

WIRRAL ENVIRONMENTAL NETWORK ENERGY, FOOD & ECONOMY

OVERVIEW – THE BIG PICTURE

In our modern society we seem to be so busy we seldom seem to have time to reflect on the world we live in. This booklet has been designed to give you a short time-out to reflect on where we are, the problems we face and how the 21st century will be one of massive changes starting sooner than we think.



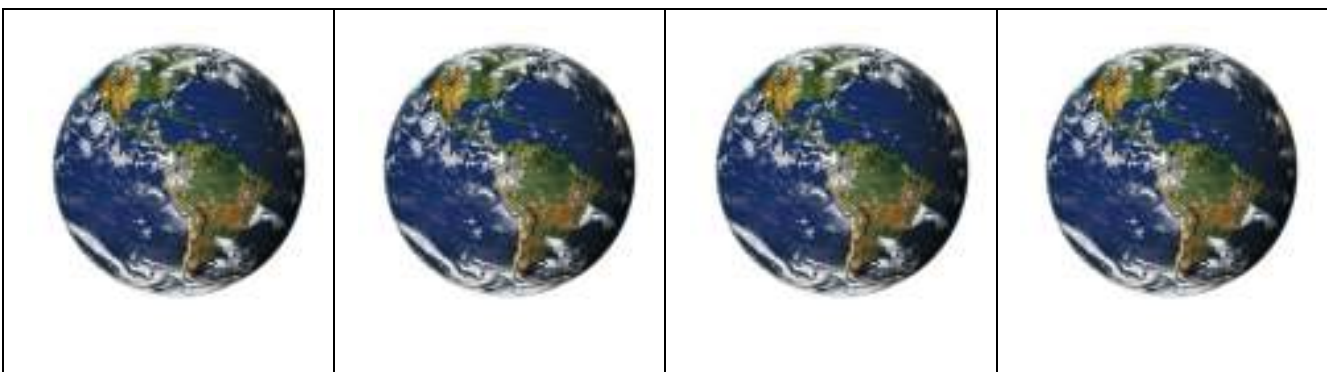
Let's start with planet Earth.

There is only one; this may seem an obvious statement to make but it is a fact which we never, ever consider. If there is only one Earth then it's not rocket science that all the resources contained on the land and in the sea are finite and this means there is always a limit to how much of something can exist.

Planet Earth currently provides human societies with two types of resources, ones which we call sustainable and the others which are unsustainable. A sustainable resource is something that if managed properly will last forever, things such as the food we grow, fish stocks in the sea, trees for wood etc. An unsustainable resource is one that once it has been taken from the earth can never be replaced and this category we can divide into two sections.

The first type of unsustainable resource are the ores and minerals mined from the earth, and once converted into metals (steel, copper, etc) and chemicals form the basis for our manufacturing industries. The second type are the fossil fuels – coal, oil and gas - created millions of years ago which we harness to create the energy that drives our modern manufacturing, heats and lights our homes and fuels our cars, trucks, boats and planes. Once fossil fuels are burnt to convert them into energy they are lost forever and as there are only so much of them in existence eventually they will run out.

