[youtube:http://www.youtube.com/watch?v=fjqy8CSZDoQ auto]Dire warnings have already gripped the imagination of billions of people. Evidence linking human activity to climate change is now very compelling to most politicians, activists and opinion-formers world-wide. Carbon dioxide levels are higher than at any time in the last million years, with most of the rise in the last 30, during which time over 400,000 square miles of Arctic ice have melted. Many scientists believe that a quarter of all animal and plant species could be wiped out within the next 30.

However, scientific predictions are only estimates about what climate may be like in 50-100 years time. If we want guidance about the immediate impact on business and personal life over the next two decades then we need to look at public opnion and how passionately people are likely to feel in future about the issue. Regardless of whether the science turns out to be correct or not, it is emotion that will determine government action and business strategy.

Re-insurance companies such as Munich-Re are warning that most of the world's megacities are in coastal areas and likely to be hit by rising sea levels, caused by a combination of water expansion as temperatures rise, plus melting of ice. They are worried about peak tidal surges half a metre to a metre higher than today. Some countries could be turned to desert. On current trends more than a billion people will be short of fresh water by 2050. Many urban areas will be hit by freak storms and flash floods, costing billions a year in reconstruction.

Wealthiest nations and largest multinationals will be blamed by the poorest, while wealthier nations will worry about massive jumps in energy use by emerging economies. Expect many crises as the poorest 4 billion people on earth struggle (or fail) to survive in a world that has (they feel) been poisoned for many decades by carbon burning in the wealthiest nations. At the same time other nations will worry that the economic growth of India and China alone could be enough to tip the world over the edge into an almost unstoppable process, when added to two centuries of extravagant waste in industrialised regions.

The stage will be set for new and dangerous conflicts.

As the world's greatest user of energy per person, the United States will find new global forces attack US business interests through sanctions, trade blocks and consumer boycotts. Expect vigorous and aggressive American reactions, which will further increase global tension.

Governments will come to see global warming as an issue of national security, more serious than terrorism in its economic impact. Global military spending is more than $1 trillion a year, and rising. That is the amount countries – mainly the US – are willing to spend to protect their nations from attack at a time when the world is largely at peace. If we were caught up in a third world war we can be certain that total global spending would be at least three times what it is today. So we can see that significant government funds will be made available from different budgets to tackle global warming - if the threat appears serious enough.

We can continue as we are and the result is likely to be disaster. Or we can apply business ingenuity to solving this problem. The good news is that climate change can be fixed at relatively low cost in terms of total impact on the economic growth of the world, in a highly efficient and profitable way.

[youtube:http://www.youtube.com/watch?v=DNTww7UiRBg **300 250]Economic cost of global warming**

The economic cost of dealing with global warming will largely be met as part of the package of adjusting to higher energy costs.

Oil prices of around $80-$100 a barrel are more than enough incentive to encourage rapid transition away from oil use, paid for out of energy savings. If the market price falls, a similar incentive would be created by increasing carbon taxes to compensate. High market prices are creating huge wealth in energy-producing nations, while revenues from carbon taxes would be spread more widely.

The future pace of global economic growth is a major challenge - despite the recent downturn. Global energy demands are growing 2% a year and emerging nations will very soon produce most of the world's carbon dioxide (by 2010). With 4% of world population, America produces 20% of greenhouse gases. What happens when every nation wants the same lifestyle?

Munich-Re has estimated that action against global warming could cost 1% of global economic activity (GWP). It sounds a huge amount but is only the same as the world economy stalling for

three months and then carrying on for the next three decades at the normal rate of growth.

The comprehensive Stern Report (2007) calculates that in cash terms this would work out at $400-500bn each year fighting global warming. The target is to stop carbon dioxide levels in the atmosphere rising higher than 500-550 parts per million (ppm) by 2050, up from 450 ppm today. But such a target will still mean a significantly warmer world.

[youtube:http://www.youtube.com/**watch?v=mW9fMfgL5Zg** 300 250]The Stern Report expected this $400-500 billion a year to be spent on changes in:

Gas supply and distribution 25%

Refined petroleum 24%

Electricity production and distribution 16%

Cement production 19%

Fertilisers production and use 5%

Fishing 5%

But this is only part of the story. Hundreds of thousands of new business products and services will be sold that don't fit the headings above. The Report estimated *additional* costs to society, but most innovations will save money.

Take for example geothermal heat pumps which save up to 50% of fuel costs. Today's systems pay for themselves in 15-20 years but future technology will shorten payback periods. Geothermal sales are not true additional costs to society in the longer term, particularly if phased in as old boilers need replacing, or in new homes being built. The global market for geothermal heat systems alone could be worth £50bn a year or $2 trillion dollars over 20 years (see page xx).

