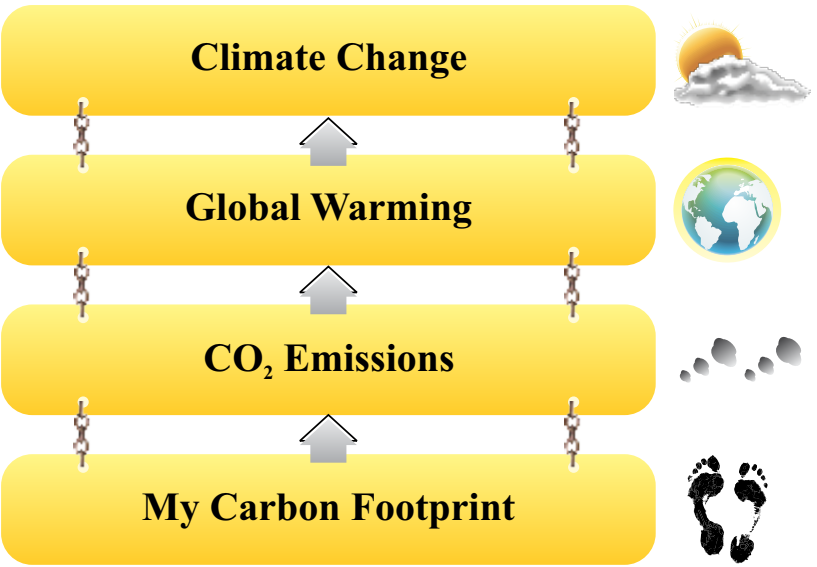
Chapter

1 Introduction



A healthy environment and availability of enough natural resources ensures sustainability of life on earth. Each of us has an average minimal daily usage of natural resources and unless we take conscious decisions to use these resources sustainably there could be an ecological backlash. Our everyday actions add up and influence the environment, both, in a positive and negative manner. Most of what we do in our daily lives produces greenhouse gases. Even the breakdown of food and sewage release greenhouse gases in the process of digestion/ decomposition. Think seriously and you'll realize that almost all our activities - consuming electricity, travelling, adding waste and eating habits are responsible in varying degrees for the production of the greenhouse gas, carbon dioxide (CO_2), which is the primary cause of global warming. Our carbon costly lifestyles are exceeding the limits of natural carbon sinks thus threatening life support systems of our Planet. The average per capita footprint of an Indian citizen including Land Use Land Use Change & Forestry (LULUCF) in 2007 was 1.5 tons of CO_2eq emissions per year (MoEF, GoI, 2010). It is vital that we initiate change and become ecologically sensitive today because choices that we make now will shape our opportunities in future. So, small adaptations in our lifestyle, whether at our homes or at our work places can contribute towards shrinking of our individual Carbon footprints.

Though we all strive to achieve a good quality of life, including clean air, access to good quality water and nutritious food besides other physical pleasures of 'neo development', however at times, the way we live, and the resources we use exceed the carrying capacity of life support systems of the Earth. Scientific studies indicate that we are using too much energy and water, creating too much waste and releasing greenhouse gases that further threaten life on Earth. Often our lifestyles also decimate the precious biodiversity that sustains life on Earth.

It is important that we are not only aware of these issues but also take action and adopt lifestyles which help to reverse this trend. This, however, is possible only if all citizens are involved through Environment Education and Education for Sustainable Development. With the changing scenario, it was felt that Environment Education (EE) is not sufficient to meet the needs envisaged for Sustainable Development. Thus, the concept of Education for Sustainable Development (ESD) was developed to enrich Environment Education. ESD has more holistic approach and involves development of critical thinking, creation of positive attitudes and active participation of all in decision making to achieve a Sustainable future. We, therefore, need to move forward from Environment Education to Education for Sustainable Development.

