HORIZONS

HORIZONS TOOLKIT

/2018

Introducing Horizons

What does your future market look like? How could your business model adapt? Horizons is a practical tool designed to help you identify the big trends, issues, risks and opportunities coming your way. Use it to develop and test your strategy, inform commercial decisions, and drive new innovation.

We can't predict our future economy. But we do know the trends driving its development – like the digital revolution, levels of pollution, public trust, and energy security. These factors shape markets, disrupt business models and shift the political landscape. They may present risks for your organisation, but also reveal global market opportunities for entirely new solutions.

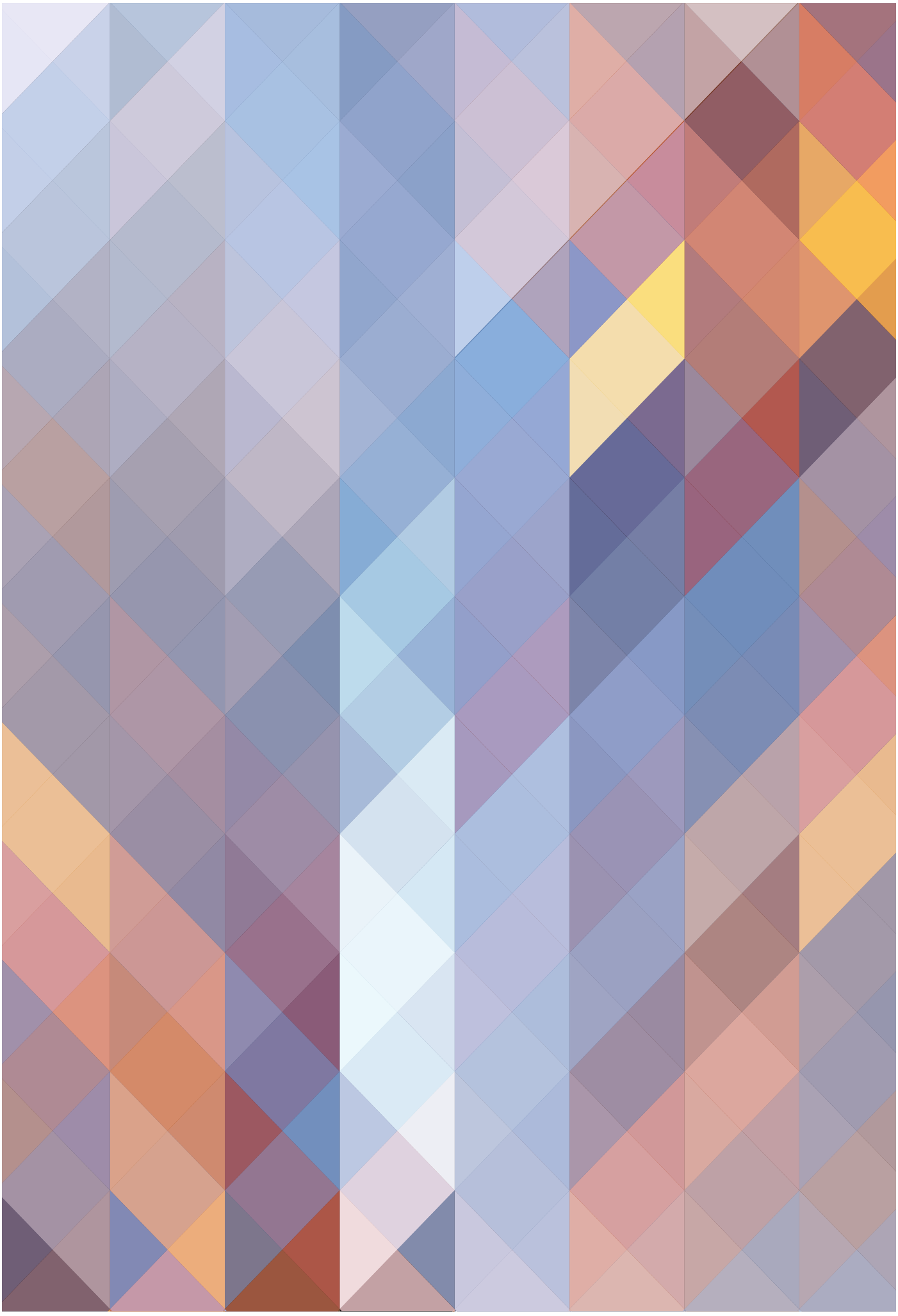
To create successful businesses and societies in the long term, we need to think sustainably. Horizons has been developed to help you do just that.

Horizons is based on the Sustainable Economy Framework, which was developed by Forum for the Future, the Technology Strategy Board and Aviva Investors. Horizons defines what we mean by a sustainable economy – one that operates within safe environmental limits and delivers social value.

Horizons identifies the environmental boundaries that keep our planet in good health, the social and political foundations that enable our societies to flourish, and the essential needs for us human beings to survive and thrive. Each of these is broken down into a number of topics. Together, they work towards delivering a sustainable future.

Innovate UK
Knowledge Transfer Network

FORUM FOR THE FUTURE



How To Use Horizons?

Horizons is a great tool to help you understand the big issues and trends coming your way, and stimulate thinking and discussion about how you should respond to them.

You can use Horizons independently, or with a group. Below are some suggestions for using it, which can be adapted to suit your individual circumstances.

1. Consider your objectives: what do you want to accomplish by using Horizons? Keep it focused.

2.Involve the right people: include those who bring different perspectives and experience to encourage new ideas and cross-fertilisation.

3. Explore and discuss: discuss the cards that are most critical and/or you haven't thought about much. Remember that cards that don't seem connected at first glance may provoke new insights and ideas.

You can use the following questions to help drive your discussion:

- What are the challenges and opportunities this card presents to your organisation? Think about the life cycle of your products/services. What and where are the impacts?
- Translate each statement for your sector eg 'everyone has reliable energy sources'.
- What are the potential risks eg to your supply chain or customer base?
- What opportunities may it open up?
- How are these driving changes to your market?
- How are you uniquely placed to contribute something to this?
- What are the commercial opportunities arising from this?
- What can you do? Write a one-sentence summary.
- Review all the summaries. What's your overall contribution to a sustainable economy?
- How can you achieve this?

You can delve deeper into each topic by accessing the supporting information in this document.

How To Use Horizons?

4. Prioritise areas and actions to take forward. Individual risks and opportunities can be presented in a matrix to aid prioritisation. Example axes could be 'level of commercial opportunity' and 'risk'.

5. Take action: Horizons does not tell you how to achieve your goals, but logical next steps might include: map out your role in taking opportunities identified forward, develop an action plan and integrate thinking into your normal business planning or innovation process.

Let us know what you think! What did you think of this tool? How you have used the cards? How could they be improved?

Get in touch to share your views, talk anything through, or if you need help facilitating a workshop.

Contact ben.peace@ktn-uk.org

/01

CLIMATE CHANGE

The average global temperature must not rise more than 2°C above pre-industrial levels.

WHAT IS CLIMATE CHANGE?

Greenhouse gases, such as carbon dioxide and methane, are being produced by human activity faster than natural processes can remove them, and are accumulating in the atmosphere. As a result, the mean global temperature is rising.

WHY IS THIS CRITICAL?

Climate change is expected to lead to a range of effects such as increased frequency of extreme weather events, changes to regional precipitation patterns, a decrease in snow cover and sea ice extent, and sea level rise. These impacts, alongside the inevitable societal response (from regulation and innovation through to investor pressure and activism), will fundamentally transform the competitive context within which all organisations operate.

