MY CARBON FOOTPRINT

TRAVEL

WATER USE

WASTE

ELECTRICITY

FOOD

WESSA
90 YEARS of
people caring for the earth

HAND PRINT™
action towards sustainability
This booklet has been compiled as part of the Handprint – actions towards sustainability - series. A handprint is a positive action anyone can make to off-set the negative impact of our footprints! See www.handsforchange.org

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ACKNOWLEDGEMENTS

This ‘My Carbon Footprint’ booklet was first compiled in 2010 as an assignment for Project 90x2030. Many people assisted in the development of the booklet and we are grateful to all of them for their support. In particular Avril Wilkinson (WESSA Schools Programme) contributed very helpful information on the formulae for calculating the CO₂ emissions. Valuable input and further contributions have been made by Rob O’Donoghue (Rhodes Environmental Learning Research Centre) as well as by teachers and other educators who have used the booklet in schools and at environmental education centres. In this regard Vivo Venter at Umgeni Valley has put the latest version to good use with teachers and especially found the ‘Enviro Meal’ section useful for healthy eating.

The booklet was also applied, used and adapted by Lina Nantinda in schools in Namibia. She also accompanied the Prime Minister of Namibia to the Copenhagen COP meetings on climate change, and shared the resource with any leaders there who were interested! Ranjana Saikia also shared the resource with The Energy Research Institute in India and offered insights into the development of the resource. Members of the German supported Education for Sustainable Development (ESD) Expert-Net have also shown interest in this resource and their input is valued. Pramod Sharma and Kartikeya Sarabhai from the Hand Prints project at CEE are also firm supporters of this work. They always remind us that positive ‘hand-prints for sustainability’ are more important than the negative complaining that is often associated with the environment movement!

Larette Schultz and Jim Taylor (WESSA Professional Support Service) have also assisted with editing and have provided the content and links to the SDGs and the NDP. We invite all who read and use the booklet to assist us in providing further feedback so that we can make improvements for possible future editions. Our grateful appreciation to Grindrod (Marietjie Coertzen and Cathie Lewis) for supporting this version and to Greymatter & Finch for presentation and layout.

Liz Taylor Howick July 2016
As the threats to our planet increase and we progressively exceed planetary boundaries, we have a choice: either we carry on the same, become depressed, or pick up the challenge and explore the true impacts of our lifestyles and try to reduce our CO₂ emissions.

We all seek to live in a way that is good for us and others and bring about happiness. But this is not always the case. Sometimes the way we live, and the resources we use and greenhouse gases our lifestyles emit exceed the life support systems of Earth. We use too much energy and create greenhouse gases that further threaten life on Earth. We create too much waste, use too much water and, often, our lifestyles reduce the precious biodiversity that sustains life on Earth. How can we live differently on Earth?

In this booklet we provide a toolkit that helps us understand the implications of our actions. It gives us simple formulae to calculate just about every impact of our lifestyles including the food we eat, energy we use and waste we create. Understanding these human impacts helps us make informed choices about future ways of living. We invite you to join us in making choices for a better world for all!
Our activities are rapidly reversing the very processes that made human life on Earth possible!
What is a CARBON FOOTPRINT?

A carbon footprint is carbon dioxide (CO₂) that is released into the atmosphere as a result of our actions. Carbon dioxide is one of the major contributors to climate change (global warming).

How does GLOBAL WARMING occur?

Carbon dioxide and other gases are released into the atmosphere and form a layer. This layer allows the shortwave radiation from the sun to enter and heat up the earth, but this layer traps some of the outgoing reflected heat (longwave) radiation. Therefore the earth’s atmosphere is heating up as we release more and more CO₂ into the atmosphere.

Where does the CO₂ come from and how is it linked to our ACTIONS?

Every action that we perform on Earth needs energy.

The energy we use can come from our own BODIES, e.g. lifting, walking and digging. For this, we need to eat food. Our bodies break down the food to release energy and we breathe out CO₂.

We could use ANIMALS to do the work for us (e.g. oxen ploughing, horse pulling a cart). We would then need to feed the animals. Their bodies break down the food to release energy and they breathe out CO₂.