In this book, we look at aspect of climate change and how our actions can help reduce our carbon footprint and increase our handprint leading to sustainable development. The book provides a tool to help us assess and reflect on the implications of our actions and suggests simple ways with which we can live carbon neutral lives. Although many of our actions affect the environment, however, this book focuses on only five important issues: the water we use, food we eat, energy we use in our homes, energy used in travelling and the waste we create. It is expected that understanding these human impacts would help us make informed choices about future eco-friendly ways of living. We invite you to join us in making choices for a better world for all!

Chapter

2 Understanding Education for Sustainable Development

"The most important task, if we are to save the Earth, is to educate."

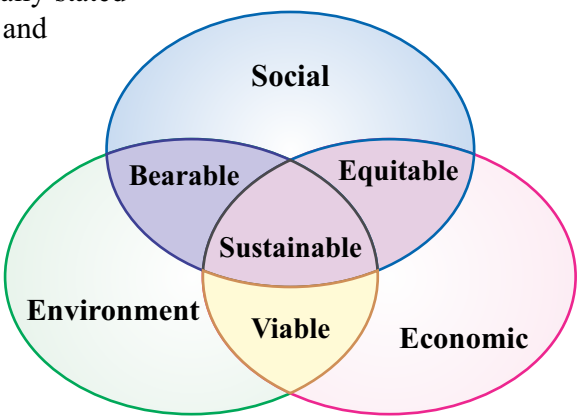
Peter Scott, one of the founders of WWF

Linkages to the Curriculum:

PSEB : This concept is being taught in 11th standard: science book, chapter- Role of Society in Development and Environment pp.34 and 12th standard: science book, chapter- Sustainable Development pp. 68.

NCERT : This concept is being taught in 10th standard: science book, chapter- Management of Natural Resources: Sustainable Management pp. 272.

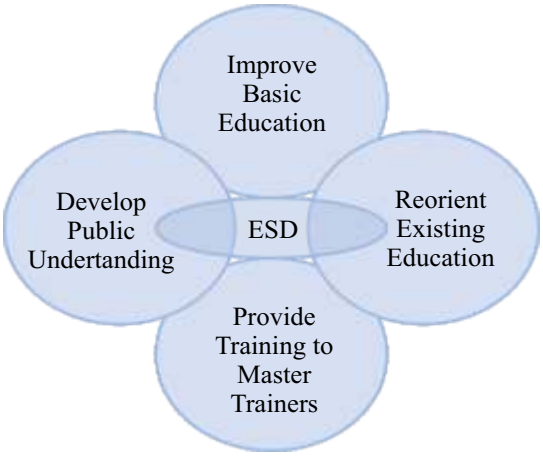
Sustainable Development (SD) is a key concept that has gained increasing international acceptance during the last two decades. It is an evolving concept, which is continuously being re-defined and re-interpreted. It can be formally stated as being based on the twin principles of intra- and inter-generational impartiality. Sustainability is a complex concept which encompasses three interdependent spheres: environment, economics, and equity. World Development Commission has defined the Sustainable Development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It implies linking development, equity, and social justice.



Education is held to be central to sustainability. Unfortunately, there is still a lack of widespread awareness and understanding of the concept of "Education for Sustainable Development" (ESD). ESD carries with it the inherent idea of implementing programs that are locally relevant and culturally appropriate. The components of education for sustainability are:

- Improving Basic Education

- Reorienting Existing Education
- Developing Public Understanding
- Providing Training/ Capacity building



Components of ESD

Simply increasing basic literacy will not advance the process of sustainable development. If communities and students look toward identifying sustainability goals and working for them, they must focus on skills, values and perspectives that encourage and support public participation and community decision making. To achieve this, basic education needs to be reoriented to address sustainability and expanded to include skills to promote critical-thinking, organize and interpret data and information, formulate questions and the ability to analyze issues that confront communities.

The implementation of National Education Policy (NEP) in India has helped to make a great progress in basic education. However, when people realize that education can improve the likelihood of implementing government policies, regional land and resource management programs and address local issues, would they be in a position to help achieve sustainability. The question, therefore, is not only of quality and quantity of education but of its relevance and aptness to development and sustainability.