In 2015 at the Conference of the Parties in Paris (COP21) 195 governments signed an agreement to limit global temperature rise this century well below 2 degrees Celsius and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius above pre-industrial levels. Beyond 2°C, the potential impacts of global warming become highly unpredictable. This would seriously disrupt nearly all ecosystems on the planet creating food and water stress, massively increase biodiversity loss, and increase ocean acidification.

Not going over the 2°C rise requires the rapid decarbonisation of the global economy. Global carbon dioxide emissions have to fall by some 6-9% a year between now and 2050 to give us a reasonable chance of staying under this threshold.

IMPLICATIONS

- SHOULD ensure that products and services are best-in-class, and fit-for-purpose, in a carbon-constrained world.
- SHOULD play a role in adapting natural and human systems to the inevitable impacts of climate change
- MUST demonstrate an understanding of – and develop strategies to tackle – the full range of risks and opportunities posed by climate change.
- MUST reduce greenhouse gas emissions in line with global reductions of 6 – 9% year on year.

CLIMATE CHANGE

/01

KILLER FACTS

- Limiting global temperature rise to two degrees celsius will lower the risk of runaway climate change, but will still cause significant damage to some regional and global ecosystems such as coral reefs and polar environments.

- Continuing today's patterns of carbon-intensive energy use is estimated, together with climate change, to cause 6 million deaths per year by 2030, close to 700,000 of which would be due to climate change. This implies that a combined climate-carbon crisis is estimated to claim 100 million lives between now and the end of the next decade.

- The Stern Review in 2006 estimated that if we don't act to reduce carbon emissions, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever and could be as much as losing 20%. In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year.

- In the UK in 2009, 10% of energy demand came from industry, 22% of energy demand came from the domestic sector, 59% of energy demand came from transport and 9% from the service sector.

- Globally in 2008, 52% of energy demand came from industry, 14% of energy demand came from the residential sector, 27% of energy demand came from transport and 7% of energy demand came from the commercial/service sector.

- 2012 saw the Arctic sea ice sheet melt further, and faster, than has ever been seen before in human history – a whopping 760,000 square kilometres less than ever recorded (which is 3.29 million square kilometres below the average minimum).

CLIMATE CHANGE

/01

KILLER FACTS

- Flooding risk is rising each year due to climate change. provisional figures show that 2014 was the UK's warmest, and fourth wettest year on record, with mean temperatures of 9.9 degrees celsius, which is 1.1 °C above the long-term (1981-2010) average and beats the previous record of 9.7 °C set in 2006.
- By 2050, flood damage in the world's coastal cities is expected to reach $1 trillion a year as sea levels rise and global warming triggers new extremes of heat, windstorms and rain.
- The amount of greenhouse gases in the atmosphere reached a new record high in 2013, propelled by a surge in levels of carbon dioxide. The observations from WMO's Global Atmosphere Watch (GAW) network showed that CO2 levels increased more between 2012 and 2013 than during any other year since 1984.
- We've passed Rockstrom's climate change planetary boundary of carbon dioxide at no more than 350ppm - with levels currently at 400ppm and climbing.
- In 2015 at the Conference of the Parties in Paris (COP21) 195 governments signed an agreement to limit global temperature rise this century well below 2 degrees Celsius and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius above pre-industrial levels.

/02

OZONE

The ozone layer must be protected and helped to recover.

WHAT IS THE OZONE LAYER?

Ozone (O3) is a gas occurring naturally in small amounts in the stratosphere. The ozone layer absorbs ultraviolet radiation from the sun and so protects life on Earth from the harmful effects of that radiation.

WHY IS THIS CRITICAL?

Ozone-depleting substances (ODS) are man-made gases that damage the ozone layer in the upper atmosphere. This causes an increase in ultraviolet radiation reaching the ground and leads to more cases of skin cancer, cataracts and other health problems. Halons, hydrochlorofluorocarbons (HCFCs), chlorofluorocarbons (CFCs) some solvents and methyl bromide (used as a pesticide) are all types of ODS. Common uses for ODS include refrigeration and air conditioning equipment, aerosols, foam blowing agents, firefighting fluid and high voltage switch gear.

Most ODS have been phased out, but they can be found in older equipment. There are also a few exceptions for certain uses. If you manufacture, supply, use, install or service equipment containing ODS, you must comply with strict legislation.

As a result of global action to phase out ODS, the ozone layer is now beginning to recover with positive implications for human health. Scientists at MIT have found that the September ozone hole has shrunk by more than 4 million square kilometers since 2000 and is estimated to be half closed within the next five years.

IMPLICATIONS:

- MUST NOT deplete stratospheric ozone by using any ozone depleting substances.

OZONE

/02

KILLER FACTS

- The total mass of ozone in the atmosphere is about 3 billion metric tons.
- The Montreal Protocol committed the UK Government to monitoring the state of the ozone layer over the UK. There is no ozone hole over the UK that compares to the hole which appears over the Antarctic region during the southern Hemisphere spring (August to December) each year.
- Ozone in the stratosphere absorbs most of the ultraviolet radiation from the Sun. Without ozone, the Sun's intense ultraviolet radiation would sterilize the Earth's surface.
- NASA estimated that without the Montreal Protocol two thirds of the Earth's ozone layer would have disappeared by 2065.
- An increase of ultraviolet radiation reaching the ground can lead to more cases of skin cancer, cataracts and other health problems.
- In the lower atmosphere (the troposphere) near the Earth's surface, ozone is created by chemical reactions between air pollutants from vehicle exhaust, gasoline vapours, and other emissions. At ground level, high concentrations of ozone are toxic to people and plants.
- Chloroflourocarbons (CFCs) found in spray in aerosols heavily used by industrialised nations in the last 50 years, have caused the breakdown of the ozone layer in some places which reduces its ability to absorb radiation.
- Scientists at MIT have found that the September ozone hole has shrunk by more than 4 million square kilometers—about half the area of the contiguous United States—since 2000, when ozone depletion was at its peak.
- NASA scientists have estimated that in the period from 2016 to 2020 we should recover half the amount of ozone that was lost from 1980 up until the Montreal Protocol in 1997.

/03

FRESH WATER

Global consumption of fresh water must not exceed 4,000 cubic km per year.

Watersheds at the local level must be managed sustainably.

WHAT IS FRESH WATER?

Surface water, e.g. freshwater streams, rivers or lakes, and ground water, such as aquifers.

WHY IS THIS CRITICAL?

Water is vital for life, for food production, industrial processes, hygiene etc.] Freshwater withdrawals have tripled over the last 50 years with demand for freshwater increasing by 64 billion cubic meters a year (replacement stat). The World Economic Forum predicts that the gap between freshwater demand and supply will be about 40% globally by 2030 if 'business as usual' continues. According to the World Bank, 80 countries currently have water shortages that threaten human health and economic activities.

Today at least two-thirds of the global population, over 4 billion people, live with severe water scarcity for at least one month every year, according to a major new analysis by the Twente Water Centre (replacement stat). Already there is competition and conflict for available clean water. The costs of recycling polluted water will rise. Many companies rely heavily on water and access to water is critical for their products or services. Worldwide, agriculture accounts for 70% of all water consumption, compared to 20% for industry and 10% for domestic use. In industrialized nations, however, industries consume more than half of the water available for human use. Belgium, for example, uses 80% of the water available for industry (replacement stat). Water use in agriculture and industry supply chains is often not factored into the cost of production. The production of 1kg of plastic uses about 185 litres of water, a pair of jeans 11,000 litres and a car 400,000 litres.