We could use MACHINES to do the work for us (e.g. tractor for ploughing, driving a car). These machines need fuel to operate. This is usually in the form of “fossil fuel” (oil, petrol). Burning oil and petrol releases energy for the car to use, which releases CO₂ into the air.

We could use ELECTRICITY to do the work for us (e.g. to run machinery in factories, do work in our homes). This electricity comes mainly from burning coal. Burning coal releases energy which is used in power stations and releases CO₂ into the air.

When anything moves energy is used to enable the movement to take place. Look around you: Everything that is moving – cars, trucks, ships, aeroplanes, humans and animals, the air around you and the water in the rivers and oceans of the world, is moving because it has energy. Cars, trucks, ships, aeroplanes, humans and animals release CO₂ when they use energy.

There are some forms of energy that do not release CO₂ into the air e.g. wind energy. Can you think of others?
The importance of PHOTOSYNTHESIS?

Many millions of years ago, before there was any sign of life on Earth, there was no free oxygen in the atmosphere (i.e. there was no \( \text{O}_2 \)). Then, roughly 1 billion years ago (1 thousand million years ago) the first life appeared as blue-green algae. This primitive one-celled organism was able to use light from the sun to photosynthesise, taking in \( \text{CO}_2 \) molecules and releasing the first \( \text{O}_2 \) molecules. **THIS WAS THE FIRST FREE OXYGEN.**

Over the next few millions of years the algae developed into more complex plants and continued taking in \( \text{CO}_2 \) and releasing oxygen. (This process allowed the atmosphere to become more oxygen rich, creating the right conditions for animals to evolve). By the start of the carboniferous era about 355 million years ago, there were 3 000 parts per million of \( \text{CO}_2 \) 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 \( \text{CO}_2 \), keep the carbon to build their bulk and release oxygen. Once the plants died, they would sink into the swamps and eventually become coal. They did not rot away as most plants would today. Over this incredibly long time a LOT of carbon was taken in from the atmosphere and stored under the ground as coal.

Eventually, at the end of the carboniferous era, the measurement of \( \text{CO}_2 \) in the atmosphere was 250 parts per million. When we burn this coal, we release the carbon back into the atmosphere as \( \text{CO}_2 \). This is what is increasing the amount of \( \text{CO}_2 \) in the atmosphere. Today our atmosphere has about 400 parts per million of \( \text{CO}_2 \) and this is increasing. This \( \text{CO}_2 \) is a greenhouse gas which leads to global warming and ultimately to climate change.
How much ELECTRICITY do I use in a day?

A watt is a unit of power
A watt rating is the rating given to appliances.
A kilowatt (kW) is 1 000 watts
kWh = kilowatt-hour

<table>
<thead>
<tr>
<th>List all the things you use every day that rely on electricity.</th>
<th>Insert the watt rating of each of these appliances. You will find this underneath each appliance. (This is an indication of how much ENERGY the appliance is using.) Divide by 1 000 to calculate kilowatts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heater</td>
<td></td>
</tr>
<tr>
<td>Kettle</td>
<td>2 200W ÷ 1 000 = 2,2kW</td>
</tr>
<tr>
<td>Toaster</td>
<td>750W</td>
</tr>
<tr>
<td>Fan</td>
<td></td>
</tr>
<tr>
<td>Lights</td>
<td></td>
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<tr>
<td>Computer</td>
<td></td>
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<tr>
<td>TV</td>
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<tr>
<td>Stove</td>
<td></td>
</tr>
</tbody>
</table>

Briefly describe how electricity is made.

Eskom, last year alone, burned more than 200 million tons of coal. This released about 260 million tons of CO₂ into the air.

What does kWh mean?

DID YOU KNOW?

1kg of CO₂ is produced for every kWh of electricity consumed.

1 kg of CO₂ is produced for every kWh of electricity consumed.

MY CARBON FOOTPRINT

1 kg of CO₂ is produced for every kWh of electricity consumed.
In the table below list all the electrical appliances that you use in a day. Next to each one calculate how long you use it for. You can then multiply by the minutes to get kWminutes and then divide by 60 to get kWh.