Challenges for Sustainable Development

The three global development indicators that pose a key challenge to Sustainable Development are:

- Exponentially increasing human population and its associated needs
- Changing trend in consumption patterns
- Dwindling state of our natural resources

A number of policy initiatives and programs have been adopted by the government to bridge the gap between 'Education' and 'Education for Sustainable Development'. The present Activity Book is one such initiative. Its focus is to promote an activity based approach to practice sustainable development through the concept of carbon footprint vs handprint. It is also expected to engage other teachers, students and communities in the ESD process, help them appreciate the environment around them and develop necessary skills for an environmentally responsive behaviour.

Chapter

3 Carbon in Our Lives

The CO_2 Factory in Nature

We all know that green plants take in Carbon dioxide (CO_2) from the atmosphere to combine it with water and produce complex organic molecules in the presence of sun light. These molecules trap the energy from the Sun in form of chemical energy and provide it to us when we use these plants as food. However, geologists tell us that many millions of years ago before there was any sign of life on earth, there was no free oxygen in the atmosphere. Roughly one billion years ago the first life appeared as blue-green algae. These primitive one-celled organisms were able to use light from the sun to make new molecules taking in CO_2 and releasing Oxygen (O_2) in the process. Over the next millions of years these forms developed into more complex plants and continued taking in CO_2 and releasing oxygen, thus allowing the atmosphere to become oxygen rich, and allowing newer life forms to evolve. By the start of the carboniferous era (about 355 million years ago), there were 3000 parts per million of CO_2 in the atmosphere. During the carboniferous era (which lasted 50 million years), many trees, cycads and ferns grew and died. During their life they would take in CO_2, keep the carbon to build their bulk and release the O_2 . Once the plants died they would sink into the swamps and eventually become coal. Over this incredibly long time a lot of carbon was taken from the atmosphere and stored under the ground as coal. Eventually at the end of the carboniferous era the measurement of CO_2 in the atmosphere was 250 parts per million.

When we burn this coal now a days we release the carbon back into the atmosphere as CO_2. This is what is increasing the amount of CO_2 in the atmosphere. Today our atmosphere has about 380 parts per million of CO_2 and this is increasing. This CO_2 is a greenhouse gas which leads to global warming which ultimately leads to climate change.

How does Global Warming occur?

Carbon dioxide and other greenhouse gases released by us into the atmosphere allow the visible (shortwave) radiation from the sun to enter and heat up the earth, but trap some of the outgoing reflected heat (longwave) radiation. This means heat can get through the atmosphere, but it can't get out. Therefore, the earth's atmosphere heats up as we release more and more CO_2. As a result, the temperature rises. This phenomenon is called Global Warming.

Where does the CO_2 come from and how is it linked to our actions?

Every action that we perform needs energy and subsequently releases CO_2 into the atmosphere.

- Energy can come from the break down of food in our bodies which is further utilized for various activities such as lifting, walking and digging, etc. CO_2 is released during the process of generation of energy from food.
- Similarly, animals used to do the work for us (e.g. oxen ploughing, horse pulling a cart) also generate energy from food and breathe out CO_2 in the process.
- If we use machines to do the work for us (e.g. tractor ploughing, driving a car) fuel is needed. This is usually in the form of petrol or diesel. Burning fuel releases CO_2 into the air besides providing energy for the work.
- Similar is the case with electricity used by us to do the work (e.g. to run machinery in factories, do work in our homes). Mostly, coal is burnt in power stations to generate electricity. This process releases significant amount of CO_2 in the atmosphere.

Look around you: everything that is moving - cars, trucks, ships, aeroplanes, humans and animals, consumes energy in the form of fossil fuels, food, etc.. In the process, CO_2 is released into the atmosphere.

But there are some forms of energy that do not release CO_2 into the air for example - Wind Energy. Can you think what other forms are?

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What is a Carbon Footprint?

Carbon dioxide is one of the major contributors to global warming/climate change. Amount of carbon dioxide that is released into the atmosphere as a result of our actions is termed as 'Carbon Footprint'. Its increase in the atmosphere causes an increase in temperature of the Earth which can lead to melting of icecaps and glaciers, rise in sea level resulting in inundation of coastal areas, increase floods and droughts, change in cropping pattern as well as pests and diseases and many more. This can adversely affect our ecology and economy.