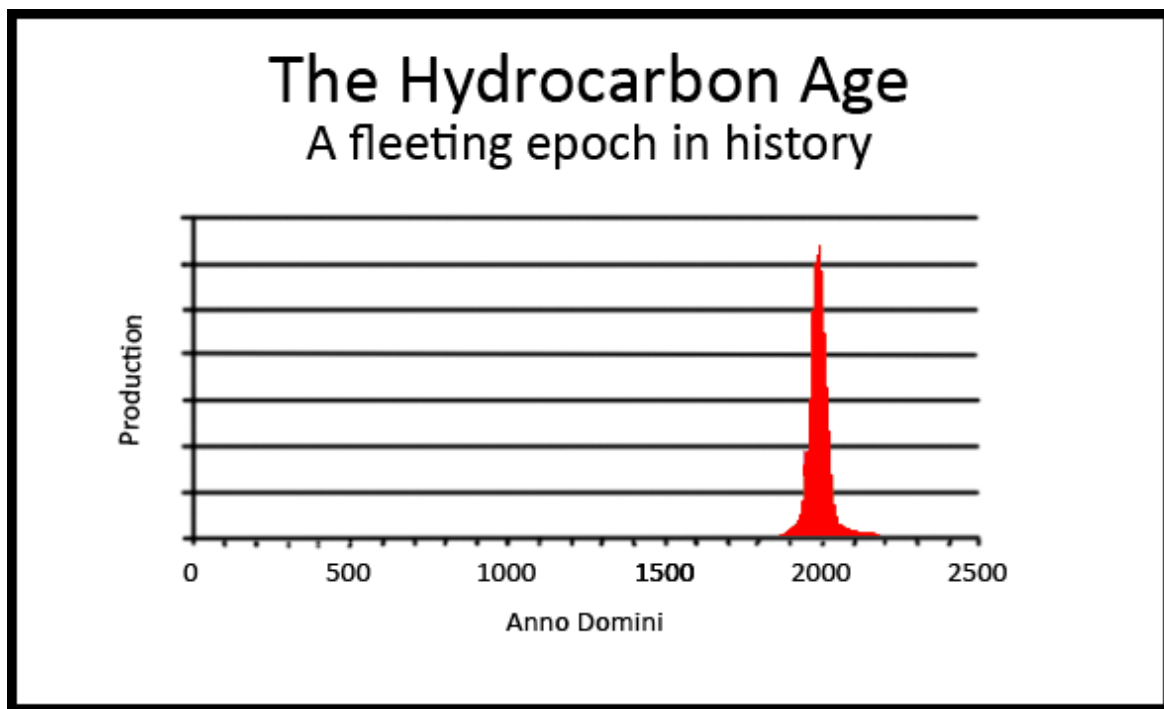
There are 7 billion people in the world today and the Industrialised nations of the world – Europe, USA, Japan, Australia, etc – make up 25% of this number, yet this quarter of the world’s population consume 75% of all the available resources. The problem we face in the 21st century is that the countries we once referred to as under-developed (the ones who make up the 75% of world population) are now catching up to the lifestyles we enjoy in the UK. This means with China and India enjoying 10% economic growth a year and with populations of 1.5 and 1.2 billion respectively in order for their citizens to consume resources the way we do we will have to find another three planet Earths.



NUMBER OF PLANET EARTH’S REQUIRED IN THE 21ST CENTURY FOR 7 BILLION PEOPLE TO CONSUME AT THE SAME RATE WE DO IN THE UK

ENERGY

The modern developed societies of the world, where up to 80% of the populations live in urban environments, depend almost entirely on energy that comes from the three fossil fuels coal, oil and gas. These three are non-renewable sources, once you use them they are gone, and in the 21st Century our biggest problem is that scientists have identified that these sources are fast running out. The graph on page 3 (Hydrocarbon age) shows that in the context of world history, fossil fuels have only a small part to play.