<table>
<thead>
<tr>
<th>Complete this column from page 05</th>
<th>Complete this column from page 05</th>
<th>Number of minutes used</th>
<th>kW multiplied by minutes = kW minutes</th>
<th>Divide by 60 to get kWh</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

TOTAL kWh used in one day.............................

THEREFORE  

\[ \text{\ldots\ldots\ldots kWh} \times 1\text{kg CO}_2 \]

\[ = \text{\ldots\ldots\ldots kg CO}_2 \]

\[ \text{\ldots\ldots\ldots kg of CO}_2 \]

released by me in one day.
TRAVEL

How much PETROL do I use in a day?

Measure the distance you travel each day by car.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To school</td>
<td></td>
</tr>
<tr>
<td>To sport</td>
<td></td>
</tr>
<tr>
<td>Home from school</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
</tr>
</tbody>
</table>

Our car travels .......... km on one litre of petrol

What is the SIZE of your car’s engine?

<table>
<thead>
<tr>
<th>Engine size (cm³)</th>
<th>Consumption (km/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
<td>22,22km/l</td>
</tr>
<tr>
<td>Under 350</td>
<td>33,3km/l</td>
</tr>
<tr>
<td>351 – 1 100</td>
<td>20km/l</td>
</tr>
<tr>
<td>1 101 – 1 300</td>
<td>12,65km/l</td>
</tr>
<tr>
<td>1 301 – 1 500</td>
<td>12,3km/l</td>
</tr>
<tr>
<td>1 501 – 1 800</td>
<td>10,63km/l</td>
</tr>
<tr>
<td>1 801 – 2 000</td>
<td>10,41km/l</td>
</tr>
<tr>
<td>2 001 – 2 500</td>
<td>9,17km/l</td>
</tr>
<tr>
<td>2 501 – 3 000</td>
<td>8km/l</td>
</tr>
<tr>
<td>3 001 – 4 000</td>
<td>7,24km/l</td>
</tr>
<tr>
<td>Over 4 000</td>
<td>6,37km/l</td>
</tr>
</tbody>
</table>

2,4kg of CO₂ is produced for every litre of petrol combusted.

DID YOU KNOW?

Science

Please note that these figures were calculated by Avril Wilkinson in her work on Formulae for Science Projects. Advice on updates or more recent calculations are welcome.
THEREFORE

How many litres did I use in one day?

\[ \text{\ldots\ldots\ldots\ldots} \text{km} \div \text{\ldots\ldots\ldots\ldots} \text{km/l (our car)} = \text{\ldots\ldots\ldots\ldots} \text{litres used} \]

THEREFORE

\[ \text{\ldots\ldots\ldots\ldots} \text{litres} \times 2.4 \text{kg CO}_2 = \text{\ldots\ldots\ldots\ldots} \text{kg CO}_2 \]

\[ \text{\ldots\ldots\ldots\ldots} \text{kg of CO}_2 \text{ released by me in one day.} \]
How much WATER do I use in a day?

All the water you use in a day needs to be pumped to your house or school. This uses electricity.

1. Did you know it takes about 0.0018 kWh to pump 1 litre of water for your use?
2. Therefore, 0.0018 kWh x 1 kg CO₂ = 0.00178 kg CO₂ for every litre of water you use.

Please keep this audit sheet with you at all times and update it lunch time, supper time and when you go to bed. Water used for washing clothes, washing dishes and cooking will have to be an estimate. Think of how much is used at home.

**SHOWERING**
Get one person to stand in the shower holding a bucket at the shower rose. Switch on the tap at the volume you would usually use for showering. Time one minute. Measure the amount in the bucket. Now everyone just needs to record their showering time and multiply it by the volume in the bucket.

**BRUSHING TEETH AND WASHING HANDS**
Similar to the above method, hold a jug under the tap and open the tap to the volume you would use for washing hands or cleaning teeth and then time one minute. Thereafter you just need to time yourself and multiply by the volume.