HSBC have called for global action to tackle water shortages and companies like PepsiCo have now made water a strategic priority, and aim to replenish the water it consumes.

IMPLICATIONS:

- MUST radically reduce the amount of fresh water used for human activity.
- MUST build resilience of water systems and minimise the pollution of aquifers.
- SHOULD be reusing whenever possible.
- SHOULD measure and minimise water use embedded in products/raw materials.

FRESH WATER

/03

KILLER FACTS

- Almost half the world population (47%) will be living under severe water stress by 2030 if no new policies are introduced.
- In the UK an average single person currently consumes around 150 litres of water per day.
- Water demand could be as much as 40% higher than supply by 2030.
- On current trends, over the next 20 years humans will use 40% more water than they do now.
- By 2050 the UK could have a structural deficit of up to 8,200 Mlitres of water a day (8.2 billion litres) – 1,000 Mlitres is the daily consumption of Wales.
- A report has found that achieving the Millennium Development Goals on water supply and sanitation worldwide would amount to an equivalent of more than $56 billion per year in potential economic gains between now and 2015, and that providing universal access to safe water and sanitation would imply a potential economic gain of $220 billion per year.
- USD $40 billion worth of crops were lost in 2012 due to drought.
- Roughly 75% of all industrial water withdrawals are used for energy production.
- Global water demand is projected to increase by some 55%, due to growing demand from manufacturing (+400%), thermal electricity generation (+140%) and domestic use (+130%).
- Despite overall progress in drinking water coverage and narrowing of the urban-rural gap, rural areas remain particularly disadvantaged in all developing regions.

FRESH WATER

/03

KILLER FACTS

- Only 2.5% of the water on the Earth is fresh water and of that only 1% is available for human use.
- Energy and water are intricately connected. All sources of energy require water in their production processes: the extraction of raw materials, cooling in thermal processes, in cleaning processes, cultivation of crops for biofuels, and powering turbines. Energy is itself required to make water resources available for human use and consumption (including irrigation) through pumping, transportation, treatment, and desalination.
- Globally, there were more than 3,000 floods during 1990-2006 (30% of global natural disasters), killing almost 7 million people or 19% of all fatalities from natural disaster.
- From 1992 to 2014, floods, droughts and storms affected 4.2 billion people (95% of all people affected by disasters) and caused US$1.3 trillion worth of damage.
- On average to produce 1 Kcal of food requires 1 litre of fresh water.
- Energy production represents 44% of the EU's total water use.
- 78% of jobs constituting the global workforce are dependent on water. Investments in safe drinking water and sanitation have paved a path to economic growth. Such investments have high rates of return: for each US$1 invested, the World Health Organization (WHO) estimates returns of US$3-34, depending on the region and technology.

/04

WASTE

Most industrial and domestic waste should be eliminated

WHAT IS WASTE?

Any substance or object that the owner discards, intends to discard or is required to discard.

WHY IS THIS CRITICAL?

Excessive or poorly managed waste leads to environmental damage and the depletion of natural resources. Just over half of UK waste is disposed of in landfill. In terms of household waste alone, each person in Europe is currently producing, on average, half of tonne of such waste. Only 40 % of it is reused or recycled and in some countries more than 80% still goes to landfill. Biodegradable waste in landfill produces methane, a greenhouse gas 20 times more potent than carbon dioxide. Of the 600 million tonnes of material used each year in the UK economy, only 115 million tonnes are recycled.

Yet waste can be a valuable resource either for reusing, or putting to other uses, such as generating energy from food waste. The more waste created, the greater the cost to business of dealing with waste, because disposal costs rise over time and the cost of resources also rises as they become more scarce.

IMPLICATIONS:

- MUST follow the reduce, reuse and recycle hierarchy.
- SHOULD explore using waste as a resource.
- COULD apply closed loop processes (where waste or by-product is used to make another product).

WASTE

/04

KILLER FACTS

- Current global municipal solid waste (MSW) generation levels are approximately 1.3 billion tonnes per year, and are expected to increase to approximately 2.2 billion tonnes per year by 2025.
- The England 'waste from households' recycling rate was 43.9 per cent in 2015. This is a decrease of 0.9 percentage points, from 44.8 per cent in 2014. Recycling rates had previously been increasing each year. This is the first time the 'waste from households' recycling rate has been lower than 44 per cent since 2011.
- Water leaching through landfill sites can carry with it toxins such as acids and heavy metals into groundwater or nearby bodies of water and from there into drinking water supplies or the food chain.
- Nearly 25% of waste electrical and electronic equipment (WEEE) that's taken to household waste recycling centres could be re-used, worth around £200m gross a year.
- An economic analysis conducted for the Ellen MacArthur Foundation concluded that the circular economy represents an economic opportunity exceeding $340 billion p.a. for the EU alone.
- Food waste costs the world's economy some $750bn (£470bn) a year.
- Each year the European Union throws away 3 billion tonnes of waste - some 90 million tonnes of it hazardous. This amounts to about 6 tonnes of solid waste for every man, woman and child.
- The waste management sector in the UK accounted for 4% of the UK's total estimated emissions of greenhouse gases in 2013, or 22.6 Mt CO_2. Between 2012 and 2013, emissions from waste management fell by 14%.

WASTE

/04

KILLER FACTS

- Between 2014 and 2020, WRAP estimates that electronic waste in the UK will total more than 10 million tonnes. A quarter of this will comprise of IT equipment, consumer electronics and display screens. This 12 million tonnes will include precious metals, such as 20 tonnes of gold, 400 tonnes of silver and 7 tonnes of Platinum Group Metals. These have a total estimated market value of £1.5 billion.
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- The global volume of e-waste generated is expected to reach 93.5 million tons in 2016 from 41.5 million tons in 2011.
- 1 recycled tin can would save enough energy to power a television for 3 hours.

/05

NON RENEWABLE RESOURCES

Stocks of non-renewable resources must not be depleted faster than the introduction of substitutes or discovery of new sources.

WHAT ARE NON-RENEWABLE RESOURCES?

Natural resources that cannot be replaced at the rate at which they are being consumed, such as metal ore, fossil fuels and some aquifers. Once depleted there is no more available to meet future needs.

WHY IS THIS CRITICAL?

Increasing pressure on resources (eg through population growth, growing per capita consumption), combined with increasing scarcity of non-renewable resources that are more difficult to access, will drive up competition, volatility and cost of raw materials. This increases the need for more efficient use, recycling where possible, and development of alternative materials or processes that do not require the scarce material.

Commodity prices have increased sharply since 2000 and during the next decade we will use more oil, gas, iron, and other mineral resources than have been consumed throughout human history. While oil prices have fallen over recent years (from more than $100 a barrel in July of 2014 to less than $30 a barrel in January of 2016) there is still a worldwide average demand of nearly 96 million barrels of oil and liquid fuels per day, equating to 35 billion barrels a year. We have also seen an increase in demand for difficult-to-extract fossil fuels, such as tar sands or shale gas. While these may satisfy the need for energy, they do so by damaging local biodiversity and land use, and adding to climate change in both their extraction and use.

However a reduction in the relative price of renewable energy alternatives and leadership from China in transitioning away from fossil fuels has lead to positive progress in curbing the global economies reliance on conventional non-renewable energy supplies.

IMPLICATIONS:

- MUST reduce depletion rates of non-renewable resource stocks.
- MUST improve the material efficiency of the economy, for example by developing closed-loop material systems.
- COULD provide sustainable alternatives to non-renewable resources.