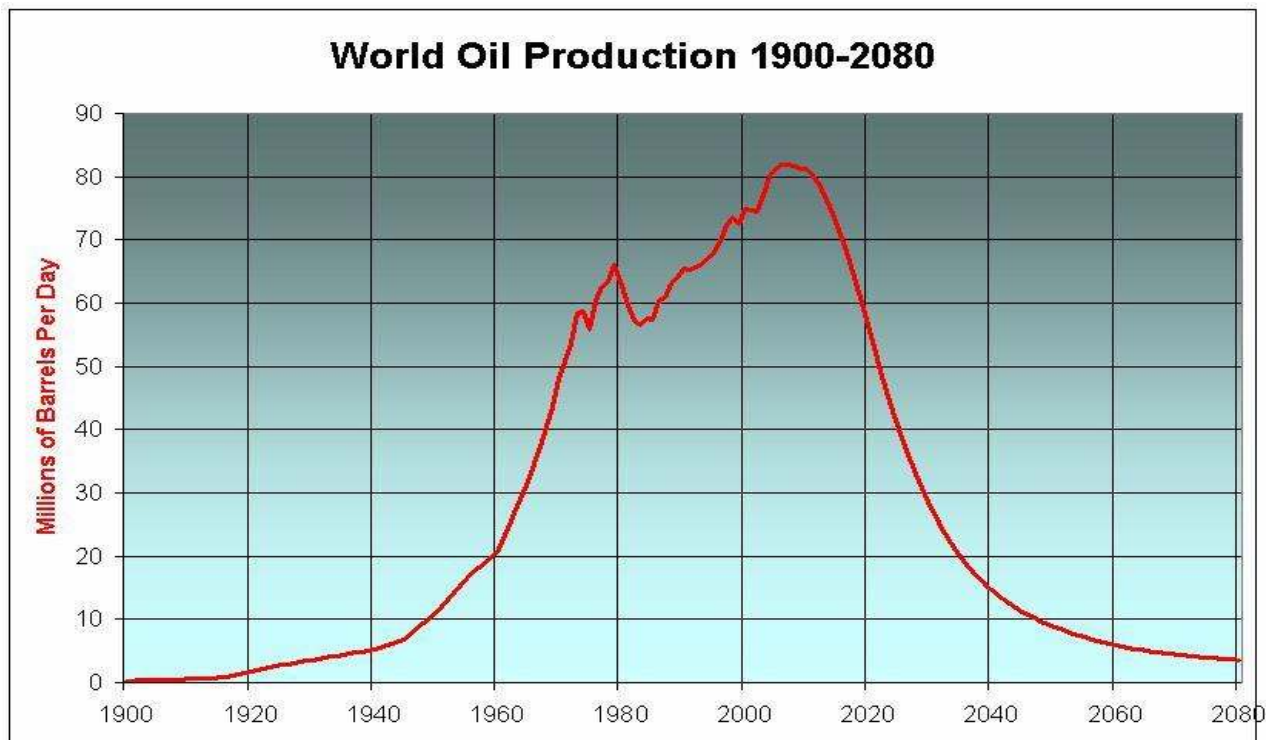
Of the three fossil fuels oil is by far the most important to our society. Converted to petrol and diesel it powers 97% of our global transport system made up of cars, boats, trains and planes; 10% of oil is used to make plastic which itself is used in hundreds of thousands of products (including not so obvious things like clothing and medicines); and is also turned into pesticides sprayed on the crops which are vital to our food production system. Its energy density and portability have allowed many other systems, from mineral extraction to deep-sea fishing (two sectors particularly dependent on diesel fuel but sectors by no means unique in their dependence on oil), to operate on a global scale. Oil is also the lynchpin of the remainder of the energy system. Without it, mining coal and uranium (for nuclear power), drilling for natural gas and even manufacturing and distributing alternative energy systems like solar panels would be significantly more difficult and expensive. Thus, oil could be considered an “enabling” resource, that is, it enables us to obtain all the other resources required to run our modern civilization.

Oil, though, is a finite resource, it is held under pressure in rocks and drilling oil wells allows the oil to force its way out and then the oil well is capped and the oil pumped away. When an oil field is discovered more and more wells are drilled which increases the amount of oil which can be produced.

Because each oil field has a fixed amount of oil in it and because after time the pressure of the oil starts to drop we reach a point that geologists call **Peak Oil** – this is the point in time when the maximum amount of oil that can be produced in a year has been reached and

drilling more oil wells in that particular oilfield won't make any difference to it. The reason it is called *peak* oil is because a natural maximum point is reached after which the amount oil produced by the oil field begins to drop each year until finally it bottoms out at zero.

Geologists have made calculations of all the oil in the world and how fast it is being extracted and come up with the chart below representing world oil output.



If you look at the dates along the bottom you realise that the global peak is occurring right now – which means we are living at the top and shortly are going to start on that downward curve. So within a short space of time the world will have to come to terms with ever decreasing supplies of oil but unfortunately it gets worse.

The world currently consumes 84 million barrels of oil a day, but the demand for oil is increasing daily – the USA, for example consumes 25% while in Europe we consume 16% of daily oil production. But China only consumes 8% and with massive economic expansion is demanding more oil every year and once demand exceeds supply then the price will rocket upwards with serious economic consequences for us.

Newspaper Headline March 2nd 2012

Petrol prices hit record high with further rises expected

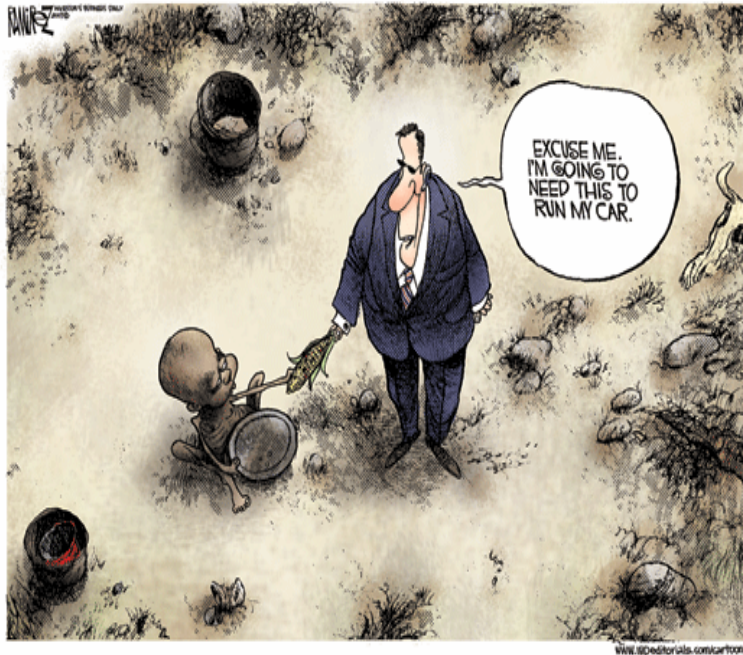
Petrol rises to 137.44p a litre while diesel hits 144.60p, according to the AA, and the 'prospects don't look great'.