What is Carbon Handprint?

Today, it is widely acknowledged that our energy dependency is increasing and carbon emissions are released from almost all our activities. In order to protect the planet from the perils of climate change we need to start taking actions to heal the planet and reduce our ecological footprint. The concept of a Handprint is to decrease human footprints by taking more action towards Sustainable Development.

Handprint is, therefore, a measure of positive environmental actions performed by an individual or actions that are directed to decrease the ecological Footprint.

You can measure your handprint and take steps to contribute through your own actions to save the environment. Environmental aspects where individual handprints can have appreciable impact include wise use of resources like water, power, etc., effective steps to reduce, reuse and recycle wastes and reduce emissions by adopting ecologically sensible habits. For example, an individual can reduce his/her water use, restrict water wastage while following daily activities like fixing leaky taps, showers and flushes, not letting the taps run unnecessarily, using a bucket and small mug to water plants or washing vehicles (instead of a hosepipe), etc. Besides limiting water wastage, one can also adopt wiser ways to contribute towards carbon handprint by using grey water or harvested rain water for irrigating lawns and potted plants. Similarly, individuals can reduce use of electricity, fuel in travelling and cooking and promote reuse and recycling of waste materials.

Let us explore some of the simple ways to reduce our carbon footprint and increase our handprint through the use of this book. You can actually conduct some activities and calculate your handprint to assess how much you can contribute individually…….!

Chapter

4 Being Water Wise

Linkages to the Curriculum:

PSEB : This concept is being taught in 6th standard: science book under the chapter- Our Environment pp112; Health & Hygiene: water pollution pp.104, 7th standard: science book under chapter- Life on Earth: Conservation of Renewable Resources- The Water pp.61; Water- A Wonder Liquid pp.67; Effect of Population Growth on Environment: Water Pollution pp.216; Consequences of Human Activities on Environment: Impact on Water Resources pp.223, 11th standard: science book under the chapter- Impact of human activities on Environment pp.13-19; Environmental pollution : water pollution pp. 41 and 12th standard: science book under the chapter- Environment Management (part III): Water quality criteria pp.61; Environmental Action : Water pollution pp.147.

NCERT : This concept is being taught in 6th standard: science book under the chapter- Water pp. 136, 7th standard: science book under the chapter-A Precious Resource pp.193;Waste water Story pp.221, 8th standard: science book under the chapter- Pollution of Air and Water pp.239, 9th standard: science book under chapter-Natural Resources: Water-A Wonder Liquid pp. 193, 12th standard: science book under the chapter- Environmental issues Water Pollution and its Control pp.273.

Water is one of the most important natural resources which touches all aspects of human civilization - from agricultural and industrial development to the cultural and religious sentiments of society. Only 2.5% of the world's water is fresh, while 97.5% is saline. Of that freshwater, only 0.3% is in rivers, lakes and reservoirs while rest of the freshwater is locked up as polar ice, glaciers or soil moisture. For easier comprehension this can be explained to students/community in other words i.e. if all water on earth were to fit in a 1 liter bottle, only about one teaspoon is available to us as a freshwater! Unfortunately, this precious fraction is being contaminated.

Let us learn how Climate Change is linked to water usage?

Each litre of water delivered to our house, requires energy. Significant CO_2 emissions take place when water is collected, disinfected and pumped for domestic, industrial, agricultural and commercial use. Conserving water daily in our households can not only reduce our water bills, but can reduce energy used in supplying this water. This, in turn will help reduce CO_2

emission during production of energy, especially in thermal plants. We, therefore, need to understand how we can contribute to reducing CO_2 emissions by simple daily activities. Further, how can we save water through little actions and can create a big handprint.

Measuring your water use for one day

All the water that we use in a day needs to be pumped to your houses or schools. This uses electricity.

- To pump out 1 litre of water 0.0018kWh electric energy is consumed.
- One kWh of electricity production generates 0.98 kg CO_2.
- Therefore, for every litre of water used you generate about 0.00176 Kg CO_2 (0.0018kWh x 0.98 CO_2).