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Pre-lunch</th>
<th>Lunch to supper</th>
<th>After supper</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Amount</td>
<td>Number</td>
<td>Amount</td>
</tr>
<tr>
<td>Glasses of water (340ml or 0.34l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Cups of tea/coffee (250ml or 0.25l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Brushing teeth (......ml or ...... l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Washing hands (......ml or ...... l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Flushing toilet (......ml or ...... l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Showering (......ml or ...... l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Washing clothes (......ml or ...... l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Washing dishes (......ml or ...... l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Cooking (......ml or ...... l)</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
<tr>
<td>Total</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
<td>.......... in litres</td>
</tr>
</tbody>
</table>
Measure your water use for one day.

TOTAL ..........litres x 0,00178kg
CO₂ = .............

......kg of CO₂ released by me in one day.
How much WASTE do I produce in a day?

Everything you throw away was made somewhere in a factory. This process of making the item released CO₂ emissions.

kg CO₂ produced per 1kg waste*

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Weight of waste</th>
<th>CO₂ produced by 1kg</th>
<th>Total CO₂ emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic material</td>
<td></td>
<td>0.62kg CO₂</td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td></td>
<td>2.13kg CO₂</td>
<td></td>
</tr>
<tr>
<td>Plastic</td>
<td></td>
<td>3.30kg CO₂</td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td></td>
<td>1.03kg CO₂</td>
<td></td>
</tr>
<tr>
<td>Metal</td>
<td></td>
<td>2.20kg CO₂</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

1. Carry a plastic bag with you all day. Put everything that you would have thrown into the bin in the bag.
2. At the end of the day separate the rubbish into paper, plastic, glass and tin.
3. Weigh each separate pile.

Please note that these figures were calculated by Avril Wilkinson in her work on Formulae for Science Projects. Advice on updates or more recent calculations are welcome.
Measure your waste for one day.

......kg of CO₂ released by me in one day.
Carbon footprint associated with FOOD AND DRINK

The most important things about the food that you consume, when related to your carbon footprint, is:

- **Car** How far did it travel to get to you?
- **Egg** Is it meat or fish?
- **Fridge** Is it in season or has it been refrigerated for months (or flown in from somewhere else)?
- **Package** How is it packaged?

THE ENVIRO MEAL

This Enviro Meal activity helps give us an indication of CO₂ levels produced. It does not give an actual CO₂ score like the Electricity, Travel, Water and Waste calculations.

The Enviro Meal is an educational activity which examines some of the choices we make as consumers – in particular, choices around food, packaging and waste which have an impact on our environment. It can be used as a stand-alone activity or as part of a larger learning programme. The activity is exciting and competitive and lends itself to active participation by everyone involved. In addition to the environmental learning which grows out of the activity, the Enviro Meal is great for team building!

**Time required:**

4 – 6 hours

**Group size**

12 – 36 participants in 3 – 4 teams (depending on available cooking facilities)

**Resources**

Each team should be supplied with an Enviro Meal audit sheet, a pencil, a cardboard box and cash with which to buy the food (R20.00 per person).

**Instructions for participants**

Your team must plan and prepare a meal, which you will eat together. You will need to purchase all of the ingredients you need for the meal with the money provided by the facilitators. Afterwards your meal will be audited to assess its environmental impacts, in terms of food types and packaging. The Enviro Meal audit sheet will be used to assess these impacts. Your team’s final score represents the impact of your meal on the environment. The higher the score, the greater the impact.
Rules

1. No ingredients will be provided beforehand. You must purchase everything you need to prepare your meal including salt, oil, margarine, tomato sauce, drinks etc.

2. You may not add your own money to the money provided. You must remain within the budget.

3. Your team should attempt to cater for the preferences and special dietary requirements of all of its members.

4. Teams may share items, such as salt and oil.

5. You may not purchase pre-cooked foods such as roast chicken, pies or pizza.

6. You may not remove any packaging from items, while shopping, to reduce your packaging points. Collect and keep all items of packaging, which came with your ingredients, in your cardboard box.