The world has now consumed half of all known oil reserves but this is the easy half - go to the middle east (Saudi Arabia, Iraq, Iran) where the largest reserves are and push a straw in the sand and oil will come out. But the new oil discoveries are being found far out in the oceans and by drilling two miles through the rocks. Economists use the term *Energy Return on Energy Investment (EROEI)* to work out if an oil field is worth the bother. In the middle east EROEI is 1 : 100 (one unit of energy gives a return of 100) but for more recent finds out in the oceans EROEI falls to 1 : 30 – in simple terms this means it is only viable to extract it when the price of petrol is very high. For some of the so called new oil discoveries like tar sands in Canada the EROEI is as low as 1 : 2 but this doesn't even take into account the massive environmental damage caused by extracting these tar sands with highly toxic chemicals.

There is no viable alternative to oil. The average car does 60 miles to the gallon, an electric car will do 100miles on one charge, but the container ship in the picture does 1 mile to 250 gallons so how big a battery would that be !!! As 95% of all world trade is carried out on one of these ships we need to heed the advice of Faith Birol, Chief Economist at the International Energy Agency, “we need to leave oil before oil leaves us”.



Biofuels sounded like a good idea at the time but the reality has proved a lot different – as the cartoon shows growing cereal crops for fuel directly competes with the supply of food available and leads to huge price rises. The biggest argument, though, is the maths – the USA is the biggest producer of cereal crops in the world, if it used all its cereals to produce biofuels



it would only replace 1% of its oil needs. In addition countries like Brazil which have poor quality soil use chemical fertilizers and pesticides made from oil to grow the biofuel crops – and these are the very things biofuels are supposed to replace!

While oil and gas companies invest billions of pounds each year to extract these ever harder to reach fossil fuels the real alternatives arrive free of charge each day in the form of the sun and the wind, all we have to do is build the solar panels and wind turbines to collect them. The sunlight falling on the earth in an hour will provide enough electricity to power the world economy for a year, a 2009 survey of world wind resources by the US National Academy of Sciences reported a wind potential on land that was 40 times the current world electricity consumption.

FOOD

Supermarkets create an illusion so huge it makes Derren Brown look amateurish. The illusion they create is one of abundance; every time you walk in the shelves are fully stocked no matter what time of day (or night). Behind this illusion lies a worrying reality that in the UK we only produce 60% of the food we eat.



The Government appointed Sustainable Development Commission in a report called 'Sustainability and UK Food Policy 2000-2011' highlights many people's concerns about how we produce and distribute our food:

'we do not have a sustainable food system, by any stretch of the imagination, and the evidence of the need to change the UK food system to face the immense challenges ahead is so strong that the policy development within Government still remains inadequate. For politicians not to address food as a key element of the national interest would be a dereliction of duty'.

Food is at the heart of the sustainability challenge. The transition from the post-war era of rationing to today's previously unimaginable range of choice is remarkable. More people have been fed; food has become progressively cheaper, making available an unprecedented range of foods, across the seasons. Yet by no stretch of the imagination could our complex web of food supply, consumption patterns and impact be currently described as sustainable.

The story of modern food begins in the 1950's with what was called the 'Green Revolution'. Small farms which previously grew a variety of crops began to be swallowed up into huge businesses which produced monocrops – this means growing a single variety on a massive scale. In addition to this chemical fertilizers made from natural gas and pesticides made from oil were introduced to limit the high levels of pest damage that inevitably occur in monocropping. The result was spectacular, with cereal crops doubling their outputs ; thanks to the green revolution, between 1961 and 2009 the world's cropland grew by just 12% but food productivity increased by 150%

At the heart of modern food production was the availability of cheap fuel to create a global transport system – taking into account the farm machinery such as tractors, combine harvesters and the articulated lorries and planes involved in our global food system it is calculated it takes 400 gallons of oil to feed each person for a year. But as we have seen the availability of oil is diminishing and the price will almost certainly be rising.