In other words, if you save a single litre of water from your daily activities then you would reduce 0.00176 Kg CO_2 emissions thus creating a carbon handprint of 0.00176 kg CO_2 (Nantinda *et al.*, 2010).

Learning to reduce your carbon footprint and increasing our handprint

(Alternatively how you can create handprint by shrinking your carbon footprint) - an example:

Calculating your water footprint during a shower:

Step 1: Put a bucket under your shower for one minute and measure the amount of water collected in the bucket **(say 'X' litre)**.

Step 2: Now you just need to record your shower time **(say 'T' minutes)**.

Step 3: Multiply 'T' min. by the volume collected in bucket in 1 min. = **X litres**

X litres would be your Water Footprint

If you change your habit and use less water by switching to a bucket bath then :

Step 1: Check the capacity (in litres) of your bucket.

Step 2: Multiply the capacity by no. of buckets you need for bath = **Y litres**

X litres - Y litres = Your Water Handprint

Note: Carbon footprint created by utilization of 1 kW of electricity is actually higher than carbon footprint created while its generation, as there is transmission loss of approx. 20% associated to provide electricity to your home from the generation site. However, for calculating our footprint it may be presumed that the value is same for both i.e. 0.98 CO_2/ kW of electricity generated and consumed.

The amount of water which you and your family uses in the whole day can be calculated similarly. For example for calculating water used in cleaning teeth and washing hands hold a mug under the tap with your preferred pressure for one minute and measure the amount of water collected in the mug. Now, multiply the volume collected in one minute by time you keep the tap opened while brushing and washing hands. The value would be your water footprint.

Calculating your Water Footprint Vs Handprint

Do you have a significant Water Handprint?

Indian Standard (BIS):1172-1993 recommends water consumption of 135 litres/capita/day for urban areas (BEE, 1993). As per Punjab Govt. norms, minimum water requirement in rural areas was 40 litres/capita/day, however, to meet increased demand, nowadays water supply is being designed for providing 70 litres/capita/day in rural areas.

If you as an individual are consuming:

< 1000 litres per week:

- Your household is using water wisely.
- Share your knowledge with neighbours, friends and family.

1200 - 1400 litres per week:

- You are on the way but there are still plenty of ways for you to save water.
- Please refer resource material available for tips on water saving.

>1400 litres per week:

- You are using a lot of water for similar daily activities.
- You need behavioural change in performing those activities and be water sensitive.

Have you ever wondered what would be your footprint if you draw water from a handpump?

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Now let us perform some activities.

Activity

Activity	Footprint w.r.t. water (Fw)	Handprint w.r.t. water (Hw)
1. How many litres of water on an average do you and your family members consume for bathing per day? {Refer your actual calculations as mentioned earlier or follow the under mentioned assumptions (Follow whichever is applicable to you): • A conventional shower consumes 12 litres in a minute. • A low flow shower uses 7.5 litres a minute. • A tap running with normal flow wastes 5 litres of water per minute. • Replacing the conventional shower with low flow shower would reduce your water footprint by 4.5 litres a minute. • Using a bucket for bathing requires less water. The volume of a bucket is approximately 15-20 litres}. Please calculate total time of shower of your family: **n1 ___ + n2 ____+n3 ____ +n4_____ = T minutes,** where n1,n2,n3,n4 represents family members & T represents total minutes}. **For example,** If family of 4 members take bath for 5,7,10,5 min. on an average then, **T min. will be 5+7+10+5 =27 min**.		
1(a) If you have a conventional shower, then: **T min. x 12 litres = Fw1 litres** (enter the value **Fw1** under footprint column)	**Fw1**	
OR		
1(b) If you have changed your conventional shower with low flow shower, then your footprint would be smaller than those using conventional showers: **T min. x 7.5 litres = Fw2 litres** Your handprint can be calculated as: **Fw1-Fw2=Hw1** (enter the value **Hw1** under handprint column)	**Fw2**	**Hw1**