NON-RENEWABLE RESOURCES

/05

KILLER FACTS

- The Chemistry Innovation Knowledge Transfer network identified 9 elements that were under serious threat in the next 100 years and 7 that were under rising threat from increasing use.
- 2002-2012 saw the share of global fossil fuel trade going to China and India more than doubling in value terms (from 4.4% to 10.8%) and tripling in weight terms (from 4.5% to 14.3%).
- It took us 125 years to use the first trillion barrels of oil. We'll use the next trillion in 30 years.
- Almost one third of profit warnings issued by FTSE350 companies in 2011 were attributed to rising materials prices.
- To obtain just the metal used in all the mobile phones in the world in 2012 required 450 million tonnes of mineral rock to be dug up, smashed a processed – this is equivalent to 12 x the weight of all the cars on UK roads.
- By 2050, humanity will demand twice as many resources as the planet can supply. Meeting future demand for steel, water, agricultural products and energy would require roughly $3 trillion average capital investment/year.
- About 40% of UK carbon emissions come from burning non-renewable fossil fuels such as coal, oil and gas.
- A number of emerging economies such as Indonesia have either imposed or are considering new export restrictions on a variety of metals. China and India would be among the hardest hit by these bans.
- Mining accounts for somewhere between 7-10% of global energy consumption.

NON-RENEWABLE RESOURCES

/05

KILLER FACTS

- During the next decade, we will use more oil, gas, iron, and other mineral resources than were consumed throughout previous human history.
- Demand for steel is set to rise by 80% between 2010 and 2030.
- According to IEA research, 37 governments spent $409bn on artificially lowering the price of fossil fuels in 2010.
- Oil prices fell from more than $100 a barrel in July of 2014 to less than $30 a barrel in January of 2016.
- Prior to COP21 China committed to increase the share of non-fossil fuels as part of its primary energy consumption to about 20% by 2030, and peak emissions by around the same point, though it would "work hard" to do so earlier.

/06

RENEWABLE RESOURCES

Stocks of renewable resources must be managed sustainably to meet both human and broader ecosystem needs.

WHAT IS THE OZONE LAYER?

A natural resource is renewable if it is regenerated by natural processes within a reasonable timeframe, for example timber, biomass (biological material eg plants that can be converted into energy), water, solar power, soil and wind energy.

WHY IS THIS CRITICAL?

Overuse of renewable resources through direct exploitation or habitat damage can impair the ability of some resources to replenish themselves and, in some cases, lead to extinction. For example, three quarters of the world's fish stocks are fully fished or fished beyond their sustainable limits: soil health is vital to agriculture productivity and the economic cost of soil erosion in Europe is estimated around £46 per hectare. Overexploitation can also damage the ability of ecosystems to mitigate other environmental dangers, such as climate change.

Renewable resources are only available for commercial exploitation in the long-term if managed sustainably.

IMPLICATIONS:

- MUST Not exploit stocks of renewable resources beyond their recovery point.
- MUST Utilise valuable renewable resources, like wind and solar, in place of non-renewable resources where possible.
- SHOULD Build stocks and flows of renewable resources.
- SHOULD Improve the material efficiency of the economy eg by developing closed-loop material systems.

RENEWABLE RESOURCES

/06

KILLER FACTS

- 80% of the world's fish stocks are already fully exploited or in decline.
- Forests cover about 30% of the world's land area.
- Globally, around 13 million hectares of forests were converted to other uses or lost through natural causes each year between 2000 and 2010 as compared to around 16 million hectares per year during the 1990s.
- Renewable energy provided an estimated 19.2% of global final energy consumption in 2014, and growth in capacity and generation continued in 2015.
- An IPCC report claims that renewable energy could account for almost 80% of the world's energy supply within four decades – but only if the right policies are pursued by governments.
- The UK has a legally binding obligation to produce 15% of total energy from renewable resources by 2020.
- It is forecast that the UK will fail to meet its targets on renewable energy generation, with take-up of clean fuels for heating and transport falling badly behind aims.
- More than 120 million people are estimated to depend on fish for all or part of their incomes. In Africa, as much as 5% of the population, some 35 million people, depend wholly or partly on the fisheries sector for their livelihood.
- Some 46-58 thousand square miles of forest are lost each year—equivalent to 36 football fields every minute. It is estimated that 15% of all greenhouse gas emissions are the result of deforestation.
- At least 118 countries, more than half of which are developing countries, had renewable energy targets in place by early 2012, up from 109 as of early 2010.

RENEWABLE RESOURCES

/06

KILLER FACTS

- Some 147 Gigawatts of renewable electricity came online in 2015 with solar energy accounting for 56% of the total and wind power for 38%. This was the largest annual increase ever and as much as Africa's entire power generating capacity.
- While global investments in fossil fuel power generation more than doubled between 2004 and 2011, investments in renewables more than quadrupled over the same period.
- Clean energy investment increased to $286bn (£198bn) IN 2015. Overall, more than twice as much money was spent on renewables than on coal and gas-fired power generation ($130bn in 2015).
- By 2050, humanity will demand twice as many resources as the planet can supply. Meeting future demand for steel, water, agricultural products and energy would require roughly $3 trillion average capital investment/year.

/07

LAND USE

Land-use must be managed sustainably to meet both human and broader ecosystem needs.

WHAT IS WASTE?

The main activity taking place on an area of land such as agriculture, forestry, cities and forestry.

WHY IS THIS CRITICAL?

As the global population rises (from seven billion in 2011 to over nine billion in 2050), there will be huge pressure on land for food, energy and housing. The availability, condition, spatial distribution and intensity of land use is critically important for the production of: food, regulation of freshwater flows, maintaining biodiversity and important habitats such as peatland and other ecosystems services - such as soil renewal, pollination and primary productivity (the production of organic compounds from atmospheric or aquatic carbon dioxide, eg through photosynthesis). Almost all life on Earth relies directly or indirectly on primary production.

Currently 12% of the world's ice-free land is used for crops. Johan Rockstrom of The Stockholm Resilience Centre advocates that no more than 15% of ice-free land globally should be converted to cropland to maintain capacity for the provision of ecosystem services. Pressure for more cropland will increase as the UN anticipates the need for a 70% increase in food production to meet demand.

Conversion of land from non-human to human use can trigger a multitude of effects such as releasing CO_2 and methane. It can contribute to biodiversity loss through habitat destruction and has been identified as one of the causes of recent food price volatility. These changes can then potentially disrupt supply chains.

IMPLICATIONS:

- MUST Avoid excessive use of land and not further deteriorate land condition.
- SHOULD Reserve most productive land for agricultural uses and maintain high conservation-value land in current state.
- SHOULD Radically improve land-use efficiency of human activity.
- SHOULD Restore land to former or improved condition after it has been damaged or altered.