Eating has never been so transport-intensive, 25% of all the lorries on the road are involved in food, and we are now talking of a new concept – food miles. In the UK, comparatively little of the food we consume comes from local producers; and much will have been transported over great distances – such as apples 14,000 miles from the New

Zealand, and green beans 4,000 miles from Kenya. Cheap non-renewable fossil fuel energy makes intensive agriculture and long-distance transportation economically viable, and has allowed food production and distribution to become global industries.

WATER

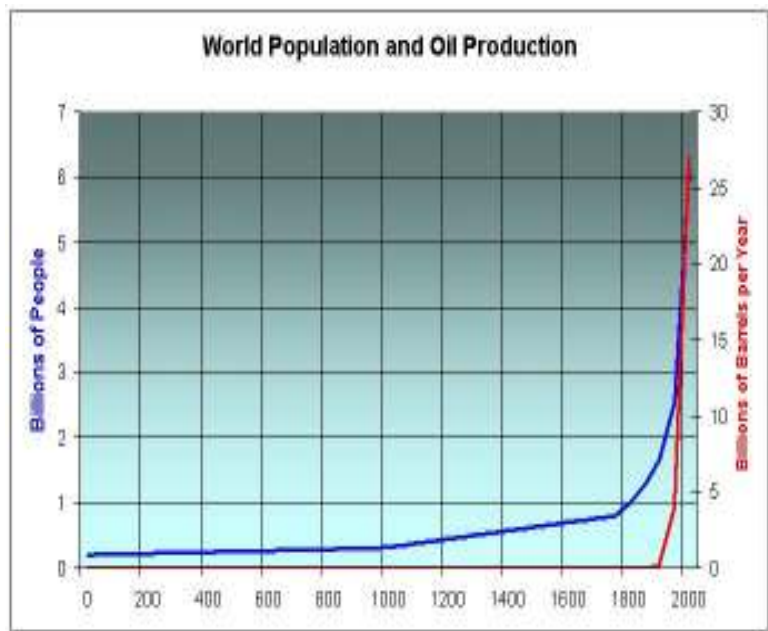
We obtain our water from two sources – the first and most obvious is the rain and snow that fills our rivers and is stored in lakes or behind dams ready to be pumped out for our use. The second source is a hidden secret below the Earth's surface where huge reservoirs of water called aquifers have built up over thousands of years., these aquifers exist all over the world and the water is obtained from them by pumping it out. These aquifers can be used as a sustainable water source as long as the water pumped out of them is equal to the rain water replenishing them.

Unfortunately this is not what is happening, 70% of all the fresh water on the planet is used to irrigate crops and as the world population grows the demand for food increases and farmers require more water to grow crops. The present situation is that the world is incurring a huge water deficit – half the people in the world live in areas where water tables are falling as aquifers become depleted and some of them are starting to run dry.

Water shortages can quickly translate to food shortages, The over pumping of aquifers for irrigation temporarily increases food production and so can feed the ever increasing population but it results in what environmentalists call a 'food bubble' - one that bursts when the aquifer becomes depleted resulting in serious food shortages.

In the UK we import 40% of all our food and much of this - tomatoes from Morrocco, potatoes from Egypt – comes from those countries facing water depletion problems, so when their food bubble bursts it has direct consequences for us.

This graph is interesting as it shows how increases in oil - fuelled transport systems, diesel powered irrigation pumps (17% of land is irrigated but produces 40% of world food) and oil produced pesticides have increased the amount of food available and have contributed to a massive population explosion in the 20th century.



The UN Food and Agriculture Organisation (FAO) estimates that farmers will have to produce 70% more food by 2050 to meet the needs of the world's expected nine billion strong population, yet all the world's available land capable of growing is now in use.

ECONOMY

For the last few years Europe has been in a severe economic recession, with unemployment in some countries bordering on 20% of the population. The message from the politicians and financial sectors is that this has happened before and with a little belt-tightening we can all ride the storm and things will pick up in a couple of years and get back to normal.