OR		
1(c) **If you & your family** uses bucket for bathing, your water footprint is smaller than those using conventional showers. However, if you keep the tap running during bucket bath, your water footprint will be higher. **In case** the tap is kept running during bucket bath, your footprint will be: **T min. X 5 litres = Fw3** Where T min. is the total time in minutes the tap kept open by your family members for bathing. **OR** **In case** of bucket bath, when you don't let water overflowed from the bucket, your footprint will be: **No. of buckets x Volume of bucket = Fw4 litres** (enter the value **Fw3 or Fw4**, whichever is applicable to you under footprint column) **In this case** you have restricted the unnecessary flow of water during bucket bath, your handprint will be: **Fw3 - Fw4 = Hw2** (enter the value **Hw2** under handprint column) **OR** **If you** were earlier using a shower and have now started using a bucket, your handprint will be: **Fw1- (Fw3 or Fw4) = Hw3** (enter the value **Hw3** under handprint column)	**Fw3 or Fw4**	**Hw2** **Hw3**
However, in some rural areas, people take bath under tube wells also, in such cases: **1(d)** **If you,** specifically switch on the tube well for taking bath, then your footprint would be very high and can be		

	Footprint w.r.t. water (Fw)	Handprint w.r.t. water (Hw)
calculated as: Measure the amount of water (in litres) coming from your tube well in one minute say **'Z' litres.** **Z litres x T min. = Fw5** (enter the value **Fw5** under footprint column) Where **T min.** is the total time taken by the family members for taking bath under the tube well.	**Fw5**	
1(e) **However,** if you take bath under the tube well which is actually running for irrigating fields, then your footprint **Fw6** would be **zero**. (enter the value **Fw6** under footprint column)	**Fw6**	
2. **How many litres of water do you and your family members use when brushing teeth?** {Refer your actual calculations as mentioned earlier or follow the under mentioned assumptions: • On an average an individual consumes 50 litres of water for brushing under a running tap for 5 minutes twice a day. • On an average an individual consumes 20 litres of water while brushing if, tap is opened only when required. • A tap running with normal flow wastes 5 litres of water per minute. However, in case you use a mug, only two litres of water is consumed}.		
2(a) **Your** daily water footprint for cleaning teeth under running tap for 5 min. twice a day is: **number of family members x 50 litres = Fw7** (enter the value **Fw7** under footprint column)	**Fw7**	
OR		
2(b) **If you** open the tap when required while brushing for 5 min. twice a day, your water footprint is smaller than those who keep the tap running, continuously while brushing.		

	In this case, your footprint can be calculated as: **Number of family members X 20 litres = Fw8** (enter the value **Fw8** under footprint column) Your handprint can be calculated as: **Fw7 - Fw8 = Hw4** (enter the value **Hw4** under handprint column)	**Fw8**	**Hw4**
2(c)	**If you** use a mug, your water footprint is minimal: Recalculate your footprint after initiating the use of a mug. **Number of family members x 2 litres = Fw9** Your handprint can be calculated as: **Fw7 - Fw9 = Hw5**	**Fw9**	**Hw5**
3.	**Do you have a leaking toilet in your household?**		
3(a)	**If yes,** on an average **45 litres per day** are being wasted by you which is your footprint. (enter the value **45** under footprint column)		
3(b)	**If no,** your water footprint is **0 litres**.		**--**
	OR		
3(c)	**If you** motivate others or take initiative to fix the leaks observed in your home, you can limit the wastage of about same amount of water per day. **Thus, 45 litres** will be your **handprint**. (enter the value **45** under handprint column)		
4.	**Do you consciously limit water wastage while flushing toilets?** {Toilets use a lot of water and the water we flush away is usually valuable tap water. Switching to a more water-efficient toilet will make a big difference to your personal water use. It is estimated that: • An old-style single flush toilet can use up to 12 litres of water in one flush. • Water efficient dual flush toilet uses 3 litres on half flush. • A mug uses approx. 1 litre of water}.		