Expect innovation and new sales at every level – many of them hidden to consumers. It could be something as simple as a new low cost nanotechnology coating for ball bearings, reducing energy use in engines by at least 20%.

For every £1 of "additional cost" to society, expect at least a further £3 sales of products linked in some way to tackling global warming. The Stern Report's $500m a year then becomes $2 trillion of sales or $40 trillion over the next two decades.

100 business innovations with added impact

[youtube:http://www.youtube.com/watch?v=qskCwvjcOr0 300 250]One approach to solving global warming is to think about multiple small steps, each with a wedge-shaped impact, starting small and growing. Just 10 major innovations could reduce global carbon emissions by at least 25% by 2030, assuming very little political or economic change or major shifts in consumer behaviour. These are rough estimates with allowances for variable take-up in different parts of the world. The savings assume no economic growth, no increase in vehicle ownership and so on. They also assume no radical
innovations
other than natural extensions of proven technology. Oil prices are assumed to stabilise above $90 but below $140 a barrel – high enough for most steps below to succeed on a commercial basis with only modest government intervention beyond what we have today.

Countries like Australia have already announced a commitment to reduce greenhouse gases by 60% by 2050. With that kind of momentum in many other nations, the savings below could easily be doubled from 2030 to 2050. When you add in the other 90 innovations in this book, it becomes clear that
climate change

should be manageable even without radical new discoveries, and even when allowing for strong economic growth to continue in emerging economies.

Carbon offsetting – will create a fund of at least $50bn a year by 2012 to fund energy saving / carbon use reductions, growing rapidly. That's equivalent to dealing with 1.6bn tons a year of carbon dioxide, or 6% of the 27 billion global carbon dioxide emissions. Carbon offsetting will help finance many of the other innovations in this book. **6% by 2012 and growing fast to 20% by 2030. Assume that half of this finances strategies other than those listed below.**

Heat pumps – >25% fuel saving in an additional 1% of homes and offices a year in developed nations. Reduction in building energy use globally by estimated **2%.**

Carbon capture – pilots are already capturing 3m tons of CO2 a year – expect minimum 1bn tons a year to be captured **3.6%.**

Electric cars – more efficient than burning fuel in mobile engines – 20% energy saving in 20% of vehicle miles driven in developed nations = 4% saving in motoring. Estimate **0.5 %**
.

Low energy streetlights – **2%**

Polymer cement – 15% reduction in the 7% of global emissions caused by concrete industry - **1%**

Wind power – 20% power generation in US and other nations by 2020-2030. Global impact on carbon dioxide emissions – **5%**

Solar power – rapid growth - **5%**

Aviation efficiency – multiple efficiencies reduce energy use per passenger kilometre flown by 35% - **1.5%**

Shipping efficiency – 20% saving of energy, of 5% global emissions from shipping is **1%**

These few strategies above could have a major impact on carbon emissions.

Environment videos

Many more Global Warming Videos by Futurist Dr Patrick Dixon and Sustainagility book.

Articles and Videos on Global Warming

Here are more resources on this site that you may find helpful.

True Cost of Global Warming
How business will help solve global warming with green technology
CARBON DIET to save the World
Global Warming - Science Summary
Future of Oil Prices: Middle East, global economy
Roof Gardens Impact on Energy Saving
Biofuels Controversy and Climate Change
Iceland Volcano Eruption - Geothermal Power Potential
Energy Use Consulting - Boom Industry
Smart Power Regulation - Energy Saving
Green Technology Innovation Awards Chaired by Patrick Dixon
Product Exchanges and Climate Change
Wind Turbines and Global Warming
Solar Cell Roofing and Climate Change
Low Energy Streetlights and Global Warming
Polymer Cement - to save 2% global CO2
Carbon Capture - Climate Change Business

Future of Oil Industry when will oil run out? Kuwait and region
Heat Pumps - to prevent global warming
Cost of global warming - practical answers
The $40 trillion climate change business
Impact of Global Warming on Human Life
The Future of the Environment
Green Technologies innovation will help with climate change
Sustainability, climate change and crazy biofuels policy
Sustainagility: innovation will help save world. Sustainable business future
Sustainable business: $40 trillion green tech boom will help save world
How Green IT saves money and energy, improves image and environment - keynote
Water Wars Risk? Futurist Q&A with Patrick Dixon
Global Warming: green technology will help world
Economic Growth Limits? Sustainability. FUTURIST Q&A