LAND USE

/07

KILLER FACTS

- There is strong evidence that as more of the Amazon rainforest is turned over to cultivation and grazing, eventually a threshold will be crossed that transforms the basin to semi-arid savannah.
- Agriculture is the largest type of land use in the UK, accounting for about 77% of the total area, compared with an average 50% for the EU. Of the 17.5 million hectares used for agriculture, about 28% is allocated to crops, and 67% is grassland.
- Agriculture in the United Kingdom uses 69% of the country's land area, employs 1.5% of its workforce (476,000 people) and contributes 0.62% of its gross value added (£9.9 billion).[1] The UK produces less than 60% of the food it eats.
- Globally, nearly 40% of land is degraded due to soil erosion, reduced fertility and overgrazing. Land productivity is declining, with estimated yield loss as high as 50% in the most adverse scenarios.
- Palm oil plantation expansion is projected to contribute more than 558 million metric tons of carbon dioxide to the atmosphere in 2020 – an amount greater than all of Canada's current fossil fuel emissions. In 2010 alone, land-clearing for oil palm plantations in Borneo emitted more than 140 million metric tons of carbon dioxide – an amount equivalent to annual emissions from about 28 million vehicles.
- One study estimates that the value of the carbon capture services which could be gained through halving the deforestation rate by 2030 is around $3.7 trillion.
- Globally, 20,000 - 50,000 sq km of arable land is lost annually through degradation, chiefly soil erosion. If current trends continue, up to 20% of global cropland may be lost by 2050 resulting in a global food shortfall of up to 25%

LAND USE

/07

KILLER FACTS

- The world has lost a third of its arable land due to erosion or pollution in the past 40 years, with potentially disastrous consequences as global demand for food soars.
- Since the mid-2000s, it is estimated that an area almost the size of Western Europe has been transferred in land allocation deals. The latest rush for farmland was triggered by the food crisis of 2007-08, but long term drivers include population growth, increased consumption by a global minority and market demands for food, biofuels, raw materials and timber.
- Agriculture in the United Kingdom uses 69% of the country's Deforestation is a major challenge. Between 1990 and 2010 Latin America and the Caribbean and Sub-Saharan Africa experienced the greatest forest losses, followed by the Arab States. The other regions have seen minor gains in forest cover.
- Currently in the developing world, only about 30% of land is regulated by some form of land registration system.
- About 200 years ago, each human had the equivalent of 24 football fields of land and freshwater resources. In 2012, this dropped to three fields and in 40 years it will be less than two.
- We've passed Rockstrom's land use planetary boundary of maintaining 75% of original forests - we're currently down to 62%.
- A study by The Economics of Ecosystems and Biodiversity (TEEB) found that damage to the ecosystems is costing the global economy $4.7 trillion per year. The study estimates that conserving forests would eliminate $3.7 trillion in damage related to climate change by 2030.

/08

OCEAN ACIDIFATION

The concentration of acid compounds in the world's oceans should be reduced to pre-industrial levels.

WHAT IS THE OZONE LAYER?

When CO_2 dissolves in seawater, carbonic acid is formed and the ocean becomes more acidic.

WHY IS THIS CRITICAL?

Our oceans have become more acidic, rising from 8.2 pH to 8.1 pH since the beginning of the industrial revolution. As the ocean waters become more acidic, calcifying organisms like corals, mussels, algae and plankton are less able to produce carbonate shells and skeletons. Affecting organisms at the bottom of the marine food chain could threaten the entire ocean ecosystem.

Millions of people depend on the oceans including fish stocks for food, tourism and livelihoods. It may also reduce the ability of the ocean to absorb CO_2 and contribute to coral reef erosion.

IMPLICATIONS

- MUST NOT deplete stratospheric ozone by using any ozone depleting substances.

OCEAN ACIDIFICATION

/08

KILLER FACTS

- The total mass of ozone in the atmosphere is about 3 billion metric tons.
- The Montreal Protocol committed the UK Government to monitoring the state of the ozone layer over the UK. There is no ozone hole over the UK that compares to the hole which appears over the Antarctic region during the southern Hemisphere spring (August to December) each year.
- Ozone in the stratosphere absorbs most of the ultraviolet radiation from the Sun. Without ozone, the Sun's intense ultraviolet radiation would sterilize the Earth's surface.
- NASA estimated that without the Montreal Protocol two thirds of the Earth's ozone layer would have disappeared by 2065.
- An increase of ultraviolet radiation reaching the ground can lead to more cases of skin cancer, cataracts and other health problems.
- In the lower atmosphere (the troposphere) near the Earth's surface, ozone is created by chemical reactions between air pollutants from vehicle exhaust, gasoline vapours, and other emissions. At ground level, high concentrations of ozone are toxic to people and plants.
- Chloroflourocarbons (CFCs) found in spray in aerosols heavily used by industrialised nations in the last 50 years, have caused the breakdown of the ozone layer in some places which reduces its ability to absorb radiation.
- Scientists at MIT have found that the September ozone hole has shrunk by more than 4 million square kilometers—about half the area of the contiguous United States—since 2000, when ozone depletion was at its peak.
- Nasa scientists have estimated that in the period from 2016 to 2020 we should recover half the amount of ozone that was lost from 1980 up until the Montreal Protocol in 1997.

/09

POLLUTION

Release of contaminants must be controlled in such a way as to eliminate any damage to natural systems and human health.

WHAT IS POLLUTION?

When contaminants (chemical, energy, noise, heat or light) resulting from human activities enter the environment and contaminate air, water or soil, or tissues of plants and animals. These include run-off from industry or agriculture, or air pollution from vehicles and industry. Some chemicals are persistent pollutants with global distribution, for example mercury, certain plastics and Persistent Organic Pollutants (POPs), such as PBDEs (chemical compounds used as flame retardants), dioxins and DDT.

WHY IS THIS CRITICAL?

Pollution damages the environment and can threaten human health. It can be slow-acting but cumulative. In particular, toxic chemicals can be found in common products such as certain cleaning products. Persistent pollutants are not quickly broken down by natural processes into harmless materials. They accumulate in human and animal tissue and can be amplified as they pass up the food chain. It has a variety of effects, from direct toxic effects on humans (such as increased risk of cancers and birth defects), to damaging whole ecosystems.

As a result of the concerns of society, many hazardous materials have been banned or restricted in some countries, and others are under threat of being banned. A business using hazardous chemicals will face additional costs to protect workers and the environment during manufacture, to clean up waste streams, and to manage the risks of release during the use and disposal phases of the life cycle. Many major brands are making commitments to eliminate all releases of hazardous chemicals from their supply chain and products, including Marks and Spencer, Levi's and Nike.

IMPLICATIONS:

- Must not increase the burden of persistent pollutants on the environment.
- Should reduce overall burden of pollution by substitution with less or non-hazardous alternatives if identified.
- Could help remove chemical pollution from the environment.
- Must adhere to REACH (Registration, Evaluation, Authorisation and restriction of Chemicals) and the Basel and Rotterdam and Stockholm conventions on toxic waste, hazardous chemicals and persistent organic pollutants.

POLLUTION

/09

KILLER FACTS

- POPs (persistent organic pollutants) have been shown to travel vast distances from their original sources. They can be found all over the world, including in areas where they have never been used and remote regions such as the middle of oceans and Antarctica.

- Exposure to POPs can cause disruption of the endocrine, reproductive, and immune systems; neurobehavioral disorders; and some cancers.

- Humans are responsible for approximately half of all mercury emissions; volcanoes are the main natural source. The chief anthropogenic sources of mercury are fossil fuel combustion (particularly coal-fired power plants) and gold production.

- Current anthropogenic sources are responsible for about 30% of annual emissions of mercury to air. Another 10% comes from natural geological sources, and the rest (60%) is from 're-emissions' of previously released mercury that has built up over decades and centuries in surface soils and oceans. Although the original source of this reemitted mercury cannot be determined with certainty, the fact that anthropogenic emissions have been larger than natural emissions since the start of the industrial age about 200 years Executive Summary i UNEP Global Mercury Assessment 2013 ago implies that most re-emitted mercury was originally from anthropogenic sources.

- Many POPs are currently, or were in the past, used as pesticides. Others are created and used in industrial processes and in the production of a range of goods such as solvents (used in products such as perfume and glue), polyvinyl chloride (used in a range of products from construction materials to clothing), and pharmaceuticals. POPs have few natural sources; humans are responsible for the bulk of their creation.