Environmentalists disagree. Our current economic model which served so well in the 20th Century to boost living standards and create lifestyles unimaginable by our forefathers has, like an aging motor car which has seen good service but is beyond repair, come to the end of its natural lifetime.

Politicians see the problem in terms of economic growth which currently has stopped and shortly will commence again putting us back on course to prosperity but they are looking at the world from a purely financial perspective not from a view that if there is only one planet

then the resources on that planet are limited and therefore what you can produce with them is equally as limited.

The world has reached the limits of its natural capital – this being all the physical resources it contains – so that economic growth is no longer restricted by numbers of fishing boats but by numbers of fish, not by numbers of chainsaws but numbers of trees.

To emphasise this point let us compare the world's biggest economy, the USA, with its newly emerging competitor for top spot, China. The United States, with five percent of the world's people, consumes a third or more of the earth's resources. What would happen if consumption per person in China were to catch up to that of the United States? If we assume conservatively that China's economy slows from the 11 percent annual growth of recent years to eight percent, then in 2035 income per person in China will reach the current U.S. level.

If we also assume that the Chinese will spend their income more or less as Americans do today, then we can translate their income into consumption. If, for example, each person in China consumes paper at the current American rate, then in 2035 China's 1.38 billion people will use four fifths as much paper as is produced in the entire world today. There go the world's forests.

If we assume that in 2035 there are three cars for every four people in China, as there now are in the United States, China will have 1.1 billion cars, the entire world currently has just over one billion and so China would require the entire current world output of oil to fuel these at a time when, as discussed earlier, this is decreasing.

The simple fact is that the maths doesn't add up, growth based on limited resources is an impossible task. What China is teaching us is that the western economic model - the fossil-fuel based, car-centred, throwaway economy - will not work for the world. This means society needs to use its resources more productively – efficiency is the key; each unit of energy or resource made to be ten times more productive.

THE FUTURE

As the availability of oil decreases we will no longer be able to import all our goods from places like China thousands of miles away but will have to re-construct our economy back to manufacturing powered by local energy sources of wind and sun. Many countries are already investing for the future, Concentrated Solar Power (CSP) is the new face of power stations of the future and are already in operation in the USA and Spain, the Andasol CSP pictured is the size of 210 football pitches and can produce enough solar electricity for 400,000 people.



Compare the £350 million pounds it cost to construct the Andasol CSP with the £200 billion of taxpayers' money the government handed over to the failing banks (a lot of which ended up in million pound bonuses) – clearly we have the financial resources and technology for change, all we lack is the political will power and a sense of leadership.

In the UK 75% of people work in the service sector – this comprises the public sector (i.e. police, hospitals, council and government workers) and the private sector of retail (shop workers) car insurance sales etc. Only 23% work in manufacturing (13% of these in food production) and only 2% in agriculture.

With oil becoming less available to fuel our transport system and the price of what we have skyrocketing the economy by 2025 will be undergoing massive changes (whether we like it or not) and the world of work will be changing drastically, none more so than in agriculture.

A tractor with one gallon of petrol can plough an area of land equivalent to 30 football pitches in a couple of hours; It would take a man six months to dig it over by hand. With less oil available more people will have to return to the land to produce our food. The proportion of agricultural workers will have to increase from 2% to over 25% as farmwork and food production becomes more labour intensive.



In addition more people will have to move closer to the land resulting in a massive transformation of living spaces with migration out of our cities to the countryside. Those who remain will utilize the abandoned inner city lands for urban agriculture. The concept of 'unemployment' will have no place in a future economy where physical labour will be a necessity and all those capable of physical work will be required to take part, while those restricted by disability will fill those administration and organizational posts .

In 1989 Cuba depended on the Soviet Union for all its oil imports but following the political crash of the Eastern Bloc countries those imports dried up and Cuba faced a major problem of food production. It has successfully overcome this problem with Urban Agriculture ; in Havana, the capital, 80% of the city's fresh produce is grown organically from local urban farms and gardens. In 2003, more than 200,000 Cubans worked in the expanding urban agriculture sector.

The blueprint of how our society will look in the future is already with us but you need to look hard to find the examples. People are producing local organically grown food in small quantities; small businesses making cheese, wine, beer, clothes etc from local products are dotted around, solar panels on houses and wind farms are producing local electricity. With a sharp reduction in the availability of petrol and diesel localised manufacturing of all the products we consume will become a necessity as will the need to re-design products to make them last longer and be repairable.

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Wirral Environmental Network

Working to advance the education of the public about the environment and its protection.

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