend has been doing all these months?

Well, Pani Prasad has been very busy visiting new places and learning new things. From climbing to the top of Mount Everest to calling on Red Pandas, Pani Prasad has indeed been on the go.

And now, he will take you along in his thrilling journey, where he is accompanied by his three friends just like you - Chandra, Matina and Dolma. Along with them, you will learn about a lot of new and exciting things.

For instance, did you know what 'Wetlands' are? What about Climate Change? And its impacts on all of us? Go ahead, flip the pages and meet up once again with Pani Prasad and embark with him on this special voyage where you will encounter new friends, new places and new ideas.

Happy Learning!

And don't forget, YOU are our Water Ambassador! So spread Pani Prasad's message and let everyone know how precious water is and how we can all work together to save it.

Thank you,

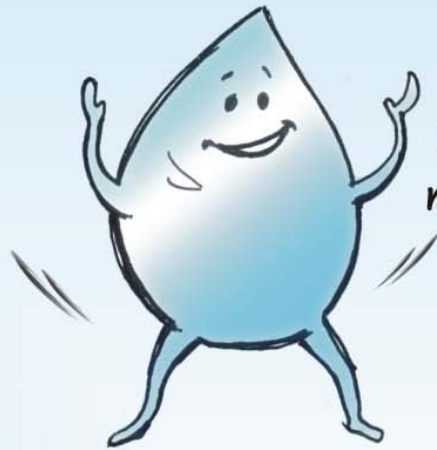


Anil Manandhar  
Country Representative  
WWF Nepal



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the page 3

# Let's Welcome Pani Prasad and his Friends



I am back!  
I had gone on a journey, and  
now I am meeting my friends.  
Do you want to meet  
them as well?



Namaste! I am Chandra, and I am from Janakpur. Pani Prasad and I have been friends for a long time. Pani Prasad and I share a lot of interests, such as our love for water, and our interest in protecting the environment.



Hello! My name is Matina, I am from Indrachowk, Kathmandu. I like to go trekking, and one day I hope to climb Sagarmatha. Maybe Pani Prasad will climb Sagarmatha with me. He has always been an encouraging and helpful friend.



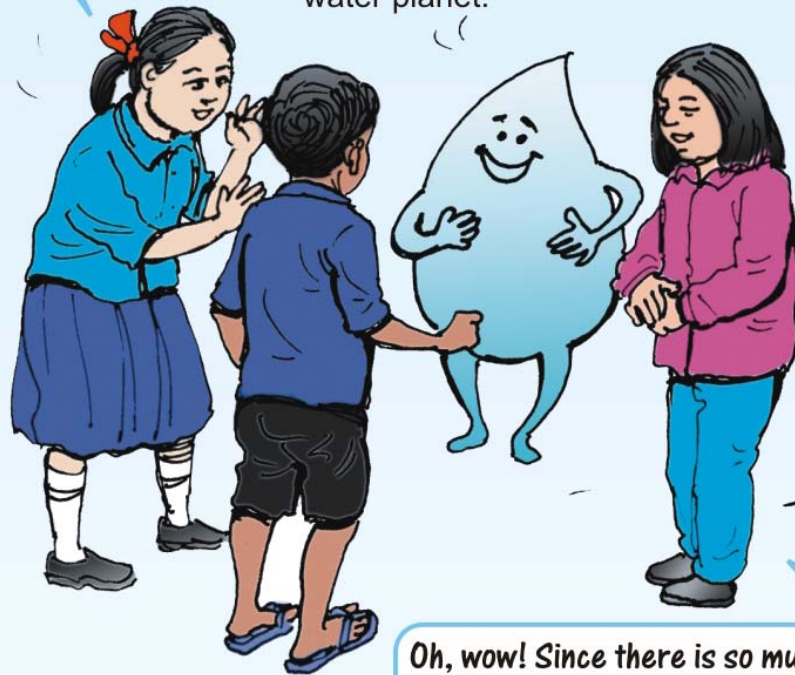
Namaste. I am Dolma. I am from Solukhumbu. I've been keeping busy with my eco-club. Pani Prasad is an important person in my life because I always learn so much from him. I'm sure I'll be learning a lot about his journey.



# Water and Water Resources

Hello Pani Prasad.  
How was your journey?  
Did you enjoy it?

Of course. It was wonderful. I got to know a lot of things about water. I learned that water is called the wonder liquid because life is not possible without water. Did you know that 70% of the earth's surface is covered by water? This is why the Earth is called the water planet.



Oh, wow! Since there is so much water on the Earth, we can use as much as we want!  
We will never run out of water.

Actually, that's not true; we will run out of water if all of us are not careful. Most of the water in our planet is saline or salty water and can't be used. Only 2.5% of the earth's water is freshwater. But not all of the freshwater is accessible; only 0.26 % of the world's water is accessible!

*We have to make sure we are using our water wisely!*



## Water Tower Himalaya



So, if the 0.26% of the water is finished, will we run out of water?



No, the water is recycled. The recycling of water is known as the water cycle. I also went to the Himalayas. You know the Himalayas store a huge amount of water as snow, glaciers, and glacier lakes. However, we can not use them directly as they are mostly frozen. But when this frozen water melts, it flows down and provide water to many streams, rivers, lakes and ponds. In this way, people downstream use water from the Himalayas. This is why the Himalayas are known as the “**Water Towers of Asia**”.

How about Nepal? Is the process the same in Nepal's Himalayas?

Yes, Nepal also gets much of its water from the Himalayas. So, Nepal has a lot of water, much of it is stored in glaciers and ice caps. Thus it is inaccessible. But when the frozen water melts, it flows into lakes and rivers.



*Glaciers and snow melt from the Himalayas account for about 50% of the water that flows down mountains. They are a major water source for 9 largest rivers in Asia.*

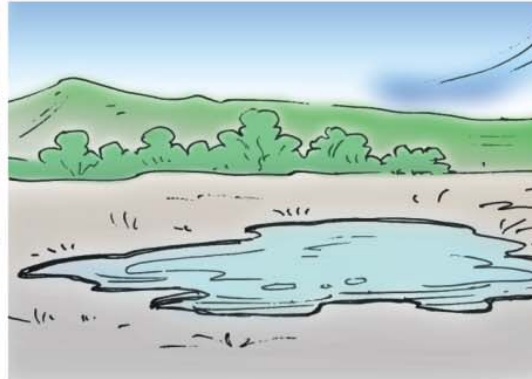
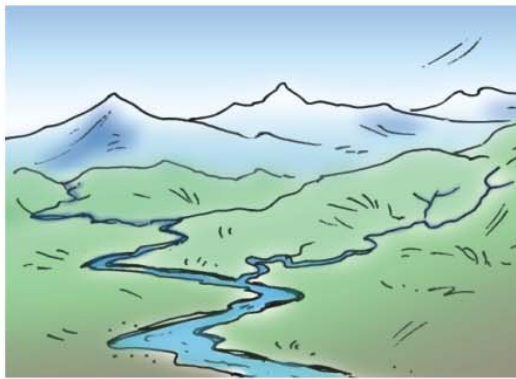




Besides the water from the Himalayas, what are the other sources of freshwater?



The water resources of Nepal are lakes, rivers, ponds, underground water, and rain water. Some of the uses of this water are for irrigation, drinking, and hydroelectricity. Nepal has a lot of water, but it isn't being utilized properly.



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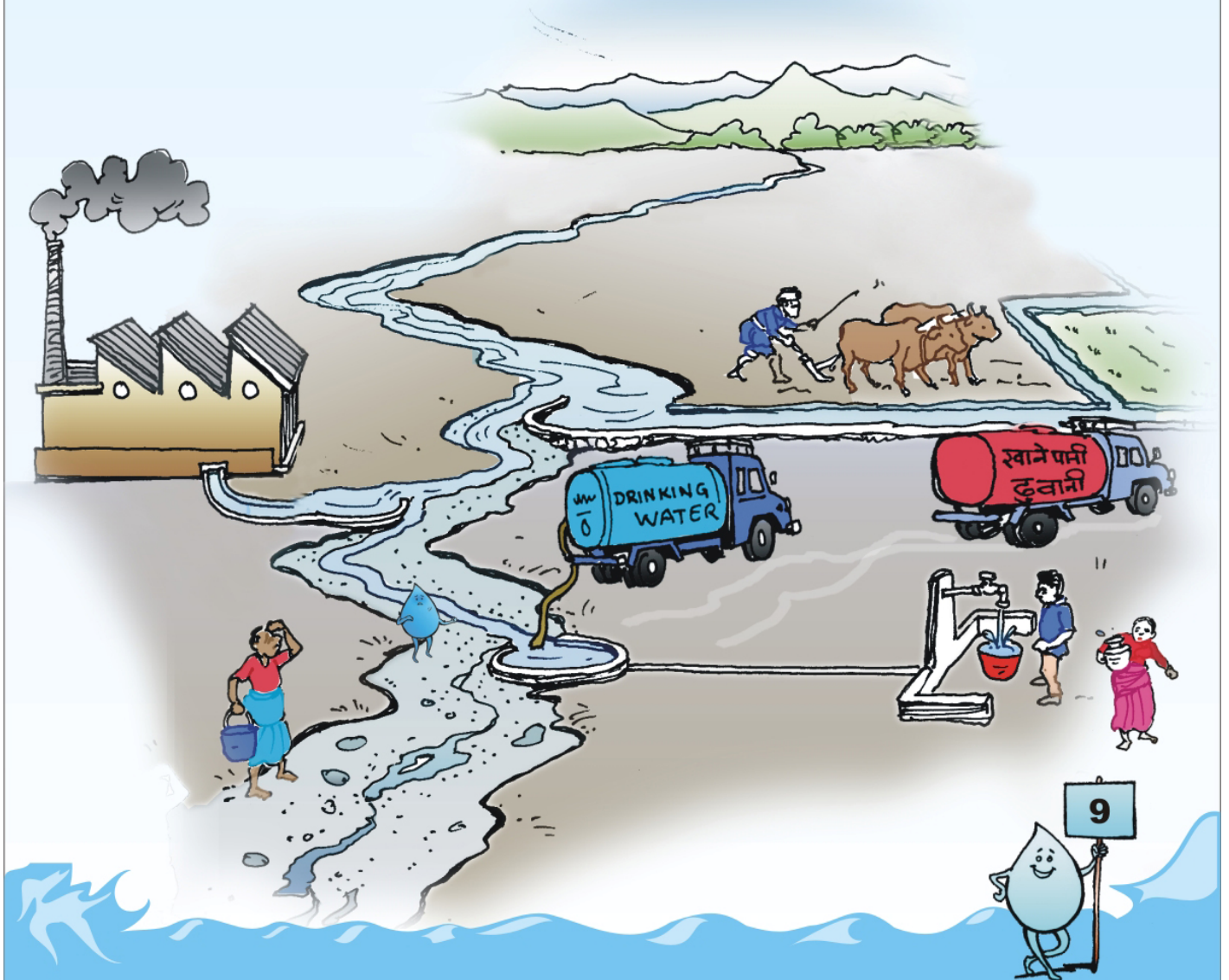


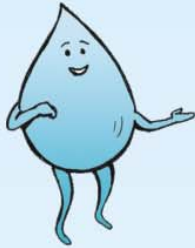
### Interesting Facts

- There are more than 3,000 glaciers and 2,323 glacial lakes in Nepal.
- Nepal is the 2nd richest country in terms of water resources, after Brazil.