POLLUTION

/09

KILLER FACTS

- Fish and shellfish tend to concentrate mercury in their bodies. Fish tissue concentrations increase over time, and fish high on the food chain such as sharks, tuna and kingfish can accumulate mercury concentrations ten times higher than those of their prey species – this is an example of biomagnification. Human mercury poisoning can then occur by eating affected fish.

- In a changing climate, several factors could result in an increase in the releases of POPs into the environment. For example, it is anticipated that the range of vector-borne diseases like malaria will increase – this could lead to a greater use of persistent organic pesticides.

- Across all agricultural sectors, an estimated 1 million to 5 million cases of pesticide poisoning occur every year, resulting in 20,000 reported deaths among agricultural workers and at least 1 million requiring hospitalisation. While developing countries account for less than 30% of global pesticide consumption, the bulk of pesticide poisonings occur in a developing world scenario; including an estimated 99% of pesticide induced deaths.

- Approximately 15–18 billion m3 of freshwater resources are contaminated by fossil fuel production every year.

/10

ATMOSPHERIC AEROSOLS

Atmospheric aerosol loading (amount in the atmosphere) must be limited.

WHAT ARE ATMOSPHERIC AEROSOLS?

An aerosol is a system of tiny particles suspended in the air. Aerosols occur naturally (for example from volcanic eruptions), but are also produced by human activity (for example, soot and sulphur from coal-fired power stations).

WHY IS THIS CRITICAL?

Human activities since the pre-industrial era have doubled the global concentration of most aerosols (concentration of aerosols is highest in the northern hemisphere where industrial activity is centred). The sources of human-produced aerosols include coal and oil-fired power stations, aircraft contrails and shipping exhaust, biomass burning, as well as burning forest to clear land for farming.

Aerosols have many effects. They are a key component of photochemical smog, and have adverse effects on human health, increasing lung cancers and respiratory diseases – the World Health Organization (WHO) estimates that nearly two million people die prematurely from illness attributable to indoor air pollution from household solid fuel use, while urban outdoor pollution causes 1.3 million deaths per year. This creates a long-term health burden for societies and reduces labour productivity.

Aerosols also influence the climate system, particularly rainfall, and can disturb important weather patterns such as monsoons. Aerosols tend to cause cooling of the Earth's surface immediately below them by reflecting sunlight back into space. Aerosols have also been linked to crop damage from exposure to ozone, as well as forest degradation and loss of freshwater fish due to acidic precipitation. A safe threshold for aerosols is yet to be quantified.

IMPLICATIONS

- SHOULD minimise release or contribution to the release of aerosols as much as possible.
- MUST comply with aerosols regulations.

ATMOSPHERIC AEROSOLS

/10

KILLER FACTS

- Aerosols are tiny particles suspended in the air. Human activities, such as the burning of fossil fuels and the alteration of natural surface cover, also generate aerosols. Averaged over the globe, aerosols made by human activities currently account for about 10% of the total amount of aerosols in our atmosphere.
- A severe volcanic eruption, such as Mount Pinatubo in the Philippines in 1991, can put large amounts of aerosol into the stratosphere. Scientists estimate that Mount Pinatubo injected about 20 million tons of sulphur dioxide into the atmosphere, cooling average global temperatures over the following year by about half a degree.
- Jet engine emissions have been shown to affect the concentrations of atmospheric water vapour and aerosols, and they may affect how clouds form and the concentrations of atmospheric ozone.
- Aerosols tend to cause cooling of the Earth's surface immediately below them. Because most aerosols reflect sunlight back into space, they have a "direct" cooling effect by reducing the amount of solar radiation that reaches the surface.
- Air pollution in China during 2003 caused 411,000 premature deaths, mostly from lung and heart-related diseases.
- 16 ships create as much sulphur pollution as all the cars in the world.
- Nearly 50% of pneumonia deaths among children under five are due to particulate matter inhaled from indoor air pollution.
- More than 1 million people are dying prematurely every year from air pollution in China

/11

BIO-DIVERSITY

Biodiversity should be maintained, with the species extinction rate no higher than the estimated background rate of 10 species per million per year

WHAT IS BIODIVERSITY?

The variability among living organisms within species, between species and between ecosystems.

WHY IS THIS CRITICAL?

The biodiversity of the planet provides many critical benefits to humanity. These range from ecosystem services, such as pollination, to contributing to human wellbeing and health. Direct pressure for land, habitat, food and from pollution, climate change and invasive species means that biodiversity declined by 30% between 1970 and 2008. The total annual economic cost of biodiversity loss and ecosystem degradation was estimated to be between US$2 trillion and US$4.5 trillion in 2008. The consequences will not just affect companies with direct reliance on natural resources, but will also affect the supply chains and growth objectives of most industry sectors in the developed and developing world. Failure of these services will, at a minimum, increase costs, and potentially threaten entire business models.

There is also an ethical case for preserving and enhancing biodiversity; for its intrinsic value and as part of human beings' role as custodians of the natural environment.

IMPLICATIONS

- MUST demonstrate an understanding of – and develop strategies to tackle – the full range of risks and opportunities regarding direct and indirect reliance on biodiversity.

- MUST reduce rate of loss of biodiversity.

BIODIVERSITY

/11

KILLER FACTS

- At least 40% of the world's economy and 80% of the needs of the poor are derived from biological resources. In addition, the richer the diversity of life, the greater the opportunity for medical discoveries, economic development, and adaptive responses to such new challenges as climate change.
- Species are becoming extinct at a rate that has not been seen since the last global mass-extinction event. Today, the known recent extinction rate appears to be some 100 or 200 times higher than considered natural.
- Biodiversity loss occurs at the local to regional level, but it can have pervasive effects on how the Earth system functions, and it interacts with several other planetary boundaries. For example, loss of biodiversity can increase the vulnerability of terrestrial and aquatic ecosystems to changes in climate and ocean acidity, thus reducing the safe boundary levels of these processes.
- The most important direct drivers of biodiversity loss and ecosystem service changes are habitat change (such as land use changes, physical modification of rivers or water withdrawal from rivers, loss of coral reefs, and damage to sea floors due to trawling), climate change, invasive alien species, overexploitation, and pollution.
- Populations of vertebrate species have fallen by half since 1970, according to the Living Planet Index.
- The services provided by insect pollinators, such as bees, doing the pollination work that underpins about one trillion dollars-worth of agricultural sales has been valued at $190 billion per year.
- We've passed Rockstrom's biodiversity planetary boundary of maintaining 90% of biodiversity - we've seen a drop to 84% in certain parts of the world.

/12

NITROGEN AND PHOSPHORUS

Control the amount of atmospheric nitrogen converted into different forms and reduce phosphorus release.

WHAT IS NITROGEN AND PHOSPHORUS?

Nitrogen and phosphorus are essential nutrients. The nitrogen cycle describes movement of the element from the air into the biosphere and organic compounds, then back into the atmosphere. When nitrogen is released, it becomes 'reactive nitrogen' ammonia, nitrous oxide, nitrogen oxides (NOx) and nitrates. The phosphorus cycle releases the element from rocks by weathering, makes it available to plants in soil, and eventually deposits it in the oceans, where new rocks are formed.

WHY IS THIS CRITICAL?

