CLIMATE CHANGE ACTION AT A PERSONAL LEVEL

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Greenhouse gas are emitted when fossil fuels are used for energy. It is the accumulation of greenhouse gases in the atmosphere over and above what can be safely absorbed by the environment which has resulted in human-induced climate change. Addressing the root causes of climate change is necessary in order to successfully mitigate the impact of climate change. Climate change is a symptom caused by population growth and excessive growth in the per-capita consumption of fossil fuels and materials. In order to reduce greenhouse gas emissions, we need to reduce our consumption of fossil fuels because each additional kilogram emission of greenhouse gases accumulates and stays in the atmosphere and contributes to an acceleration of climate change. Continued rising levels of greenhouse gases in the atmosphere risk triggering tipping points beyond which climate change becomes irreversible and an existential threat to all forms of life on Earth.

We need to use energy in order to survive, so we need to transition from fossil fuels to renewable energy. A transition from fossil fuels to renewable energy will require massive investments of fossil fuels and materials in renewable energy infrastructure because renewable energy is unable to bootstrap itself without the use of fossil fuels. We also need to reduce our consumption of fossil fuels at the very same time as we need to use fossil fuels in order to transition to renewable energy. We have what is called a wicked problem which is difficult to resolve.

There are some claims that we can decouple our economic activity from the use of fossil fuels and materials. All economic activity requires the use of energy and materials. Efficiencies in the use of resources can be improved, wastage can be avoided, and greater use of recycling can be implemented. However, there are physical and thermodynamic limits to the extent of decoupling. In order to reduce our greenhouse gas emissions at the same time as transitioning from fossil fuels to renewable energy, we need to divert a declining per capita use of fossil fuels on consumption to that of investment in renewable energy infrastructure.

There has been a lot of talk and pledges to mitigate the impact of climate, but so far most countries have delayed undertaking action. The news media tends to focus on activists demanding action at the government level while glossing over the need for families and individuals to undertake action at a personal level. It is the inaction of not only governments and local authorities, but also families and individuals that has contributed to climate change. Changes in the consumption behaviour by families and individuals are needed to help mitigate the impact of climate change. Even though our current economic and government systems restrict what can be easily changed - examples include provision of public transport, water, electricity, and transport and communication networks - there are nonetheless many changes in actions that families and individuals can undertake. Families and individuals need to realise that action starts at home. Action means being more frugal. The most effective ways of reducing greenhouses gases at the family and individual level have been well known for decades, and these actions are listed in the order of Maslow's hierarchy of needs, starting with physiological needs.

Food & water

Methane gas belched out to the atmosphere by ruminants is initially more potent than CO_2 and contributes about 50% of global greenhouse gas equivalents. The most effective and immediate way for families and individuals to reduce greenhouse gas emissions is to eat less meat or no meat at all. There are alternative plants substitutes which can provide necessary proteins and the minerals of milk. Many crops fed to animals are crops that can be eaten directly by humans. Land used for grazing can be planted back into forests which can absorb and store more CO_2 than grass.

Where possible, we should grow our own vegetables or alternatively buy local food grown using permaculture methods instead of energy intensive fertilisers. Food and the use of water are interlinked. All crops are dependent on water and some crops use more water than others. Crops which use less water should be given priority where water is scarce and irrigation makes use of aquifers. We should also avoid processed food and cook our own food using local staples. In doing we will reduce the need for packaging.

About 30% of food is wasted in the global supply chain from the farm to the waste bucket at home. We should buy only what we need so as to avoid wasting food. The only food products that we don't eat should be potato peelings etc. which should be returned to a compost heap for growing more food.

Warmth and shelter

Clothing is the most efficient way to keep warm. We should not heat a room or a house and then take off our jerseys and put our thermals into a drawer. 18^0 C is a sufficient temperature for humans and over 20^0 C is excessive. It is far too easy to accommodate a higher temperature than necessary by removing clothing.

Before heating a home on a limited budget, we should make sure our home is well insulated. Insulation of housing in New Zealand became mandatory in 1979 and these standards have been raised in subsequent years. Most homes constructed in New Zealand before 1979 have no insulation in the walls, but the ceilings can be easily insulated where there is a roof space and likewise under-the-floor insulation can be installed where there is a crawl space.

We should question whether it is necessary to heat our entire house. Heating only the rooms we occupy is the way to go if we are on a limited budget. By all means we should buy a heat pump if we can afford one - heat pumps use 25% of the energy of a bar heater to heat a room to the same level. Ideally, houses should make use of the sun instead of needing additional heating. We should not assume our electricity bills will come down as a result of using a heat pump. Families which have shifted over to using a heat pump frequently finish up with the same previous electricity bills due to what is called the rebound effect because they adopt a higher thermal comfort level in the entire house and a higher and sometime excessive temperature on the same electricity budget.

Transport

We should use public transport more often as this is the most energy efficient form of transport. Compared to using a car, public transport involves the inconvenience of the extra time involved in travelling to the nearest pickup point, waiting for the public transport to arrive, and then the extra travelling time on board due to many stops to pick up other passengers. A more regular service will help overcome the inconvenience of waiting and a greater range of routes will reduce the distance of travelling to a local pickup point.

If we use a car, then we should reduce the number of trips in any one day by doing a single round trip, rather than multiple trips. Cars are a means of transport. The days of a car being a status symbol are over. Large and heavy SUVs are wasteful of materials and energy and are extravagant purchases. A 1500 cc automatic car is more than adequate to transport four people over the hills of Dunedin.