We have over 6,000 rivers, but it is estimated that people do not get enough water for daily use. The water isn't potable either, which means that it isn't suitable for drinking. Water is also being used unsustainably, especially because the demand for water is increasing dramatically. Water is being extracted from river and groundwater sources at a frightening rate. This affects our freshwater ecosystems.





This is all so scary!



Yes. It is. Also, available water is polluted. People pollute water by dumping waste and using chemical fertilizer and insecticide. Other dangers to water systems are overgrazing and overharvesting of fuelwood, foddors, and timbers.

So, what should we do?



We must not pollute lakes and rivers with garbage and sewers, and not overuse natural resources. We should raise awareness about wise use and conservation of water.



# IT'S FUN TIME!



Can you find hidden words in the puzzle? Don't forget to look forwards, backwards, up, down even diagonally.

Glacier  
Freshwater  
Himalayas

Wonder liquid  
Wetland  
Water cycle

Pollution  
Pani Prasad  
Threats

Chandra  
Matina  
Dolma

Awareness  
Conservation  
Ecosystem

N	O	I	T	U	L	L	O	P	R	Q	S	T	A
E	C	O	S	Y	S	T	E	M	D	O	L	M	A
N	D	I	U	Q	I	L	R	E	D	N	O	W	T
L	N	R	O	W	A	G	D	P	S	Z	M	G	H
I	O	E	H	K	H	Y	Z	N	M	L	N	T	R
G	I	T	P	I	A	N	I	T	A	M	R	P	E
L	T	A	W	C	M	T	U	X	T	L	Q	A	A
A	A	W	R	V	L	A	R	O	R	O	T	Z	T
C	V	H	G	U	T	S	L	B	U	N	U	E	S
I	R	S	Y	P	B	F	H	A	R	S	M	I	W
E	E	E	W	A	T	E	R	C	Y	C	L	E	Q
R	S	R	S	S	S	E	N	E	R	A	W	A	I
H	N	F	R	C	P	B	R	Y	W	H	S	O	L
U	O	D	A	S	A	R	P	I	N	A	P	C	N
R	C	H	A	N	D	R	A	N	G	F	A	H	R

## How good is your knowledge on water resources?

1. Which is the longest river in the world?
2. Which river carries the largest volume of water in the world?
3. Which is the longest river in Nepal?
4. Name the biggest lake in the world.
5. Name the biggest lake in Nepal.
6. Name the highest waterfall in the world.
7. Which river basin do you live in?
8. Where does the water you drink come from? Which river? Lake? Reservoir?
9. How much of the world's water is available for human use?

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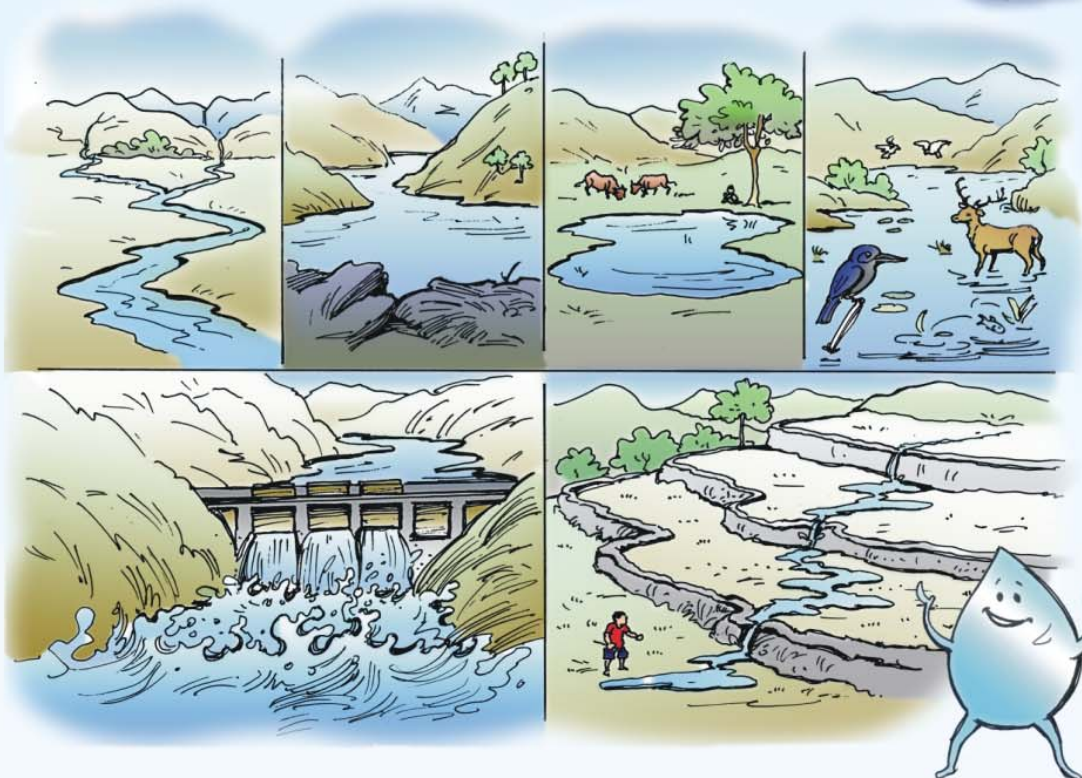


1. Nile River, 2. Amazon River, 3. Karnali River, 4. Caspian Sea, 5. Rara Lake, 6. Salto Angel Falls, 9. 0.26%

# Wetlands in Nepal

Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life. Wetlands are where water covers the soil or where water exists near or at the surface of the soil. To remember what wetlands are, look at the words, '**wet**' and '**land**'. They are areas where water and land meet. The Nepali word for wetland is "**Simsar**".

Do you know some examples of wetlands?



Wetlands can be natural or human-made. Rivers, streams, marshes, fens, peatlands, lagoons, swamps, bogs, ponds and freshwater lakes are examples of natural wetlands. Fish ponds, reservoirs, paddy fields and canals are human-made wetlands. There are 42 different types of wetlands in the world! In Nepal, there are 7 main types of wetlands:

**Lakes, ponds, reservoirs, river floodplains, marshlands, swamps and paddy fields.**

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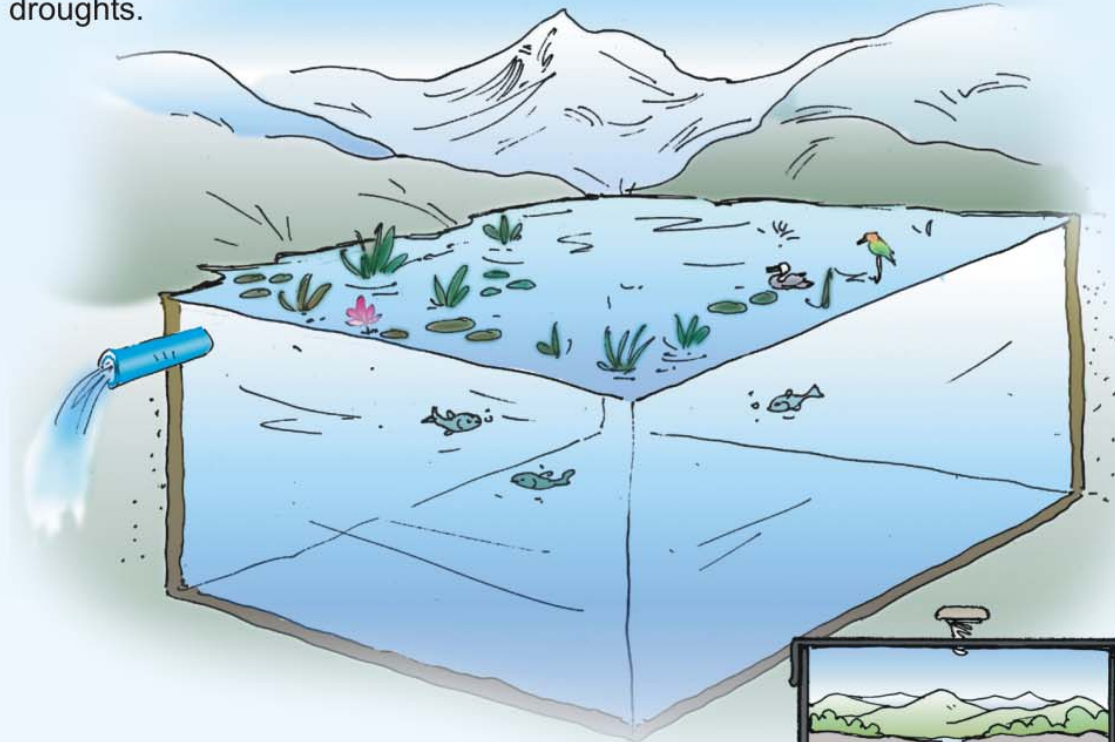


# Importance of Wetlands

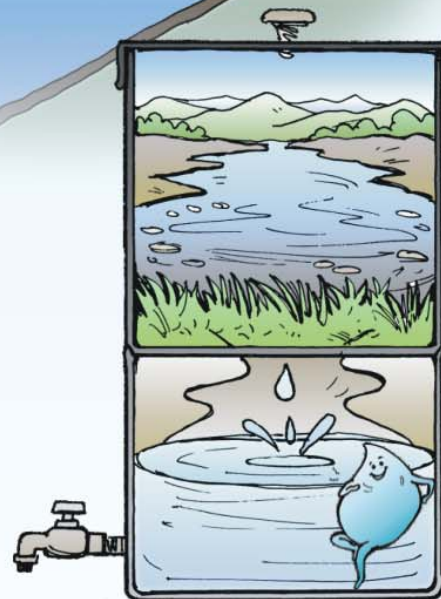
Wetlands are very important water resources.



**Wetlands store water and control floods and drought.** Wetlands absorb water as sponges and store it, slowing the rate of river flow which prevents floods and droughts.



**Wetlands act as filter system.** Wetlands purify water just like kidneys purify blood in our body. Wetlands also prevent soil erosion, retain sediments and recharge groundwater. They are used for water supply and for generating electricity.



## DID YOU KNOW?

An acre of wetland can store 4.5 to 6.75 million litres of water .





**Wetlands provide habitat.** Wetlands support diverse and rare plants and animals both living on land and in water. Wetlands are resting place for many migratory birds.



**Interesting Facts**

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-  Out of the 850 species of birds in Nepal, 190 of them are dependent on wetlands.
-  172 species of fish and 175 species of plants live in Nepal's wetlands.



**Wetlands for tourism and recreation.** Tourists visit wetlands for sight seeing and recreation. Tourism is very important to Nepal's economy.

**Wetlands provide resources.** People depend on the wetlands to obtain water, firewood, fodder, timber, fish and pasture.

**Wetlands are used for religious and cultural purposes.** Many temples and pilgrimages are near wetlands which are considered holy sacred.