7. Nothing may be discarded.

8. All purchases should be accompanied by till slips – keep these for auditing purposes.

9. Each team should cater for one of the facilitators and invite him/her to eat with them.

Some QUESTIONS to discuss together

- What could you have done to reduce your score in this activity? If you could do the Enviro Meal again, would you do it differently?
- What influenced the decisions you made as a group?
- Did you stick to your original plan? If not, why not?
- Did the options available at the shop make it easy for you to make environmentally friendly choices? Who do you think is responsible for limiting our options in this way?
- What do you think of the scoring system in the audit sheet? What aspects of the audit sheet would you like to change?
- Your environmental impacts have been audited using someone else’s value system. How does this make you feel?
- Do you agree with the way this activity interpreted your environmental impacts as a consumer?
- Are there other environmental impacts that were not considered in the activity?
- What can you do, in your own life, to reduce your environmental impacts as a consumer?
- What will happen to the packaging and leftover food after this activity?
Guidelines for facilitators

Planning the meal:
After explaining the purpose of the activity and the rules, give the teams about 20 minutes to plan their meals. If the group is very large, tell them to select four members per team to do the shopping.

Shopping:
Allow at least an hour for the shopping. Most of the challenges and difficult choices in this activity will be experienced while shopping. Facilitators should speak to shop managers and security personnel beforehand to explain the purpose of the activity and to get permission to do the activity in their store.

Cooking and eating the meal:
Return to base and prepare the meal. Set the tables and decorate them. Enjoy the meal together and taste the food prepared by the other teams.

Auditing the meal:
Each team should audit their meal using the Enviro Meal audit sheet.
- Make a list of each item purchased and its price.
- Calculate how much money was spent and how much was left over.
- Separate the packaging into types, according to the Enviro Meal audit sheet. Count how many pieces of each type of packaging are present. For example if a team has two soft plastic bags, it will accumulate packaging points for each of the two items. Calculate a subtotal for packaging.
- Identify the food types present. Calculate a subtotal for food types.
- Calculate a final score and interpret it using the Enviro Meal scale.

Auditing the waste:
Get each group to categorise the waste they have collected in their box into the various packaging types for recycling. They then need to explain why they have made the choice of divisions.

Reporting and consolidating:
Ask each team to present their score and explain why they got the score they did. Discuss the activity and the learning that has taken place.
Enviro Meal Audit sheet. Use the table on pages 17 and 18 to score the items you have bought. The GRAND TOTAL score is an indication of your carbon footprint associated with food and drinks. The smaller the score the better.

<table>
<thead>
<tr>
<th>Item</th>
<th>Distance you traveled to buy this item (Only score one distance if you bought items at the same shop). Write “same” in the other blocks.</th>
<th>Price</th>
<th>Packaging</th>
<th>Food/drink type</th>
<th>Local, national or imported</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

**SUBTOTAL – DISTANCE TRAVELED to buy**

**SUBTOTAL – OVERSPENT**

**SUBTOTAL – PACKAGING**

**SUBTOTAL – FOOD/DRINK TYPE**

**SUBTOTAL – LOCAL, NATIONAL, IMPORTED**

**GRAND TOTAL**

The team with the LOWEST score is the winner
Score the items using the following points:

<table>
<thead>
<tr>
<th>Distance traveled</th>
<th>Score</th>
<th>Overspend</th>
<th>Score</th>
<th>Packaging</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walked</td>
<td>0</td>
<td>Under budget</td>
<td>0</td>
<td>No packaging at all</td>
<td>0</td>
</tr>
<tr>
<td>Cycled</td>
<td>0,5</td>
<td>Up to R2 over</td>
<td>1</td>
<td>Returnable glass bottle</td>
<td>1</td>
</tr>
<tr>
<td>By car – 1km</td>
<td>2</td>
<td>R2 to R5</td>
<td>2</td>
<td>Discard bottle</td>
<td>2</td>
</tr>
<tr>
<td>By car – 2km</td>
<td>4</td>
<td>R5 to R8</td>
<td>3</td>
<td>Paper, cardboard, tin</td>
<td>3</td>
</tr>
<tr>
<td>By car – 3km</td>
<td>6</td>
<td>R8 to R11</td>
<td>4</td>
<td>Composite packaging, aluminium can, soft plastic</td>
<td>4</td>
</tr>
<tr>
<td>By car – 4km</td>
<td>8</td>
<td>Over R11</td>
<td>5</td>
<td>Hard plastic, styrofoam</td>
<td>5</td>
</tr>
<tr>
<td>By car – 5km</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>By car – 6km</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food type</td>
<td>Score</td>
<td>Local/national/imported</td>
<td>Score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>-------</td>
<td>--------------------------------------------------------------------------------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home grown in your own garden</td>
<td>0</td>
<td>Homegrown</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables, fruit salad, pure fruit juice</td>
<td>1</td>
<td>Local. This item was obtained from an area less than 30km away</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bread, rice, pasta, maize meal, tea, coffee, milk</td>
<td>2</td>
<td>National. This item was obtained from an area more than 30km away but still in SA</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed juice</td>
<td>3</td>
<td>Imported. This item was imported from another country</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken, fish, tins, custard, ice-cream</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red meat, alcohol, fizzy drinks</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TOTAL carbon footprint for one day

My total carbon footprint for one day is.......kg of CO₂
one week is.....kg of CO₂
one month is...kg of CO₂
one year is......kg of CO₂

<table>
<thead>
<tr>
<th>Total CO₂ Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
</tr>
<tr>
<td>Travel</td>
</tr>
<tr>
<td>Water use</td>
</tr>
<tr>
<td>Waste</td>
</tr>
<tr>
<td>Food*</td>
</tr>
</tbody>
</table>

* Not a CO₂ score. An indication only

Ideas for discussion
Discuss other factors that are not accounted for in the daily budget that could influence the weekly, monthly or yearly budget i.e. activities that are not done every day.∗

These are some activities that could increase your water budget:
- Watering the garden
- Washing the car
- Swimming pools

These are some activities that could increase your electricity use:
- Heaters in winter
- Air conditioner in summer
- Holidays
- Increased use of stove
- Swimming pool
Can you think of any others?

Soaps and detergents
Toiletries
Clothes

Other factors not included in this carbon calculation:
A carbon economy is not viable

The Mail & Guardian Critical Thinking Forum brought together science, business and green lobby groups to interrogate the possibilities of shifting away from producing energy that pollutes the environment. An expert panel debated the topic, “More energy, less carbon dioxide”, at the Gateway to Robben Island the V&A Waterfront in Cape Town. It was a heated debate moderated by Judge Dennis Davis, who, at one point, likened the scientific debates on green energy and climate change to a “convenient moral panic” that “certain people are using to push an agenda”.

The panelists responded with thoughtful and practical ideas on what path the energy supply chain should follow to save the environment, benefit citizens and halt “greedy capital”. The debate was contextualised within the dilemma for developing economies such as South Africa. Davis wanted to know from the experts whether a country with a relatively small economy needed to pump capital into green energy sources when funds should be allocated more directly to the social needs of the poor. The issue of the cost of generating power was central to the discussions. The challenge was to balance development which uses green energy strategies with ensuring growth and attracting investment.

These are edited excerpts from the panelists.

Stefan Raubenheimer is chief executive of SouthSouthNorth, a global network-based non-profit organisation. Raubenheimer is lead facilitator of the Long Term Mitigation Scenario Project on energy for the South African Cabinet:

We have a phenomenal challenge in South Africa. We need to power our nation for development and the battle against poverty. We need mainly electricity and liquid fuel to power our nation. The current delivery of electricity and liquid fuels is almost 80% from coal. In terms of liquid fuel, 30% from coal and gas is through Sasol. The rest is imported, all R95 billion a year of it. These fuels keep our economy running. The problem is that these fuels emit gigantic amounts of carbon dioxide. The whole economy emits about 450 million tonnes [of carbon dioxide] per year. Even though we are one-sixth the economic size of the United Kingdom, we have the same [carbon dioxide] emissions. Our emissions will increase fourfold by 2050 if we continue this way.