Electric cars imported into New Zealand are still prohibitively expensive for most families – they cost much more than a decent second hand petrol or diesel car and they have the extra burden of replacing an expensive battery. Electric cars currently sold in New Zealand weigh the same and use the same materials as petrol driven cars. The mindset of what constitutes an electric car needs to change. The ratio of the weight of an electric car to that of the passengers needs to be minimised as far as possible. A step in this direction is the two-seater Renault Twizy which is available overseas, but currently not in New Zealand.

Electric bikes have great potential, but are currently grossly overpriced in New Zealand at about $3,000. A conversion of a standard bike to an electric bike can be as low as $1,000. I would like to see the maximum power of electric bikes raised from 300 watts to 1,000 watts to handle the hills of Dunedin.

Electric scooters have potential at the price of $700, but sharing pavements is a problem. I have seen some scooters travelling faster than pedal bikes, so electric scooter could share cycle lanes.

Electric motorbikes on the road in New Zealand are now being sold at about $7,000. This price is still excessive, given that one can buy a decent petrol scooter for half the price.

It is the weather and safety factor, and also the hill factor in Dunedin, that put many people off from riding a bike whether pedal or electric. The weather and safety factor also put many people off from riding a motorbike whether

petrol or electric. A solution against getting wet and cold on an electric bike or a motorbike is to use an alternative electric vehicle with a canopy such as the two-seater lightweight PEBL. A vehicle like the PEBL with 4 KW power to the wheels would handle the hills of Dunedin without the need to pedal.

The safety factor still remains a problem so long as bikes or low speed mopeds share the road with cars. One solution is to provide an absolute separation of cycle lanes from the roads used by cars. This approach has been adopted by a number of cities around the world. It is the combination of weight and the speed of the two modes of transport which are in conflict. Another solution is to reduce the speed of all modes of transport to, say, 25 or 30 kph around the city where physically separated cycle lanes are not provided.

Seth Wynes and Kimberly Nicholas have estimated the most effective ways to substantially reduce annual personal greenhouse gas emissions in their 2017 publication "*The climate mitigation gap: education and government recommendations miss the most effective individual actions"*. They are as follows:

1. Having one fewer child (an average for developed countries of 58.6 tonnes CO2-equivalent (tCO2e) emission reductions per year),
2. Living car-free (2.4 tCO2e saved per year),
3. Avoiding airplane travel (1.6 tCO2e saved per roundtrip transatlantic flight)
4. Eating a plant-based diet (0.8 tCO2e saved per year).

The list of additional actions that families and individuals can do to help reduce greenhouse gases goes on and on. The book *"How Bad Are Bananas?: The Carbon Footprint of Everything"* by Mike Berners-Lee, 2011 and the website "*The Green Ration Book: The Costs of Everyday Living"* are excellent guides.

Reducing greenhouse gases at a personal level means using less materials and energy by being more frugal. However, being more frugal would be self-defeating if subsequent surplus income is then used to purchase more consumption goods and services which generate greenhouse gas emissions. Surplus income enabled by adopting frugality should be invested in a transition from fossil fuels to renewable energy and infrastructure. The key to absolute reductions in greenhouse gas emissions is curbing unnecessary consumption.

SUMMARY OF ACTIONS YOU CAN TAKE

Family Size

- Restrict your family size to a replacement level of two children.

Food

- Reduce or eliminate your consumption of meat of ruminants (cows & sheep) which belch out CH_4 gas. Consider becoming a Vegan.
- Grow your own food using your own compost or buy local vegetables which are grown using permaculture principles.
- Do not buy imported food.

Transport

International Transport

- Do not take international flights. Keep in contact with family and friends by Skype or similar.

Transport between North and South Island

- Use public transport – train, bus, and ferry.

Transport within South Island Transport

- Use public transport instead of a car – train and bus.

Transport within Dunedin City

- Walk short distances instead of using a car.
- Ride a bicycle, electric bike, or electric scooter.
- Use public transport instead of using a car.

If you can afford an electric car and replacement of batteries, then buy a lightweight electric car and consider buying a two-seater electric car. Lightweight and two-seater electric cars are currently available overseas. Importation of these latest generation electric cars requires a New Zealand public demand for these cars.

Housing

- Make sure your house is fully insulated.
- In winter wear thermals and a jersey to help keep warm. Doing so will help reduce heating costs.
- Consider installing a heat pump. Set the lounge temperature to 20° C and if you use a heat pump to heat bedrooms, then set the temperature to 18° C. Do not use a heat pump for cooling in summer. Open windows and use a floor mounted fan instead.
- Consider installing a solar hot water system if you are building a new home
- Double insulate your electric hot water cylinder (HWC) and, for washing dishes, use a separate under the sink HWC or a system that heats only the flow of water and not a tank. Reduce the temperature of your main HWC to a comfortable level for showers.
- Avoid using a bath. Use a shower instead.
- Use cold water for washing clothes.
- Use LED lights instead of incandescent light bulbs.

Consumption of Goods and Services

- Do not spend your income on frivolous and unnecessary goods and services. The next time you make a purchase of goods or services, consider whether you just want it or whether you need it. Buy only what you need and not what you want.
- Do not buy upgrade items when your current item is still able to satisfy your needs.
- Buy only durable goods which can be repaired.

Investment of Surplus Income

- Do not spend your surplus income on additional goods and services. Invest your surplus income in renewable energy infrastructure.

For those who wish to explore issues of sustainability in more detail, please visit my website www.insearchofsteadystate.org and use the convenient search engine to hunt down resources and information.