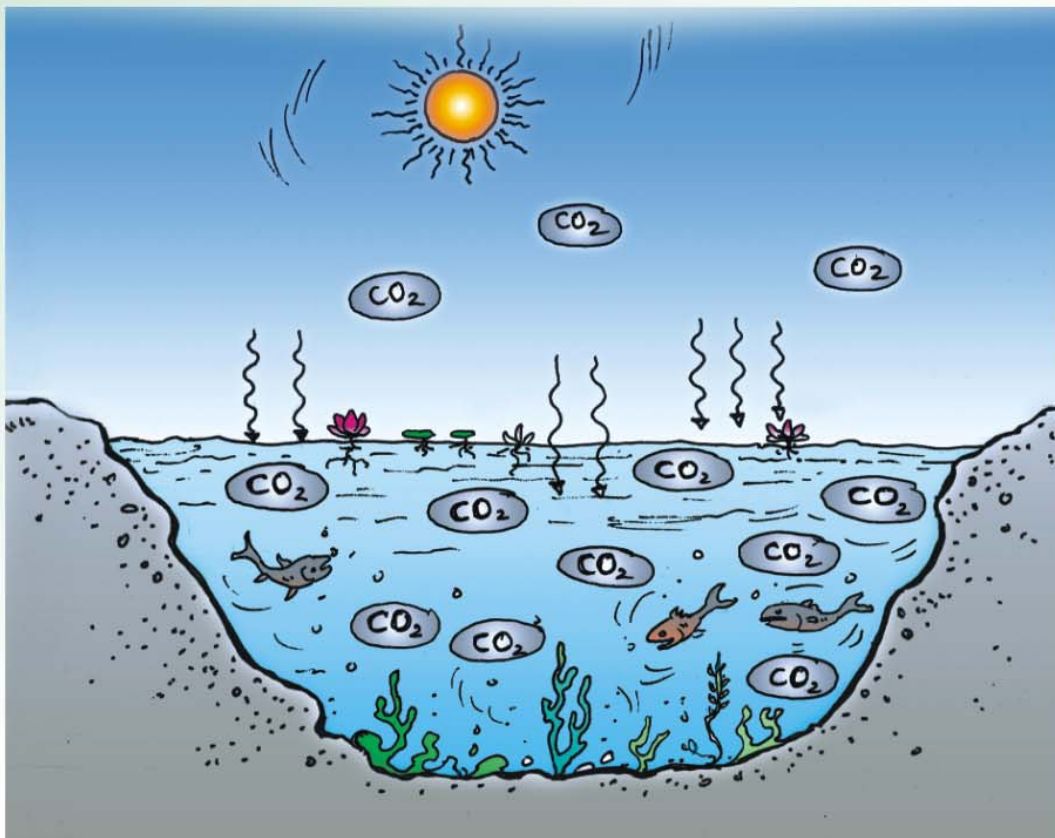
- It is estimated that wetlands occupy  $5.7 \times 10^6 \text{ km}^2$  of land area, roughly 6% of the Earth's land surface.
- Of this 6%, 2% are lakes, 30% bogs, 26% fens, 20% swamps and 15% floodplains.
- Wetlands cover 5% ( $7,437.56 \text{ km}^2$ ) of Nepal's surface area.





## WETLANDS AND CLIMATE CHANGE

*Many wetlands, especially peatlands are carbon reservoirs. Carbon is contained in plants and in litter, peats, soils and sediments. These carbon reservoirs may supply large amounts of carbon to the atmosphere if water levels is lowered. Wetland plants absorb carbon from the atmosphere through photosynthesis.*



*Wetlands simultaneously release carbon as carbon dioxide, dissolved carbon, and methane. Another important fact is that the losses of wetland areas due to conversion to agricultural land and land degradation also release CO<sub>2</sub> to the atmosphere affecting the global climate.*

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### **DID YOU KNOW?**

Wetlands constitute the largest global carbon reservoir storing about 770 Giga tons of carbon, exceeding tropical forest at 428 Giga tons.

Our wetlands are being threatened!

Wetlands in Nepal are under threat for various reasons.

- Fertilizer, pesticide, and herbicide pollution
- Impacts from water diversion and extraction
- Over-harvesting of firewood, fodder, and timber, and
- Climate change



**WE MUST RESCUE OUR WETLANDS!**



# Ramsar Convention on Wetlands



The Ramsar Convention on Wetlands is an international treaty for the conservation and sustainable utilization of wetlands. The convention was developed and adopted at a meeting in Ramsar (a town in Iran) on 2 February 1971 and came into force on 21 December 1975. The document is called "The Convention on Wetlands of International Importance, especially as Waterfowl Habitat", commonly called "**Ramsar Convention on Wetlands**".

**Nepal is one of the 158 contracting countries to the Ramsar Convention on Wetlands.**

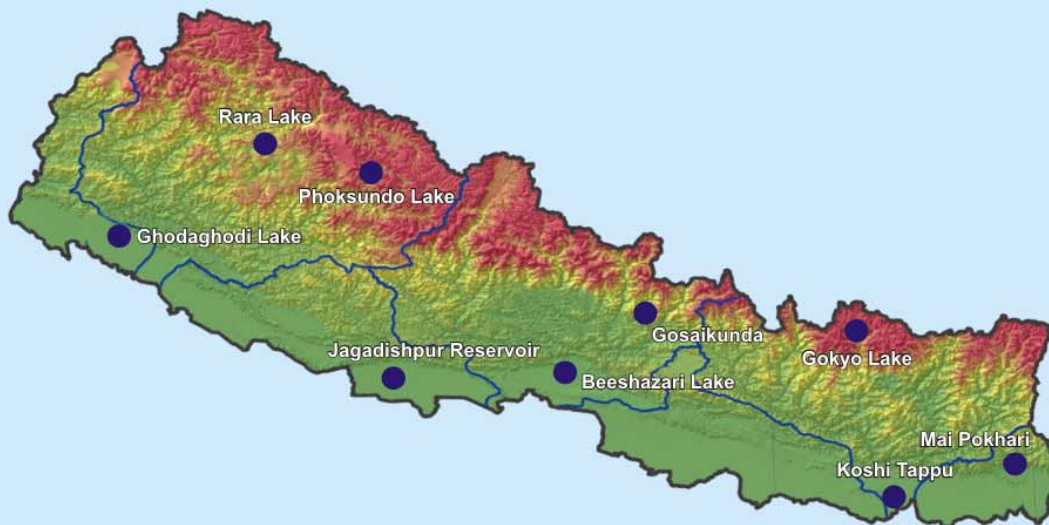
**The Ramsar List of Wetlands of International Importance** now includes 1,828 sites worldwide (known as *Ramsar Sites*) covering around 1,689,856.80 km<sup>2</sup>. The countries that signed the treaty must protect and properly use the wetlands that are included in list.



## **RAMSAR SITES IN NEPAL**


*More and more wetlands are being added to the Ramsar List in Nepal and world wide. It is important that the Ramsar List exists because it has brought awareness to people on the wetlands of Nepal and has helped protect them. Right now, only 9 wetlands in Nepal are listed in the Ramsar List of Wetlands of International Importance. These wetlands are:*


- *Koshi Tappu Wetland*
- *Jagadishpur Reservoir*
- *Ghodaghodi Lake Area*
- *Beeshazar and Associated Lakes*
- *Mai Pokhari*
- *Rara Lake*
- *Phoksundo Lake*
- *Gosaikunda and Associated Lakes*
- *Gokyo and Associated Lakes*



### **Interesting Facts**

 The nation with the highest number of Ramsar sites is the United Kingdom at 166

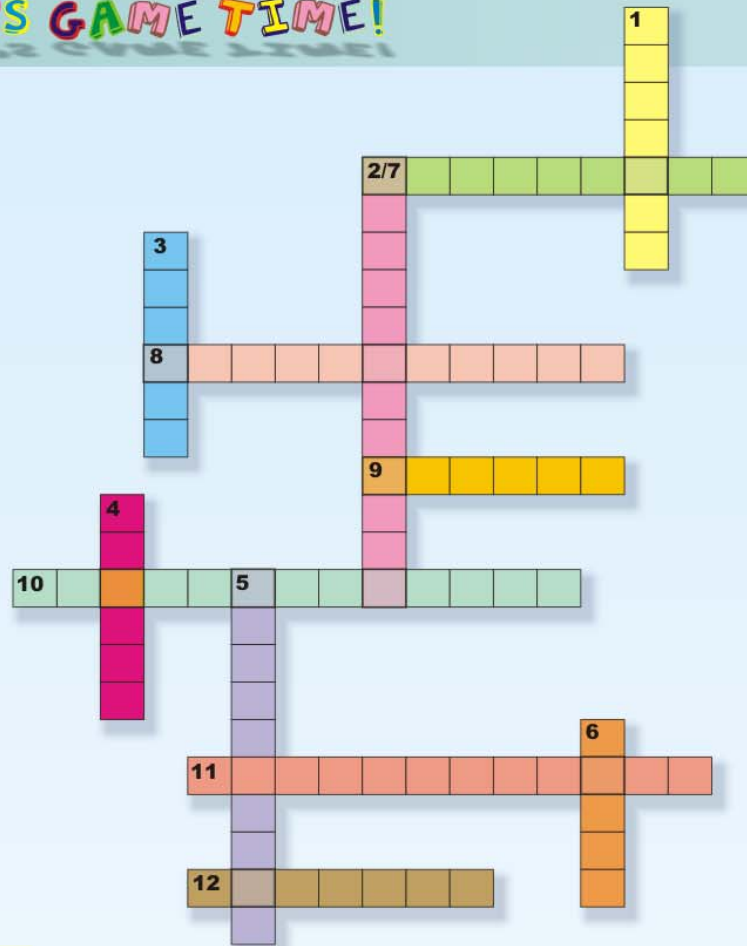
 The nation with the greatest area of listed wetlands in Ramsar is Canada, with over 130,000 km<sup>2</sup>

 In Nepal, two-third of the Ramsar Sites are within the Protected Areas.

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# IT'S GAME TIME!



## Down:

1. A \_\_\_\_\_ is an area where the water covers the soil or where the water exists near or at the surface of the soil.
2. Wetlands act as a \_\_\_\_\_ so that the water that leaves the wetlands is clean.
3. The \_\_\_\_\_ List of Wetlands of International Importance
4. Wetlands control \_\_\_\_\_ by slowing down the rate of water flow.
5. People depend on wetlands for their \_\_\_\_\_, such as for agriculture.
6. There are \_\_\_\_\_ different definitions of wetlands in the world.

## Across:

7. Wetlands complete the \_\_\_\_\_ as nutrition is passed on from one species to another.
8. Wetlands prevent \_\_\_\_\_ due to the roots of vegetations
9. The Nepali word for wetland is \_\_\_\_\_
10. Wetlands counter-act \_\_\_\_\_ by absorbing CO<sub>2</sub>.
11. Wetlands are rich in \_\_\_\_\_ since they support diverse and rare species.
12. People visit wetlands, making them a site for \_\_\_\_\_.



Down: 1. wetland 2. filter system 3. Ramsar 4. floods 5. livelihood 6. fifty  
 Across: 7. food chain 8. soil erosion 9. simsar 10. global warming 11. biodiversity 12. tourism



## How healthy is your wetland?

Visit a wetland near your home or school and observe the area thoroughly. Then fill out the following.



1. Name of the wetland: .....
2. Location: .....
3. Name five animals that live in and around the wetland:  
.....
4. Name five plants found around the wetland:  
.....
  - A. Type of wetland  
 Seasonal       Permanent       Temporary
  - B. Source of water  
 Natural       Artificial
  - C. Transparency  
 Clear       Slightly turbid       Highly turbid
  - D. Artificial color  
 Yes       NoIf yes, mention the color(s) and find out the source or make your own hypothesis on it  
.....  
.....



E. What kind of human activities are there?  
 .....  
 .....

F. Estimate the percentage of the following. Use the table below to score the different categories.

	<u>Percentage (%)</u>	<u>Score</u>
a. Plant cover	.....	.....
b. Exposed soil V	.....	.....
c. Pug marks (of animals)	.....	.....
d. Invasive weeds	.....	.....
e. Undesirable plants	.....	.....
f. Dead plants in water	.....	.....
g. Garbage pollution	.....	.....