	Footprint w.r.t. water (Fw)	Handprint w.r.t. water (Hw)
4(a) **If you** have a traditional single flush toilet in your home and you flush it fully after every urinal use, then your footprint can be calculated as: **No. of flush/day (except for toilet use) X 12 litres =Fw10** (enter the value **Fw10** under footprint column)	**Fw10**	
4(b) **If you** have installed a dual cistern flush toilet and go for half flush cycle after every urinal use, then your footprint is less and can be calculated as: **No. of flush/day (except for toilet use) X 3litres = Fw11** (enter the value **Fw11** under footprint column) In this case your handprint is: **Fw10 - Fw11 = Hw6** (enter the value **Hw6** under handprint column)	**Fw11**	**Hw6**
4(c) **However,** if you keep a bucket of water and use mug for throwing water after urinal use, then your footprint would be minimal and can be calculated as: **No. of times your toilet used for urinal only X 1 litre = Fw12** (enter the value **Fw12** under footprint column) In this case your handprint is: **Fw10- Fw12 = Hw7** (enter the value **Hw7** under handprint column)	**Fw12**	**Hw7**
5. **Overall, do you try to save water in your kitchen?** {For example: It is estimated that average kitchen water consumption is **75 litres per day.** However, if you rinse vegetables in a shallow sink of water and use tub/bucket for cleaning utensils instead of running tap you can save upto 15 litres of water}.		
5(a) **If you** do not consciously limit water usage in your kitchen, then, your kitchen has daily footprint of **75 litres**. (enter the value **75** under footprint column)		

Use water judiciously to shrink your Carbon Footprint.

5(b) However, if you start using bucket, daily reductions in water footprint can be **15 litres**. This is your handprint. (enter the value **15** under handprint column)		
6. Do you have a medium sized garden? Calculate for how many minutes or hours you use a hosepipe to water the plants. You can try to save water with methods such as watering plants as required instead of flooding the pots, drip irrigation, water sprinklers, adoption of water efficient plants for your garden, etc.		
6(a) Assuming that you run your tap for 15 minutes every day and the water flow is 5 litres per minute, your daily footprint is **75 litres** on the garden. (enter the value **75** under footprint column)		
OR		
6(b) However, if you use a sprinkler with flow of 3 litres per minute your footprint will be 45 Litres per day on an average. You would save **75 l - 45 l = 30 l** of water. (enter the value **30 litres** under handprint column) You can measure water use similarly for other methods of watering also and calculate your handprint.		
7. Do you have leaking taps? {Leaking taps can waste up to 100 litres of water a day, depending upon leak size. Instead of 100 litres, you can modify the calculation by using an average of 50 or 20 litres a day if you think, you have a small leak}.		
7(a) If there is no leak, your daily water footprint because of leaking tap is **0 litres**.		
7(b) If you have a leaking tap, your daily water footprint is upto **Fw13 litres**. It can be calculated as: **leak size (refer above) x No. of leaking taps = Fw13** (enter the value **Fw13** under footprint column).	**Fw13**	

	Footprint w.r.t. water (Fw)	Handprint w.r.t. water (Hw)
7(c) **If you** can motivate your friends and neighbours to repair their leaks or initiate action to repair them in the home, school or a public place, you can either increase your water handprint or reduce their water footprint.		
8. **Do you wash clothes in a washing machine?** • A top load fully automatic washing machine of 7kg uses 120 l of water per load. • A front load fully automatic washing machine of similar capacity uses 80 l. • Semi automatic washing machine uses 100 l or more of water per load.		
8(a) **If yes,** your footprint per load is: **Quantity of water used per load (in liters) x no. of loads/day = Fw14** (enter the value **Fw14** under footprint column)	**Fw14**	
8(b) **If you** use 3 or 4 buckets of water for the same number of clothes, your water footprint would be lesser than those who use washing machines (unless you keep the tap running while rinsing clothes). In this case calculate your footprint and handprint as under: **Capacity of bucket (in liters) x no. of buckets needed = Fw15 liters** (enter the value **Fw15** under footprint column) In this case, your handprint is **Hw8** which can be calculated as: **Fw14 - Fw15 = Hw8** (enter the value **Hw8** under handprint column)	**Fw15**	**Hw8**
9. **Do you have reverse osmosis (RO) water purification system installed at your home?** {Measure water drained from outflow pipe with calibrated small bucket or jug, say ---- **litres**}.		