Production of synthetic nitrogen is a key input for agriculture and industry, and a persistent side-effect of combustion for energy and transport. Through the production of fertilisers, growing leguminous crops, burning fossil fuels and biomass, we release about 150 million tonnes of nitrogen each year, the same as the total nitrogen fixed in natural systems. Agriculture uses the greatest amount of nitrogen, with 80% of crops going to support livestock in Europe. This reduces drinking and bathing water quality, causes soil acidification, particle air pollution (which in turn causes respiratory problems and cancers), acidification and eutrophication (presence of excessive nutrients) which leads to severe problems for fisheries and water supplies. The European Nitrogen Assessment (ENA) estimates that the annual cost of nitrogen across Europe is £60-£280 billion (€70-€320 billion).

Presently, 20 million tonnes of phosphorus are mined every year, 80% for fertilisers. It ends up in rivers, lakes and oceans where it causes excessive growth of algae that can kill fish and dramatically reduce the productivity of waters. It is a critical non-renewable resource that has no substitute in food production. The US has approximately 25 years of reserves remaining, while China recently imposed a 135% export tariff to secure domestic fertiliser supply. Western Europe and India are dependent on imports. Global peak phosphorus production is expected to occur around 2034, although this is now contested as some major reserves have not been taken into account.

IMPLICATIONS:

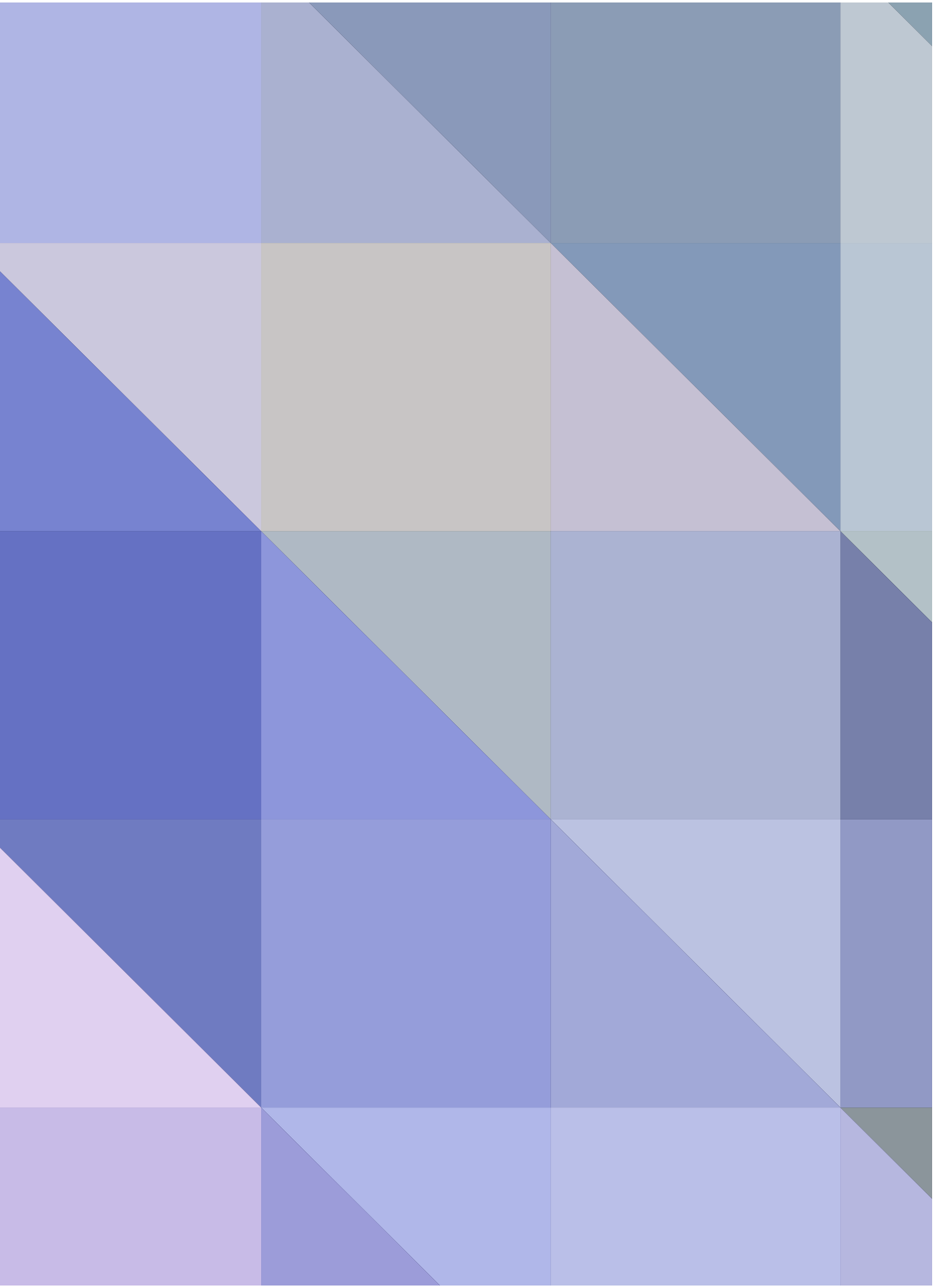
- MUST not lead to nitrogen or phosphorus pollution.
- MUST use nitrogen and phosphorus more efficiently, especially in agriculture.
- SHOULD recycle nitrogen and phosphorus from waste water systems.

NITROGEN AND PHOSPHORUS

/12

KILLER FACTS

- The global nitrogen cycle has been profoundly altered by human activity over the past century. The amount of usable or 'reactive' nitrogen produced by humans (about 190 million tonnes per year) is now greater than the amount created through natural processes (112 million tonnes per year).
- Some 20 million tonnes of phosphorus are mined every year and nearly half enters the world's oceans - 8 times the natural rate of input.
- Records of Earth history show that large scale ocean anoxic events occur when critical thresholds of phosphorus inflow to the oceans are crossed. This potentially explains past mass extinctions of marine life.
- Nitrogen availability can affect the rate of key ecosystem processes, including primary production and decomposition.
- Phosphorus is a limiting nutrient for aquatic organisms. Phosphorus forms parts of important life sustaining molecules but are very common in the biosphere. Phosphorus does not enter the atmosphere, remaining mostly on land and in rock and soil minerals.
- Overall, mineral fertilisers account for approximately 80% of phosphates used worldwide with the balance divided between detergents (12%), animal feeds (5%) and speciality applications (3%), for example, food grade, metal treatment etc.
- One half of the world's population is now thought to depend on nitrogen and phosphorous fertilisers for the production of their food.
- The annual cost of damage caused by nitrogen pollution across Europe is £60-£280 billion; it costs each person around £130- £650 a year.
- We've passed Rockstrom's nitrogen and phosphorus planetary boundary of per annum use (nitrogen at 62 teragrams, phosphorus at 11 teragrams) - we're currently using 150 teragrams of nitrogen and 22 teragrams of phosphorous.



/13

TRUST

Levels of trust must be high within society, for people and institutions.

WHAT IS TRUST?

The belief that others will not knowingly act in a way that is detrimental to our interests or, better still, will act in a way that benefits our interests.

WHY IS THIS CRITICAL?

It is argued that trust is the key to efficient markets and economic growth. Social and economic activity slow down in a low-trust environment – lack of trust was a central factor in the collapse of the financial markets, for example. Trust also affects rates of criminal offending and victimisation, morbidity and mortality, quality of life and the stability and responsiveness of democratic systems in government.