**Calculate the Total score** .....

Percentage	0-20%	21-40%	41-60%	61-80%	81-100%
<b>a.</b>	1	2	3	4	5
<b>b.</b>	5	4	3	2	1
<b>c.</b>	1	2	3	4	5
<b>d.</b>	5	4	3	2	1
<b>e.</b>	5	4	3	2	1
<b>f.</b>	5	4	3	2	1
<b>g.</b>	5	4	3	2	1

Based on the total score, rate your wetland

Total score	15	25	30	35
Description	Unhealthy	Okay	Very good	Healthy

If the rating of the wetland is '**Unhealthy**' or '**Okay**', what can be done to make the wetland healthy? And how can we manage it?

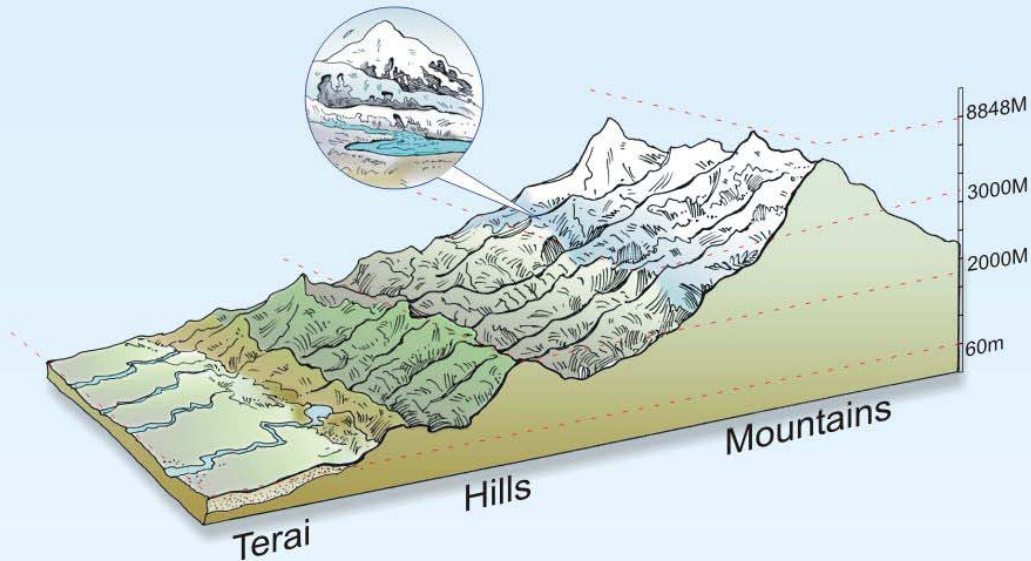
.....  
 .....  
 .....

*Draw a sketch or take a picture of the wetland and clip it on the information board of your school along with your report.*



# High Altitude Wetlands (HAWs)

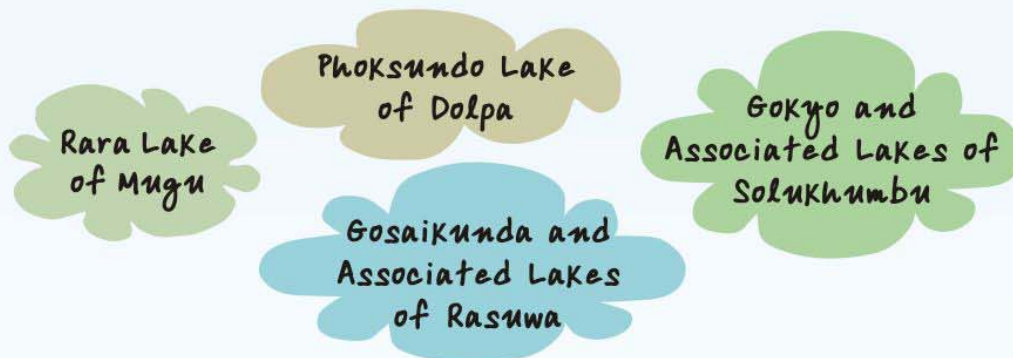
**High Altitude Wetlands (HAWs)** are those wetlands above 3,000 metres. Examples of high altitude wetlands are lakes, rivers, ponds and glacial lakes.



There are many high altitude wetlands in Nepal. Some examples are:

- ▶ Panch Pokhari
- ▶ Gokyo
- ▶ Shinjema Tal
- ▶ Gosaikunda
- ▶ Damodar Kunda
- ▶ Phoksundo
- ▶ Rara Lake
- ▶ Khaptad Daha

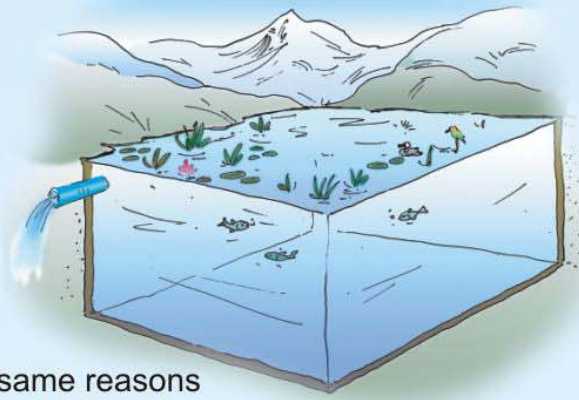
Among these, four are listed in the Ramsar List. They are:



There are many more wetlands that still need to be included in the Ramsar List!












## Importance of High Altitude Wetlands

High Altitude Wetlands are important for the same reasons as wetlands, which Chandra listed previously. Recall that wetlands are important because they:

-  Provide habitat to wildlife including rare species
-  Control floods
-  Act as a filtering system
-  Have religious and cultural significance
-  Are sites for tourism and recreation

*HAWs are especially important!  
They not only affect animals,  
birds, plants, and humans living in  
high altitude mountains,  
but also those living downstream.*





## FIVES OF HIGH ALTITUDE WETLANDS

- I. Mammals** : 1) Snow leopard 2) Musk deer 3) Brown and Black bear 4) Lynx and 5) Water shrew
- II. Birds** : 1) Ibisbill 2) Wood Snipe 3) Eurasian Woodcock 4) Ruddy Shelduck and 5) Baikal Teal



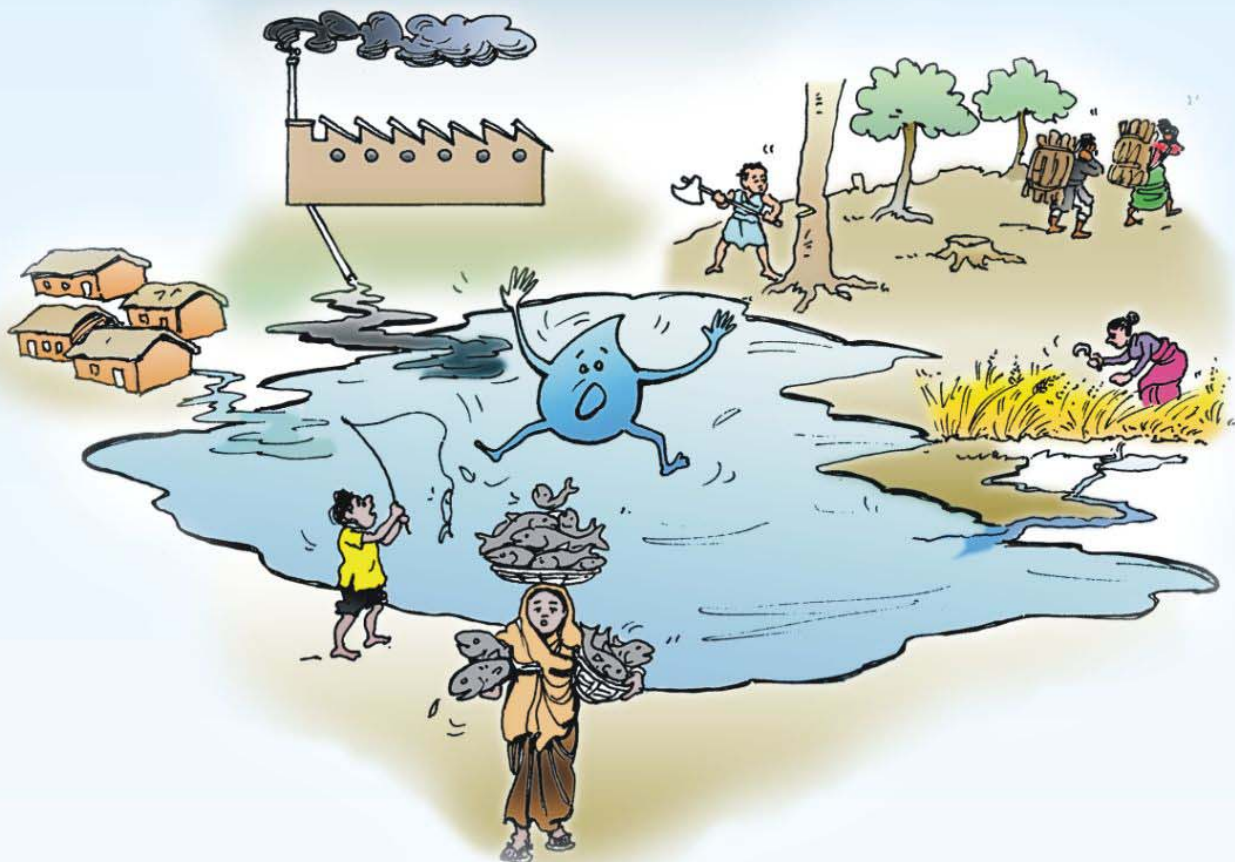
- III. Medicinal herbs** : 1) Panch Aunle 2) Mamira 3) Himalayan wild garlic 4) Sea buck-thorn and 5) Red myricaria
- IV. Ethnic groups** : 1) Bonpo Bhotia, 2) Kar Bhotia 3) Tamang 4) Sherpa and 5) Limbu
- V. Traditions** : 1) Damphoo folk dance 2) Sherpa folk dance 3) Thread ceremony 4) Sacred dips and worship and 5) Shamman's rite



# Nepal's HAWs under threat!

**Overgrazing:** With increase in human population and livestock numbers, the pastures near the HAWs are heavily grazed by animals like yak, sheep and horses. This results in soil erosion and sediment load in wetlands.

**Pollution:** HAWs are polluted from garbage, litters, and human waste from tourists and pilgrims. These pollutants damage the wetlands and its surrounding areas.