9(a) If yes, and you let the water to be drained then: your water footprint for water purification can be calculated as : **... litres by finding out the volume of water drained** (as mentioned above) = **Fw16** (enter the value **Fw16** under footprint column)	**Fw16**	
OR		
9(b) If you collect the out flowed water and reuse it for washing cars, floors or watering plants then: **Fw16 litres would be your handprint i.e. Fw16 = Hw9** (enter the value **Hw9** under handprint, in this case)		**Hw9**
9(c) If you do not use RO or use a conventional candle filter, your water footprint would be **0 litres**.	**--**	
10. Do you apply water conservation measures for other general water uses in households? **For example:** Do you minimise water wastage in cleaning bathrooms and kitchens and washing cars? {Calculate your household footprint in general cleaning activities by number of buckets used in kitchen and bathroom + number of buckets used in washing car + number of buckets used in washing courtyard = n buckets}.		
10(a)If no, then your average water footprint per day is: **no. of buckets x volume of bucket = Fw17** (enter value **Fw17** in footprint column)	**Fw17**	
10(b)If you consciously limit water usage by reducing the number of buckets used for above activities then, your water footprint will be smaller, say **Fw18** (can be calculated in a similar way as above). (enter value **Fw18** in footprint column) Your handprint in this case can be calculated as under: **Fw17 - Fw18 = Hw10** (enter the value **Hw10** under handprint column)		**Hw10**

	Footprint w.r.t. water (Fw)	Handprint w.r.t. water (Hw)
11. Does your household have a rainwater tank or a grey water system for re-using water?		
11(a)If yes, on an average, your household's water handprint is Volume of water reused + volume of rain water harvested = **Hw11**. This is your water handprint. (enter the value **Hw11** under handprint column)		**Hw11**
11(b)If no, your household's handprint is **0 litres** per day.		**--**
 **Your family's total water footprint/ handprint per day.**  **Individual water handprint (Total water handprint/ number of family members).**	**Σ Fw litres/day** **Σ Fw litres/day**	**Σ Hw litres/day** **Σ Hw litres/day**

Now you can calculate the impact of some other activities on your Carbon Footprint Vs Handprint.

	Fw kg/day	Hw kg/day
12. Do you drink packaged water? {Carbon footprint of bottled water is 0.32 kg of CO_2 per liter water}.		
12(a)If yes, your carbon footprint of drinking bottled water would be: **no. of bottles consumed in a day x 0.32 kg = Fw19** (enter the value **Fw19** under footprint column)	**Fw19**	
12(b)If no, your carbon footprint is **0 kg**.		
13. Do you have native trees in your garden? {Planting a medium sized tree in your garden can fix		

2,268 kg CO_2 per year. This can improve your carbon handprint}. It is always advisable to plant native trees as these are ecologically suited to the local environment and generally require less water and care.		
13(a)If you have planted or nurtured existing trees, calculate your carbon handprint as under: **No. of trees x 6.21 kg/ day = Hw12kg/day** (enter the **Hw12** value under handprint column)		**Hw12**
13(b)If no, your carbon handprint is **0 kg/day**.		**--**

Your total carbon footprint while using water in your household per day, can be calculated as:

(Σ Fw litres x 0.00176 kg/litre) + Fw19 kg (refer question 12 if applicable) = **…….kg CO_2**

Where **0.00176 kg** is CO_2 produced against single litre of water consumed.

If you are limiting your water usage (refer total water handprint), you are creating a carbon handprint which can be calculated as:

(Σ Hw litres x 0.00176 kg/litre) + Hw12 kg (refer question 13, if applicable) = **… kg CO_2**

……kg of CO_2 is contributed by me in one day with respect to my water use.

……kg of CO_2 is saved by me in one day when I change my habits and become water wise.