If we get in step with the rest of the world we will have to be an economy without any coal [energy supply] by 2050. We would have to be an economy with at least 60% less liquid fuel in the system. We should urgently begin to consider another direction. One should be risk averse. To be successful we have chosen to be competitive in the global economy but we won’t be successful if we choose a carbon economy. If the world reacts to the science in a prudent way we will have a world where the inherent carbon in goods will be a reason to trade or not. Our kids are going to be the leaders of that world and a country like South Africa, burning fossil fuels, just won’t be popular any more. We’ll be the pariahs of the world. It’s not going to be easy and there aren’t simple answers. We’re going to have to pump even more capital into green energy. So we need to start with the things that we can do. We can start with solar water heaters.

Richard Worthington, manager of the WWF climate change programme:

Climate change is happening faster than any of the models predicted. We need to think about more energy services and less ecological footprint. We haven’t yet evaluated our alternatives in South Africa. The opportunities of a low-carbon economy are fantastic. There are employment opportunities in utilising wind and solar energy, harnessing renewable energies, keeping value in communities and moving away from an energy supply system that utilises fuels for profit. We can make energy supply more democratic, people and climate friendly. We need more energy services for all people and industrial activity we want to pursue. We can do it but that means moving away from business as usual. That means challenging the people who are reaping the benefits from plundering the resources and thinking in terms of what is the best way to meet energy needs, and what is the best way to live within the carrying capacity of our planet.

A low carbon economy is sometimes seen as a burden. It’s not such a challenge, unless you’re sitting in a boardroom trying to persuade a bunch of investors that they shouldn’t look to their returns in the next three or four years, but returns that their children will live with. This planet does have enough resources to support all the people on it and a few more if we are prepared to use them in a way that meets our service needs rather than accumulating capital and wealth. Many of us are already talking about humanity doing something extraordinary, we are asking for responsibility. We are asking people to rethink what is productive. Gross domestic product growth is not the same thing as progress. We need to move towards quality of life.

“I’m not an environmentalist. I just want a sustainable economy. The environment is only what we need to make the economy sustainable. It just means that there’s less profit. Capital needs to be more patient.”

If we can get global emissions to start to decline before 2020 that will give us a 50-50 chance to keep global warming down. The cost of using coal to access energy includes children living in a compromised environment. The cost for energy has a price that society pays. We have major challenges. We need to get the polluters to pay.

The average carbon footprint per South African is 10 tonnes an annum. But only 10% of the population is responsible for 90% of that. Climate change is not a horror story. It’s an opportunity for humanity to move to a zero-carbon economy with better quality of life.
Dr Wolfgang Heidug, general manager and special adviser on carbon dioxide policy at Shell Downstream Services International BV:

“There is an effort internationally to design policies for clean technologies worldwide. It is a chance to develop a policy framework for developing countries such as South Africa. We can incentivise clean technology. You can do a project in a developing country and you can get credit for that. Energy producers need to take the cost of the environment into account. That way the cost of using fossil-produced electricity becomes more expensive.

“Our kids are going to be the leaders of the world and a country like South Africa. Burning fossil fuels, just won’t be popular anymore.”

Professor Kevin Bennett, UCT’s department of mechanical engineering:

“Developing economies are effectively world leaders in the use of renewable energy because they don’t have the opportunity to get hold of commercial energy. They don’t rely on large power stations. We can learn a lot from where we should be going. What would be the way to get away from carbon? Renewable energy is an obvious option. We don’t have intense renewable energy sources. They’re weak. Why are we trying to build big power stations using renewable energy? Why aren’t we forcing people to put solar heaters on their houses? Why aren’t we using heat from solar or wind on a very small scale?

“The developed countries went through the cycle from wind to coal to gas to nuclear. Undeveloped countries haven’t got there. They’re still sitting with wood. There has to be a mixture [of energy sources]. We have to have coal and nuclear. But I think we’re spending too much effort on those and not looking at the non-carbon options. We are totally blinded by this carbon fixation. Carbon dioxide has increased in the past 20 years and the economy hasn’t gone up at the same rate. We shouldn’t be completely determining our energy futures on carbon dioxide. We need to continue with the idea of continued reuse of renewable energy, not necessarily those that need to be purchased from the First World.