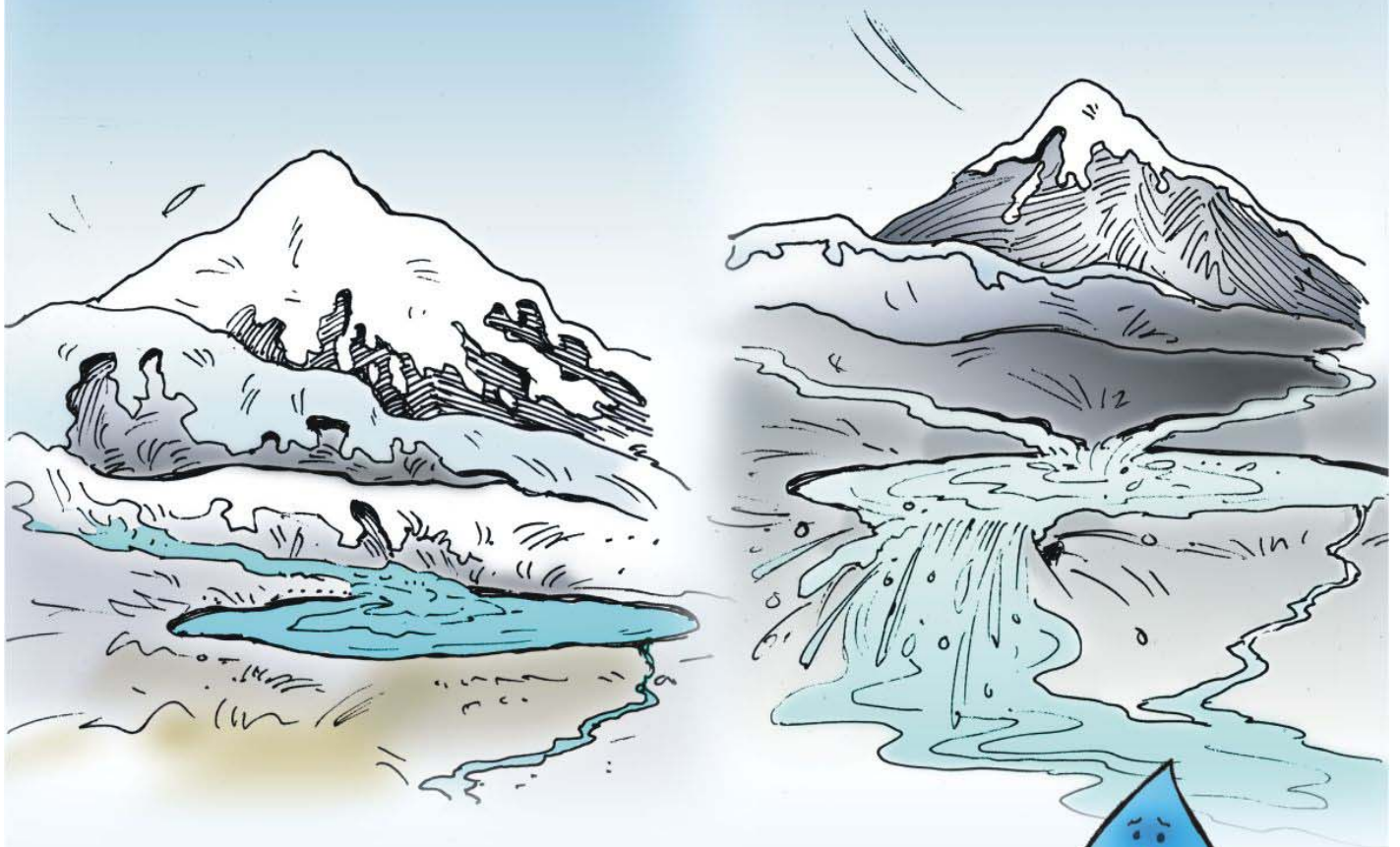
**Deforestation:** HAWs are also affected by deforestation which happen because people cut trees for cooking, heating, fuel for cheese and dairy factories and medicinal herbs.

**Hunting and poaching:** People in mountains are involved in hunting and poaching of various wild animals including endangered ones like musk deer and red panda.



**GLOBAL WARMING** also poses a serious threat to the HAWs.

This is because increase in temperature can melt glaciers quickly causing huge floods. Later, the glaciers retreat, drying up the water



If the water is dries up  
where would you get your water from?



*The high altitude wetlands in Nepal are the sources for Nepal's major rivers basins: Koshi, Karnali, Gandaki, and Mahakali. HAWs accumulate water during the monsoon and winter seasons. During the dry season, they release this freshwater to about 1.5 billion people all the way to China, India and Bangladesh.*



## Let's Make a Clay Model of HAWs



### You need:

- White cement (5 kg)
- Fevicol (1 kg)
- Water colour and brush
- Oil colour knife (or make one or two yourself out of hard metal sheet)
- A small container
- A blackboard or wooden board (2' x 1')



### Now,

- 1) Take about 1 kg of white cement and 200 g of fevicol. Mix them thoroughly in a container using a spoon until a thick paste is formed.
- 2) Apply the mixture on the board gently until the layer becomes about 6" thick. Apply more paste on one side to create the structure of high



Fig 1.



Fig 2.



Fig 3.

land (Fig 1).

- 3) Make the shape of high Himalayas, mountains, lakes, rivers and waterfalls (Fig 2).
- 4) Keep the structure in the shade for two to three days until the structure becomes concrete solid. Do not keep it in the sun to dry since this will cause cracking!
- 5) After the structure has dried properly, apply colour to highlight the snow-capped mountains, lakes, glaciers, rivers and waterfalls (Fig 3).

*Your model is ready! Show it to your friends and teachers.*

*Keep it in your science class, library or any part of your school for demonstration and decoration.*



# Nepal's High Altitude Wetlands in Ramsar List

## I. GOSAIKUNDA

Last year, I went with my father to Gosaikunda for Janaipurnima festival. I learned so much on my visit.



Gosaikunda Lake is located inside Langtang National Park in Rasuwa district. It is one of the world's highest freshwater lakes! The water from Gosaikunda feeds the Trishuli river which generates electricity. I even saw the hydropower plant on the Trishuli River on my way to

Gosaikunda!

Gosaikunda is an important pilgrimage during Janaipurnima and Gangadashahara. Gosaikunda receives around 20,000 Buddhist and Hindu pilgrims every year.

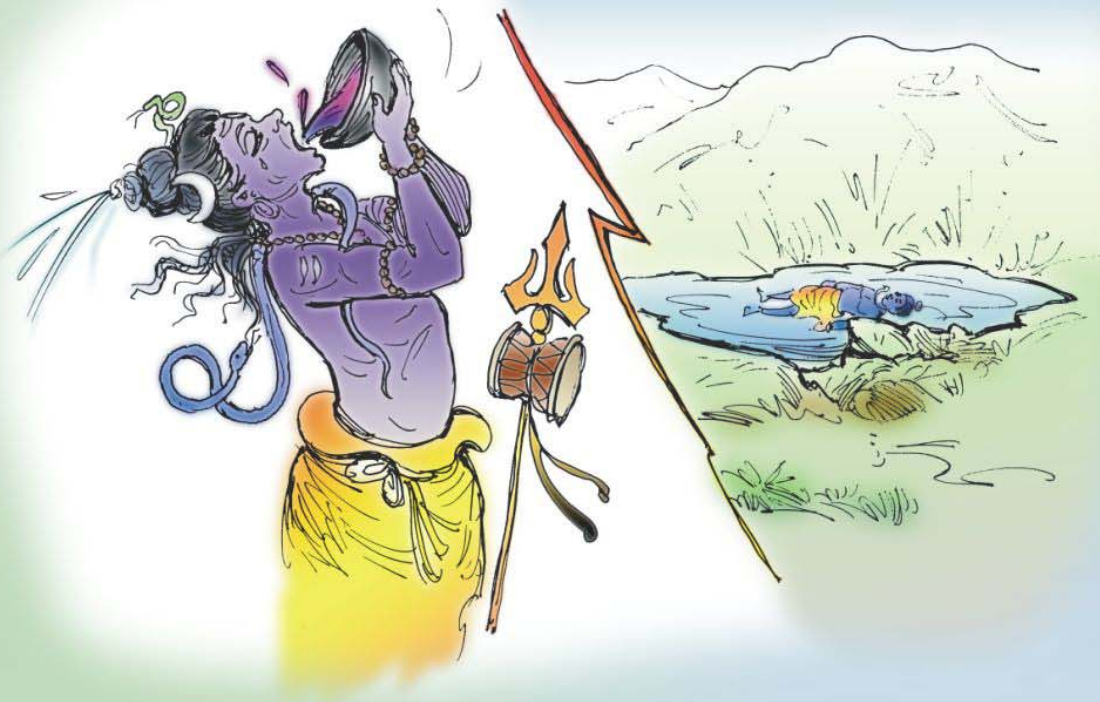
Although tourism and pilgrimages are important, they also create some problems. Tourists and pilgrims do not dispose of waste properly. They pollute the lake disposing food, waste and flower.





An old man told me an interesting story about the formation of the Gosaikunda Lake.

One day, Lord Shiva's wife, Parvati, asked her husband to stir the ocean so that something delicious would come out, just like by churning milk produces butter. Instead of something good, poison was produced!



In order to save the world, Lord Shiva drank this poison. Sadly, even Lord Shiva became sick. So, he decided to head to the Himalayas, where he hoped the cold air would help him recover. However, upon reaching the Gosaikunda area, he became incredibly thirsty. He struck his trident on the earth and out poured water, forming the lake Gosaikunda from which Lord Shiva quenched his thirst. Even today, Lord Shiva is believed to be resting in Gosaikunda. Many pilgrims come to visit him here, believed to be his resting place.

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## 2. GOKYO

I've been to the Gokyo Lake when I had been to my home during my summer vacation.



The Gokyo Lake series is located in the Everest region consisting of 6 main lakes. The lake is the source of the Dudh Koshi River, which flows from Cho Oyo, the seventh highest mountain in the world. The Dudh Koshi River is the sub-basin of the Koshi River which flows into the Ganges river basin.

Many animals are found here like Snow leopards and musk deer in winter. Sadly, the different species of flora and fauna are under threat or endangered.

Gokyo is sacred for both Hindus and Buddhists. Since it is one of the most popular routes to Everest Base Camp, tourism is a big source of livelihood for the residents of the area.

Apart from pollution caused by tourists and pilgrims a major risk for Gokyo is the potential for a glacial lake outburst flood (GLOF), which can be devastating.



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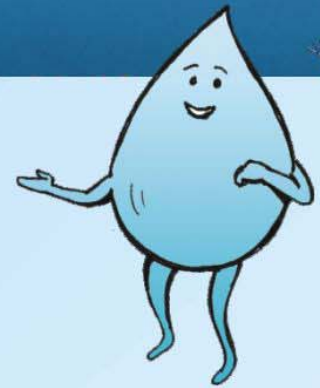




### 3. RARA



Rara Lake is the one of the main tributaries to the Ganga River. The lake is also the origin of the Khater (Nisa) Khola, which later joins the Karnali River.



Rara Lake and its surrounding is the habitat of musk deers, red pandas, himalayan black bears, and snow leopards.

In its surrounding there is a famous temple of Thakur Baba's, a local diety. It is believed that the Thakur baba threw an arrow to discharge the lake's water to lessen the potential damage caused by flooding.

Like the other HAW sites mentioned, the threats found in Rara Lake are overgrazing and unsustainable harvest of firewood and fodder. Rara also faces problems due to erosion and pollution from sewage and solid waste.

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#### Interesting Facts



*Rara Lake is Nepal's largest lake.*



*The dialect spoken in the Rara Lake area is thought to be the origin of the Nepali language.*



## 4. PHOKSUNDO

I saw the Phoksundo Lake when I visited the Shey Phoksundo National Park, The lake is Nepal's deepest and second largest lake.



Phoksundo Lake contributes water to one of Nepal's highest waterfalls, which is 167 m tall.

Shey Phoksundo National Park is home to the highest flying butterfly in the world, *Paralasa nepalaica*. During winter, musk deer and snow leopards make Phoksundo area their home. Grey Tibetan Wolves can also be found in the area.

Bon-po, a pre-Buddhist form of Tibetan religion founded 18,000 years ago is still practiced in this area. Many stupas and a gumba are also found near the lake.

Overgrazing, unsustainable collection of natural resources, domestic pollution and improper waste disposal are some of the problems. Like all the other Ramsar HAW sites, some of the flora and fauna of Phoksundo are under threat.

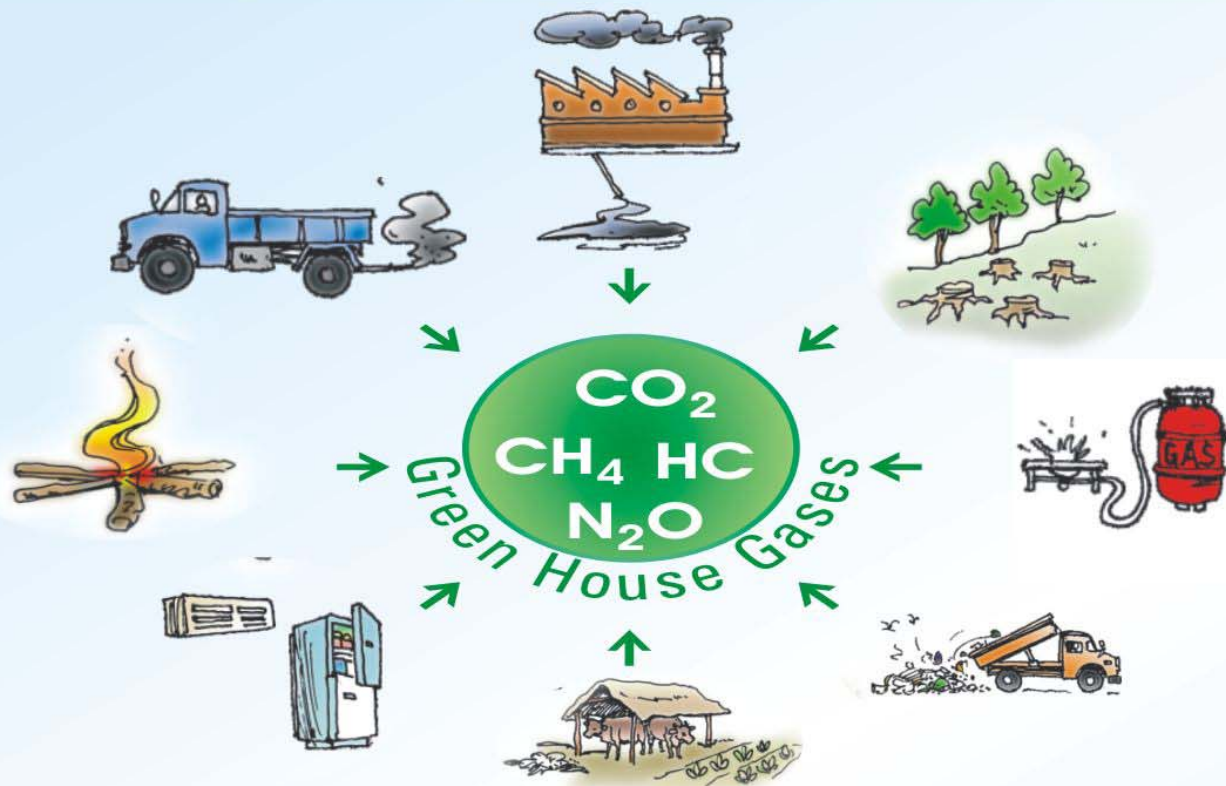


Interesting Fact

Phoksundo's Thahung Monastery was built around 900 years ago in order to conserve the wildlife of the area.



# HAWs and Climate Change



**Climate change** is the long-term change in the average weather of a region. Increase or decrease in the amounts of annual rainfall and average temperature indicate climate change.

An increase in average temperature of the earth is called **global warming**. The main cause of global warming is presence of excess **greenhouse gases (GHGs)** in the atmosphere. The greenhouses that we are concerned about are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), water vapor, ozone (O<sub>3</sub>), and halocarbons which occur naturally in the atmosphere.

*If the GHGs occur naturally, why are we so concerned about it?*

GHGs have the special ability to absorb and reemit heat waves, controlling how hot our planet gets. An increasing amount of human activities release more and more GHGs into the atmosphere which increases the earth's temperature.



# Impacts of Climate Change

## AGRICULTURE

- Shift in food growing areas
- Changes in crop yields
- High irrigation demand
- Increased pest, crop diseases & weeds in warm areas

## WATER RESOURCES

- Change in water supply
- Decreases water quality
- Increased drought
- Increased flooding

## FORESTS

- Changes in forest composition and locations
- Disappearance of some forests
- Increased fires from drying
- Loss of wildlife habitat and species

## BIODIVERSITY

- Extinction of some plant and animal species
- Loss of habitat
- Disruption of aquatic life

## SEA LEVEL

- Rising sea levels
- Flooding of low lying islands and coastal cities

## WEATHER EXTREMES

- Prolonged heat waves and drought
- Increased flooding
- More intense hurricanes, typhoons, tornadoes & violent storms

## HUMAN HEALTH

- Increased death from heat and diseases
- Disruption of food & water supplies
- Spread of tropical disease to temperate areas
- Increased respiratory diseases
- Increased water pollution from coastal flooding

## HUMAN POPULATION

- Increased deaths
- More environmental refugees
- Increased migration



*Nepal in particular is vulnerable to the effects of climate change because its fragile mountain ecosystems and its diverse climate. At present though Nepal constitutes less than 0.4% of the world population and is responsible for about 0.025% of annual GHG emission, the annual temperature increase in Nepal is 0.6°C. The temperature increase in the Himalayas is even higher! Unfortunately, we are among those at the highest risk from its negative impacts.*



## SOME IMPACTS OF CLIMATE CHANGE ON WETLANDS



**Effects on wildlife:** Wetland dependent wildlife, such as amphibians and reptiles, are sensitive to heat and find it hard to adjust to the prolonged spells of heat.

Some of these temperature-sensitive animals have already disturbing the food chain!

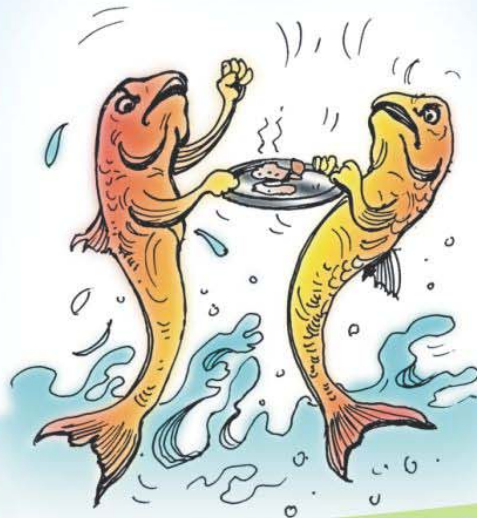
**Changes in ice cover duration and ice thickness:** Processes regulated by ice cover, such as gas exchange, erosion, nutrient cycles, biodiversity and primary productivity, will be seriously affected.

**Effects on Ecology:** Climate change can replace the original wetlands such as swamps, fen, and peat land with other types like bogs affecting everything that is dependent on the previous form of wetland.




### **Altered bird migration pattern:**

Wetlands are used as staging, wintering, and breeding sites for birds. Climate change puts the lives of the wetland dependent birds at risk.

**Effects on fisheries:** Rising temperature favors growth of some fish species increasing demand for more food, places to live, and a higher chance of diseases.



*The average temperature of the earth is 15° C. If there would be no greenhouse gases, the temperature of the earth would be -18° C.*

-  *If Greenland or Antarctica's ice were to melt, the sea would rise 5.4–6 meters. Small countries in the sea, such as the Maldives, would be underwater!*
-  *It has been estimated that the Earth's surface temperature will rise by 1.4° C to 5.8° C between 1990 and 2100.*
-  *If the air temperature increases by just 1° C, almost 20% of the glaciated areas above 5,000 m will melt.*



## CLIMATE CHANGE IS THREATENING OUR HAWs

Changes in climate may bring about changes in hydrological regimes and in biogeochemical cycles. Global warming poses a great threat to wetlands and those who depend on them. Negative impacts are caused by the burning of fossil fuel, alteration in land cover and land use resulting change in precipitation, melting of polar ice caps and rises in the sea level.

As the Earth becomes warmer the frozen water melts faster the Himalayan wetlands will not be able to hold all that water, leading to devastating floods including Glacial Lake Outburst Floods (GLOFs). Later, glacier retreat will lead to a lack of river water, especially during dry seasons in the downstream area.



Gokyo is also at risk as the main source of water Ngozumpa glacier. If Ngozumpa melts at an accelerated rate, the potential of a GLOF is dangerously high. The effects of GLOFs are devastating to animals, plants, and people living upstream and downstream.

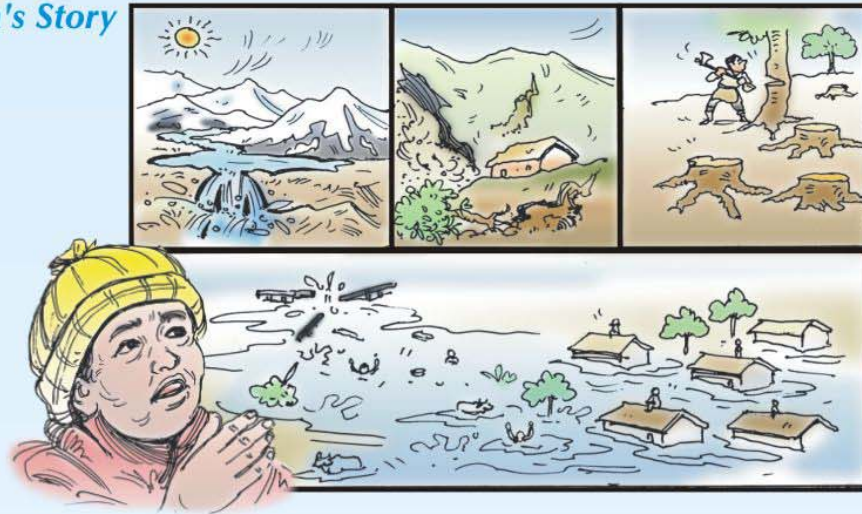
### DID YOU KNOW?

- ▶ Almost 67% of the Himalayan glaciers have retreated. In Nepal, the glacier retreat rate is about 16 km per year. Before, it was only a few millimeters per year!
- ▶ In Nepal, 20 of the glacial lakes are potentially dangerous



## IT'S STORY TIME!

### Dawa's Story



I was a young girl, about 5, when the Dig Tsho Glacial Lake burst. I was playing with my younger brother when I heard a loud gushing sound. I ran outside my home. I saw a great amount of water crashing through our village. The flood swept away everything, taking along with it the dirt, branches, and even furniture. I watched in horror as the water thrashed through my best friend's home. I prayed that no one was inside. The angry flow of water continued; it seemed never-ending. I wondered from where the great amount of water came.

Within the span of a few hours, my village was utterly destroyed. Although we were very lucky that the flood missed our house, our yaks were swept away by what we call "the big flood from the mountains." Everything that had grown in our farm was gone. I lost my best friend. Many people in the village also lost their domestic animals, farms, loved ones, and their homes. Huge landslides occurred at several places. Later, I learned that a large chunk of ice from the Langmoche glacier fell into the Dig Tsho Glacial Lake. The lake could not handle the extra water, and when it burst, its water thrashed down uncontrollably, like a wild animal, for about 90 kilometres. The flood destroyed everything along its path. Fourteen suspension bridges were mangled, and the Namche Hydropower Station, which cost \$1.4 million to build, was completely ruined.