“Developing countries need to look at domestic applications. For the major parts of the economy we might have to go nuclear. That’s not a carbon-based option. We can’t ignore it. There are concerns around nuclear. But there aren’t going to be many other options. We’re not going to drop everything and become completely renewable. We are going to be stuck with fossil-fuel power stations for the next 20 years.”
Mapping the SDG Targets and NDP Objectives

1. **NO POVERTY**  
   NDP Chapter 11  
   Social Protection

2. **ZERO HUNGER**  
   NDP Chapter 5  
   Environmental Sustainability and Resilience  
   Chapter 6  
   Inclusive Rural Economy  
   Chapter 11  
   Social Protection

3. **GOOD HEALTH AND WELL-BEING**  
   NDP Chapter 10  
   Health Care for All

4. **QUALITY EDUCATION**  
   NDP Chapter 9  
   Improving Education, Training and Innovation

5. **GENDER EQUALITY**  
   NDP Chapter 11  
   Social Protection  
   Chapter 12  
   Building Safer Communities

6. **CLEAN WATER AND SANITATION**  
   NDP Chapter 4  
   Economic Infrastructure  
   Chapter 5  
   Environmental Sustainability and Resilience

7. **AFFORDABLE AND CLEAN ENERGY**  
   NDP Chapter 4  
   Economic Infrastructure  
   Chapter 5  
   Environmental Sustainability and Resilience

8. **DECENT WORK AND ECONOMIC GROWTH**  
   NDP Chapter 3  
   Economy and Employment

9. **INDUSTRY, INNOVATION AND INFRASTRUCTURE**  
   NDP Chapter 4  
   Economic Infrastructure
If you are viewing this document electronically, click on the coloured boxes to go to SDG’s website or the icons to go to the NDP site.
Discussions from the Mail & Guardian Critical Thinking Forum

Read the discussions on pages 21 and 22. Use this as an opportunity to question, debate and discuss the following quotes. (It might be best to work in groups of 4 to 5 people so that different people can add to the debates and discussions.)

1. Read the first paragraph on page 21 out aloud in your group.
2. In the second paragraph Judge Dennis Davis wanted to know from the experts whether a country with a relatively small economy needed to pump capital into green energy sources when funds should be allocated more directly to the social needs of the poor. Discuss the meaning of this in your group.
3. Stefan Raubenheimer says “Our kids are going to be the leaders of that world and a country like South Africa, burning fossil fuels, just won’t be popular any more.” What does he say is a good way to start?
4. Richard Worthington says “A low carbon economy is sometimes seen as a burden.” Why does he say this?
5. “I’m not an environmentalist. I just want a sustainable economy. The environment is only what we need to make the economy sustainable. It just means that there’s less profit. Capital needs to be more patient.” “If we can get global emissions to start to decline before 2020 that will give us a 50-50 chance to keep global warming down. The cost of using coal to access energy includes children living in a compromised environment. The cost for energy has a price that society pays. We have major challenges. We need to get the polluters to pay. There are a number of points that Richard Worthington makes in this quote. Discuss and debate the meanings.
6. “The average carbon footprint per South African is 10 tonnes an annum. But only 10% of the population is responsible for 90% of that.” What does that mean?
7. Dr Wolfgang Heidug “Energy producers need to take the cost of the environment into account. That way the cost of using fossil-produced electricity becomes more expensive.” What does this mean?
8. Professor Kevin Bennett “Developing economies are effectively world leaders in the use of renewable energy because they don’t have the opportunity to get hold of commercial energy. They don’t rely on large power stations. We can learn a lot about where we should be going.” What does this mean?
Further reading to guide sustainable living:

WESSA (2016) Stepping up to the Sustainable Development Goals – a practical guide to integrating the SDGs into our daily lives, including our practical activities, year plan, networking and sustainable centre developments through change-choice-practices. 

WESSA-USAID Project, Bryanston, Johannesburg.