Because we lost so much, we had to start from scratch. My family is now making a meager living by running a small tea shop. That event still affects our lives today, more than 20 years after the big flood took place. I hope no one else has to go through the tragedy we had to go through.





Match the pictures with activities that release GHGs

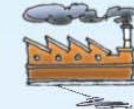
**A. Firewood**



**B. Deforestation**



**C. Exposed Garbage**



**D. Vehicles**



**E. Factories**



## Compare Past and Present

Think about the climate of today. Ask your grandparents how the climate was when they were growing up. Was there more or less rain during the monsoon season? When was the monsoon season? Was it warmer or colder? Use the form below as a guideline.

Questions	Present	Past
How much did it rain during the monsoon season?		
When was the monsoon season?		
When did the winter season start and when did it end?		
How cold was it during the winter season?		
How warm was it during the summer season?		





# Need for Conservation!

## Positive Actions

Pani Prasad has already told you about the **Ramsar Convention**. Recall that four of Nepal's many high altitude wetlands are in the Ramsar List of Sites of International Importance. The number of enlisted Ramsar Sites is increasing in Nepal. The inclusion of more Ramsar Sites shows the Government's commitment towards wetlands conservation and their sustainable utilization.

## Kyoto Protocol:

The Kyoto Protocol aims to reduce the amount of greenhouse gases released around the world. More than 170 countries, including Nepal, have signed the Kyoto Protocol to show their commitment towards combating climate change.



## World Wetlands Day:

Governmental agencies, NGOs, and citizens come together to celebrate World Wetlands Day on February 2<sup>nd</sup>. The aim of World's Wetlands Day is to raise public awareness of wetlands and create positive changes. Different events take place throughout the world. Some of these events include nature walks, children's art contests, community clean-ups, introduction of new wetland policies, and addition of new Ramsar sites.



# What is going on in Nepal?



Do you know what positive actions are going on in Nepal?



**National Wetland Policy (2003)** has been created to fulfill Nepal's obligations under the Ramsar Convention. Important aspects of the Policy include coordination between communities, conservation, management and promotion of Nepal's wetlands, use of local communities' strength and knowledge, and raising awareness



**The Water Resources Strategy (2002)** was developed for the sustainable use of Nepal's precious resources. It has introduced 5-year, 15-year, and 25-year strategies. One of the Strategy's main aim is to manage watershed and aquatic ecosystems.

There are many environmentally conscious organizations that are working to protect Nepal's wetlands. There are organizations combating climate change and its negative effects on wetlands by promoting energy efficient technologies and clean energy, such as biogas.



# We can conserve our wetlands !



- Remember, rivers, ponds, lakes and swamps are all wetlands. So, don't throw away trash in or near water bodies. Tell, and show, your parents and friends to do the same.

*Yes, we can do lots of things to conserve our precious wetlands. Let's find out what can we do?*



- Locate wetlands near you and visit the sites. See how animals, plants, and humans are dependent on the wetlands.
- Join an eco-club. Together with the other members, organize a clean up day and make a wetland near you healthy again.
- Volunteer at one of the numerous international, national, or local organizations to combat climate change's effects on wetlands.
- Find out what the government is and is not doing to protect wetlands. Stay informed and inform others.
- Reduce your impact on environment by becoming more eco-friendly. Reduce, reuse, and recycle.



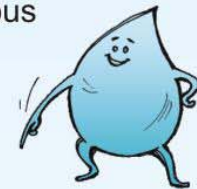
## Role Play for Conservation of HAWs

In wetland management we talk about 'stakeholders' all the individuals, groups and organizations who have a 'stake' in what happens in a particular wetland. These are fishers, farmers, tourists, families and factory owners. Wetland management works best when all stakeholders are involved. Gather your interested friends in school ground or library or any place where you can meet together.

Sit in a circle and list out the stakeholders involved in wetland management as:

- |                     |                         |
|---------------------|-------------------------|
| 1. Conservationist  | 7. Women group          |
| 2. Farmer           | 8. Tourist              |
| 3. Fisherman        | 9. Local NGO/CBO member |
| 4. Livestock holder | 10. Eco-club member     |
| 5. Hotel owner      | 11. Teacher             |
| 6. Factory owner    | 12. Policy maker        |

Consider an imaginary High Altitude Wetland that is under serious threat due to pollution, overgrazing, deforestation, hunting and poaching, and global warming. This wetland needs immediate conservation. So, all the above stakeholders are meeting to decide on how to manage the wetland.



Give each of your friends a character of stakeholder. Now each character list out what problems are you facing, what could be the solutions, and how could you conserve and wisely use this wetland. Discuss your points and draw a conclusion for the best management of this wetland.



# Students in Action

## Protecting Our High Altitude Wetlands

Pani Prasad and his friends have told you all about climate change and high altitude wetlands. You've seen the adverse effects global warming and climate change can have on high altitude wetlands, and on billions of people, animals and plants who depend on the HAWs.

There are a lot of things students can do to help protect the precious high altitude wetlands of Nepal.

## Follow 6 Step Action Plan:



### Step 1 Identify your areas of interest.

- eg. Water scarcity
- eg. Global warming

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Brainstorm! What else interests or concerns you? Read the newspaper, remember recent past events. Look around and notice what issues people have to deal with that is linked to the environment, for example the use of fossil fuel. Note them down below:

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## Get Informed

Develop your knowledge on the areas of interests. Watch special programs on the TV, read stories, or find out what other people may know.

What more can I learn about the issues that interests me? Do you know anyone who studied or worked in the field you are interested in?

Develop a set of questions that you want to answer.

- eg. How much water does a human need daily?
- eg. How does climate change affect our wetlands?

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How can I access more information?

- School, library, bookstore
- Surf the internet
- Family, friends and teachers
- .....
- .....



## Develop a team

Tell other people about what you have learned. Get them interested and make a team!

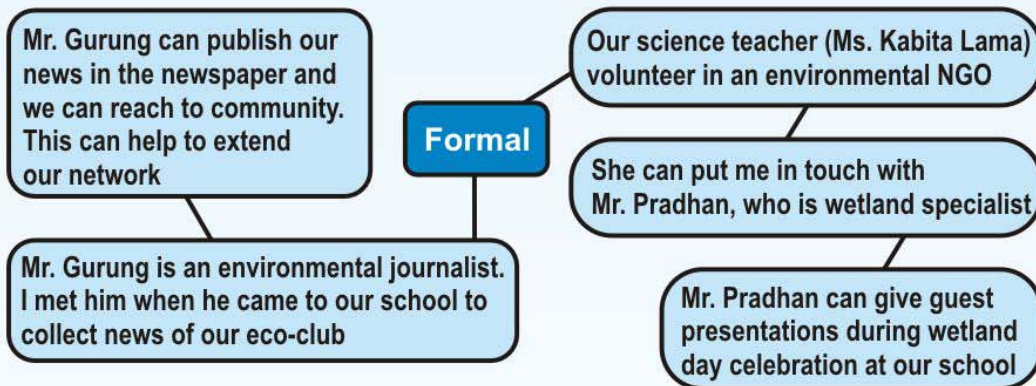
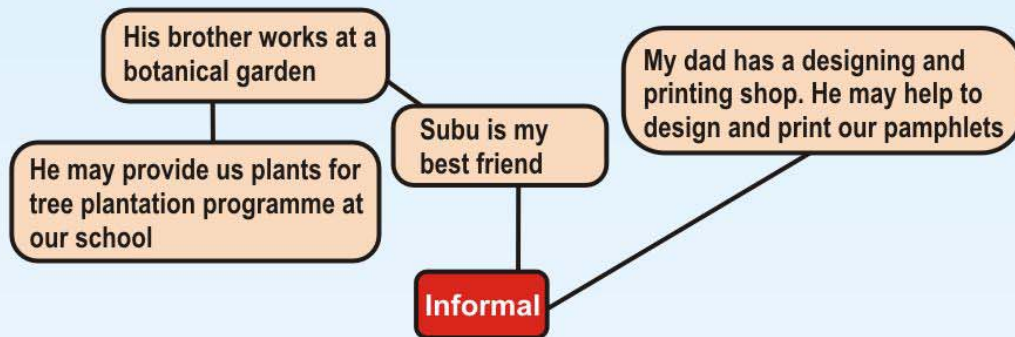




## Step 4 Identify your networks

What help can you get from your networks?

There are many types of networks. Informal networks include friends and family, and more formal networks include people you meet at some programmes, or people you know through volunteer work. Check out the examples of informal and formal networks below:



➔ Now, try mapping your own networks.





## Plan and Act

Keeping in mind the issues you have identified, what goal will you work towards in your action plan? Exactly what changes do you want to bring about?

eg. I want to make community aware about climate change and its impact on wetlands.

\_\_\_\_\_

\_\_\_\_\_

Brainstorm 5 possible actions related to the issues you have identified.

eg. Inform friends about global warming and climate change

\_\_\_\_\_

\_\_\_\_\_

Develop your personal action plan.

- eg. Save electricity
- eg. Use bicycle instead of bus
- .....
- .....
- .....



### Fill the chart:

Steps towards achieving goals	What help is needed?	Possible obstacles	How to succeed?
<b>Example:</b> Ride bicycle to school	Ask mom to prepare breakfast earlier	Long time to travel	More students riding bicycle to school learning from you



## Create a group project plan

Activities	When	Where	How	Who will help	Resources needed	Responsibilities
<b>Example:</b> Inform friends about climate change and its impact on wetlands.	1 week	School	Environment wall magazines	teachers, school administration	News, articles, bulletin board, notice board, chart paper, markers	research, information writing, talking to teachers, posting up information



### Have a lasting impact

- \* Have a clear timeline.
- \* Work with other eco-clubs outside of school.
- \* Build good relations with adults and teachers.
- \* Rotate your team leaders every year.
- \* Keep good record of your project activities and manage knowledge.
- \* Be committed, don't get discouraged, and above all, have fun with your new found passion!



## Quiz Time:

*After going on a journey with Pani Prasad and his friends, let's see how much you learned.*

- 1. What percentage of the world's water is accessible?**  
a) 70                      b) 0.26                      c) 2.5
- 2. How many glacier lakes are there in Nepal?**  
a) 5000                      b) 1500                      c) 2323
- 3. What is the area where the water covers the soil or where the water exists near or at the surface of the soil?**  
a) Simsar                      b) Glacier                      c) GLOF
- 4. Why are our wetlands under threat?**  
a) Global warming                      b) Disturbances from human activities  
c) both a and b
- 5. High altitude wetlands are wetlands that are above \_\_\_\_ metres?**  
a) 4,000                      b) 3,000                      c) 3,500
- 6. To where does the water from HAW eventually flow?**  
a) glaciers                      b) upstream                      c) downstream
- 7. What is Gokyo's main threat?**  
a) GLOF                      b) deforestation                      c) overgrazing
- 8. What causes global warming?**  
a) glacier retreat                      b) large quantities of greenhouse gas emission  
c) a warmer climate
- 9. What will global warming lead to?**  
a) a warmer, happier planet                      b) accelerated melting of glaciers  
c) newer greenhouse gases
- 10. What is the name of the International Convention for Wetlands?**  
a) Simsar                      b) Ramsar                      c) Kyoto
- 11. What is the name of the policy that is associated mainly with wetland conservation and wise use?**  
a) National Wetland Policy                      b) Water Act  
c) National Park and Wildlife Conservation Act
- 12. How can you save wetlands?**  
a) joining an eco-club and cleaning up a wetland  
b) stop throwing away garbage near or in wetlands.  
c) both a and b



Thank you for taking time to learn about High Altitude Wetlands. We hope that this information has helped you gain a better understanding and appreciation for wetland systems. By working together we can protect our wetlands.

Let's be Pani Prasad's friend!



## GLOSSARY

**Biodiversity:** The number and variety of organisms found within a specified geographic region.

**Biogeochemical cycle:** Cycling of nutrients like carbon, nitrogen, oxygen, phosphorus and sulphur through soil into plants, microbes and animals, which return the elements to the earth system through chemical processes that range from respiration to decomposition.

**Bogs:** Spongy ground formed of decayed plant materials.

**Climate:** It is the long-term pattern of the existing weather. It is what we expect to happen season to season.

**Climate change:** A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere. In addition to natural climate variability, this is observed over comparable time periods.

**Conservation:** The careful guarding of an asset. Preservation, protection and management of natural resources.

**Convention:** An international agreement dealing with a specific subject.

**Deforestation:** The process of destroying a forest and replacing it with something else. The term is used today to refer to the destruction of forests by human beings and their replacement by agricultural systems. Deforestation is considered to be a main contributor to the greenhouse effect.

**Drought:** An extended period of abnormally dry weather that causes water shortages and crop damage. Some signs of drought include: unusually low river flows, low groundwater and reservoir levels, very dry soil, reduced crop yields or even crop failure, and algae blooms in reservoirs and lakes.

**Environment:** The circumstances or conditions that surround one; surroundings.

**Erosion:** Group of processes involving the movement of soil and rock. This movement is often the result of flowing agents, whether wind, water, or ice. Gravitational pull may also influence erosion.

**Fen:** Usually a low-lying area of soft waterlogged ground and standing water.

**Fertilizers:** Natural or artificial substances composed of the chemical elements that enhance plant growth and productivity by adding nutrients to soil. The three major fertilizer elements are nitrogen, phosphorus, and potassium.

**Freshwater:** Water that is not salty. Bodies of water such as ponds, lakes, rivers and streams containing low concentrations of dissolved salts and other total dissolved solids.

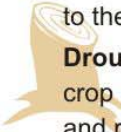
**Glacial lake outburst flood (GLOF):** Glacial lakes are fed by glaciers and are surrounded by natural moraine walls. These can withstand only a certain amount of water pressure.

When the pressure is too great, the moraine wall breaks and a huge volume of water and debris are unleashed, causing a huge flood.

**Glacier retreat:** Reduction in glacier mass.

**Glaciers:** Glaciers are slow moving masses of ice.

**Global warming:** An increase in the average temperature of the earth's atmosphere (brought about by increased emission of green house gases), especially a sustained increase sufficient to cause climatic change.



**Green house gases:** Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation. Some GHG gases are carbon dioxide, methane, carbon monoxide, nitrogen oxides, chlorofluorocarbons, water-vapor, ozone, and halo carbons.

**Herbicides:** A chemical substance used to destroy or inhibit the growth of plants, especially weeds or other undesirable plants.

**High altitude wetlands:** Wetland lying above 3000 meters.

**Marsh:** An area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.

**Non timber forest products (NTFPs):** Goods derived from forests of both plant and animal origin other than timber. NTFPs contribute to household income and subsistence and are of cultural importance in many rural societies.

**Pastures:** Land with herbaceous plant cover used for grazing of domestic animals as part of a farm.

**Peatland:** Low wetland formed by partially decomposed plant materials

**Pesticides:** A chemical used to kill pests, especially insects.

**Photosynthesis:** The synthesis of carbohydrates from carbon dioxide and water by plants in sunlight, with the release of oxygen.

**Pilgrim:** One who travels to a shrine or other sacred place out of religious motives.

**Poaching:** Illegal hunting, fishing or harvesting of wild plants or animals. A poacher is illegally selling the animal or animal parts or plant for a profit.

**Protected areas:** Locations which receive protection because of their environmental, cultural or similar value. Examples include parks, reserves and wildlife sanctuaries.

**Protocol:** The first copy of a treaty or other such document before its ratification.

**Rangelands:** Expansive, mostly unimproved lands on which a significant proportion of the natural vegetation is native grasses, grass-like plants, forbs, and shrubs. Land suitable for domestic animals to graze.

**Reservoir:** A pond, lake, or basin, either natural or artificial, for the storage, regulation, and control of water.

**River basins:** The land area drained by a river and its tributaries.

**Simsar:** Nepali word for 'wetland'.

**Swamp:** Soft wetland. Wetland large areas of land covered by shallow bodies of water.

**Vegetation:** General term for the plant life of a region; it refers to the ground cover provided by plants.

**Water cycle:** Continuous movement of water on, above, and below the surface of the Earth. Since the water cycle is truly a "cycle," there is no beginning or end. Water can change states among liquid, vapor, and ice at various places in the water cycle

**Watershed:** The land area that drains water to a particular stream, river, or lake.

**Weather:** It is the short-term pattern of a local atmosphere. It is what we expect to happen day to day

**Wetlands:** An area of land consisting of soil that is saturated with moisture, such as a river, lakes ponds, swamp, marsh, or bog.



**Explore these resources if you like to know more about wetlands!**

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<http://epa.gov/climatechange/kids>

[http://legacy.ncsu.edu/classes/nr400001/gradpage/Wetland\\_Mitigation\\_Home/wetland\\_importance.html](http://legacy.ncsu.edu/classes/nr400001/gradpage/Wetland_Mitigation_Home/wetland_importance.html)

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<http://www.wetlandinventory.org.np>

<http://www.wetlands.org>

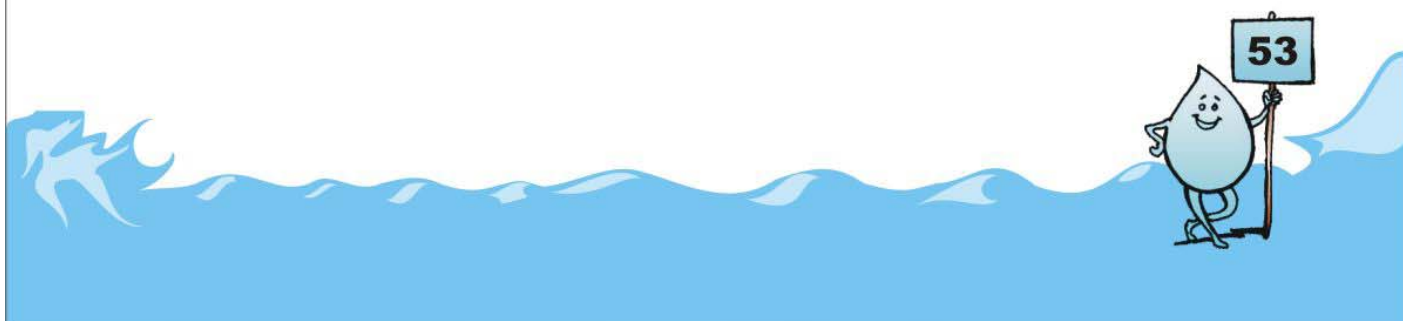
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# Notes



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# Notes



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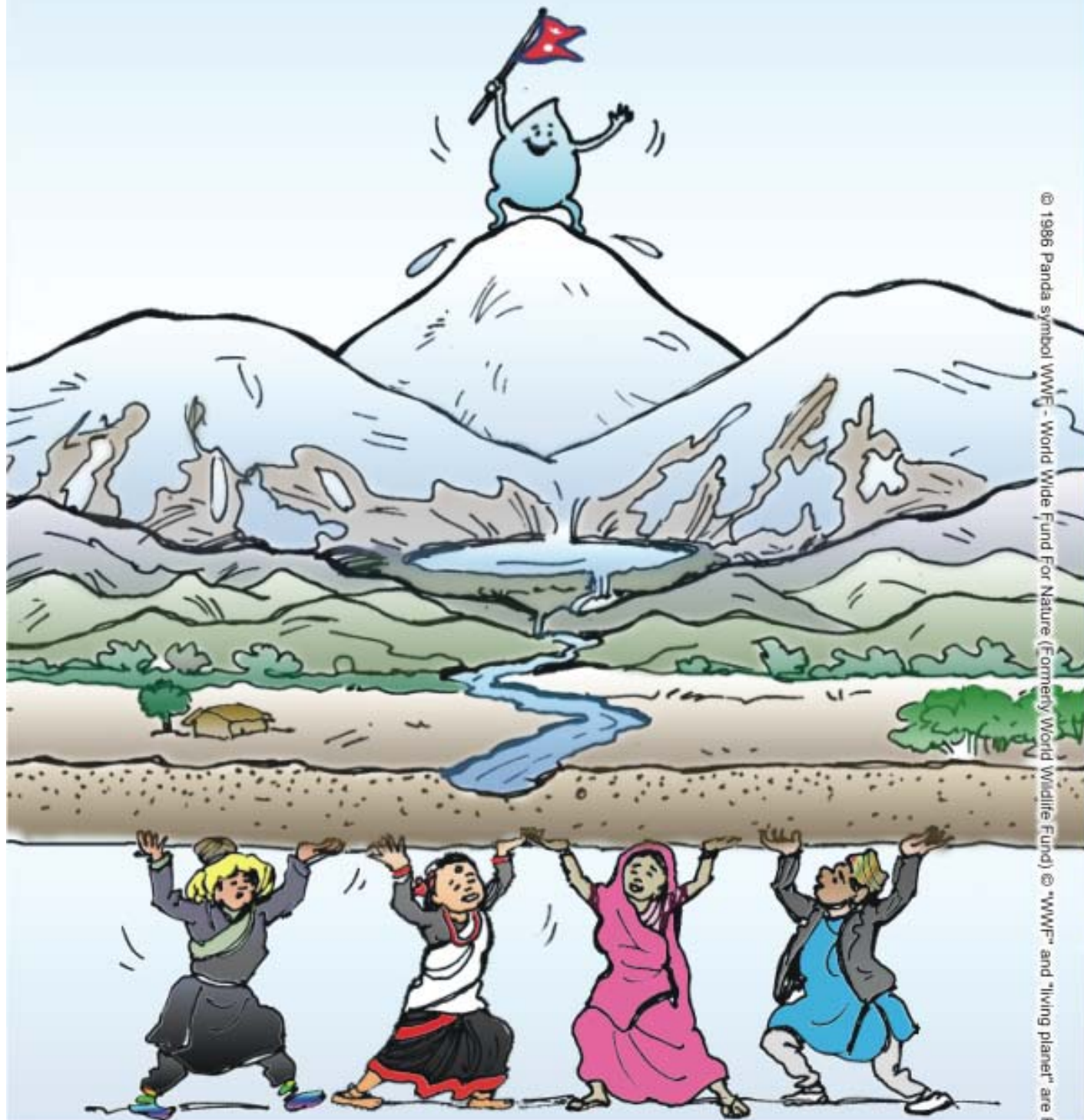
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## Pani Prasad and Friends OFF TO THE HIGH ALTITUDE WETLANDS

WWF is the world's largest and most experienced independent conservation organization, with almost 5 million supporters and a global network active in more than 100 countries.

WWF's Mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature by:

- Conserving the world's biological diversity;
- Ensuring that the use of renewable natural resources is sustainable; and
- Reducing pollution and wasteful consumption.

### Freshwater Program

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