Trust is essential to building enduring connections within communities – with employees, suppliers, customers – and it drives risk-taking that can lead to innovation, for example the rise of peer to peer business like Whipcar (lending your car) and Kiva (lending your money). Trust enables people to interact with confidence, making it easier to do business with each other, and therefore underpins a successful economy. Some economists now believe that levels of trust can explain difference in per capita income of nations; one theory by World Bank economist Steve Knack suggests that trust is worth US$12.4 trillion a year to the US.

IMPLICATIONS:

- SHOULD not undermine levels of trust in society or the basis for trust, such as social networks.
- COULD build trust, for example through actively engaging stakeholders and ensuring transparency.

TRUST

/13

KILLER FACTS

- Neuroscientists have argued that humans are biologically inclined to trust each other.
- "Virtually every commercial transaction has within itself an element of trust," the Nobel-prize winning economist Kenneth Arrow wrote in a 1972 paper.
- A lack of trust between shopping centre landlords and retailers is proving a critical barrier to more sustainable retail outlets.
- Mistrust in environmental information displayed on products and in advertisements is relatively common. 44% of consumers say they do not trust this type of information. However, consumers' trust in claims varies greatly depending on the specific environmental claim assessed.
- Building trust is essential to successfully bringing new products and services to market. The 2015 Edelman Trust Barometer study found that countries with higher trust levels overall also show a greater willingness to trust new business innovations.

/14

LONG-TERMISM

All key decisions must actively take into account the wellbeing of current and future generations.

WHAT IS LONG-TERMISM?

Long-termism is the principle that decisions, investments or services, should be made for long-term value rather than just short-term returns.

WHY IS THIS CRITICAL?

Short-termism in business and the pressure for quick returns, both in capital markets and the consumption of products and services, is a major factor in creating unsustainable development. Extreme focus on the short term has been linked with unethical behaviour that can threaten the survival of a company, illustrated by the collapse of Enron in 2001. It can undermine strategy by ignoring long-term or unexpected risks and opportunities. It fails to account for the impacts of economic activity on ecosystems and communities, and can lead to unintended and irreversible damage to both.

Focusing on short-term economic value can undermine long-term economic value and a company's ability to flourish and survive in the future. Companies are demonstrating the value of taking a longer term view. For example, Unilever is shifting to a business model designed to be successful in the long-term. Their Sustainable Living Plan is at the heart of their ambition to double turnover and their stock has topped more than one Index since the unveiling of their plan.

IMPLICATIONS

- MUST take into consideration long-term impacts and invest in action that will create long-term value.
- SHOULD fulfil a duty to future generations.

LONG-TERMISM

/14

KILLER FACTS

- The average holding period has fallen between one and three years in selected OECD stock exchanges over the last twenty years. Looking further back, the drop is even greater. For instance, in the 1980s, the average holding period in the New York stock exchange was over 5 years, compared to 5 months today.

- Academic research suggests that obsession with short-term results by investors, asset management firms, and corporate managers collectively leads to the unintended consequences of destroying long-term value, decreasing market efficiency, reducing investment returns, and impeding efforts to strengthen corporate governance. Some argue that it also leads to unethical behaviour which can threaten the survival of a company, demonstrated by the collapse of Enron in 2001.

- A global survey of 642 senior executives, campaigners and academics conducted by consultancies GlobeScan and SustainAbility found 88% of respondents regard pressure to deliver immediate financial results remains a significant barrier to firms' sustainability efforts.

- The average tenure of CEOs in the world's top 2500 public companies has dropped from 8.1 years to 6.3 years during the first decade of the 21st century.

/15

INTER-DEPENDENCE

All enterprises should consider the interdependence of human and natural systems.

WHAT IS INTERDEPENDENCE?

Interdependence refers to the fact that human systems are critically linked to each other and to other systems such as ecosystems (climate and weather patterns, water flows) and that human societies are reliant on each other for life-sustaining resources, protection and knowledge.

WHY IS THIS CRITICAL?

Human systems are all linked to a much wider system and our impact on food production, land use, consumption and resource use has effects on all other parts of the system. For example, there is widespread concern that policies supporting the use of biofuels have caused competition for biofuel crops and land, contributing to food price spikes in 2008 and 2012 and potentially putting millions more into poverty and increasing malnutrition.

Many of the different elements in this framework are interdependent. For example, climate change affects and is affected by biodiversity and land use, this affects agricultural productivity and subsequently our food security. This may in turn affect livelihoods, income, nutrition and political stability. The costs of such consequences are often not paid for directly by organisations, but if human activity leads to biodiversity loss, this will in turn undermine the economic value that can be derived from that lost biodiversity in the future.

IMPLICATIONS:

- SHOULD take into account direct and indirect impacts of economic activity on human and natural systems and vice versa.
- SHOULD value and report the true costs and impacts of resources used, e.g. paying for biodiversity loss.

INTERDEPENDENCE

/15

KILLER FACTS

- Planting and protecting nearly 12,000 hectares of mangroves in Vietnam costs just over US$1 million but saved annual expenditures on dyke maintenance of well over US$7 million.
- Some 30 million of the world's poorest and most vulnerable people in coastal and island communities are totally reliant on reef-based resources as their primary means of food production, sources of income and livelihoods.
- An estimated 1.3 billion people — nearly 20% of humanity — rely on forests and forest products for their livelihoods, with the majority living on less than US$1.25 a day.
- Food security and climate change are deeply interconnected. Over one billion people in Asia depend on rivers fed by glaciers for their food and livelihoods. While increased glacier melt initially increases water flows, ongoing retreat leads to reduced meltwater from the glaciers during the warmer months. The estimated 5,500 glaciers in the Hindu Kush-Himalayan (HKH) region could reduce their volume by 70%-99% by 2100, with dire consequences for farming.
- Children now have access to mobile phones, computers, television, social networking and computer games and many tend to spend less time outside interacting with nature. The growth of virtual, as opposed to reality-based, play is having a profound effect on children's lives, leading to health problems such as obesity, vitamin D deficiency and asthma.
- The benefits to the UK derived from improved river water quality (mostly down to EU rules) were found to be about £1.1 billion per year.
- The value to the UK of coastal protection provided by wetlands was estimated to be about £1.5 billion per year.

/16

HUMAN RIGHTS

Societies must have broad-based respect for human rights: people should have freedom to exercise choice and participate in decision-making that affects their lives.

WHAT ARE HUMAN RIGHTS?

Human rights are rights inherent to all human beings, regardless of nationality, place of residence, sex, ethnic origin, colour, religion, language or any other status. We are all equally entitled to our human rights without discrimination.

WHY IS THIS CRITICAL?

The recognition that all people are equal and are entitled to basic human rights is essential for quality of human life. The UN Declaration of Human Rights, set out in 1948, declares that everyone is entitled to live within a society that realises these basic human rights. This lays the foundation for enabling participation from all, regardless of background, gender or religion in political, social and economic activity. It also requires us to respect the rights of future generations and their need for access to resources. Globalisation presents new and complex challenges for human rights. Companies have significant power and influence over people, especially those that operate across countries. Business can be scrutinised easily and can be at risk not only from costly litigation, but from their reputation – which can severely damage a business. Equally, sound business practice and ethical practices can open up new markets.

IMPLICATIONS:

- MUST not violate human rights, and at a minimum adhere to legal standards.
- SHOULD promote and respect human rights across all operations.
- COULD raise standards to ensure that no individual or group's rights are marginalised.

HUMAN RIGHTS

/16

KILLER FACTS

- Human rights are rights inherent to all human beings, whatever our nationality, place of residence, sex, national or ethnic origin, colour, religion, language, or any other status. We are all equally entitled to our human rights without discrimination. These rights are all interrelated, interdependent and indivisible.

- On 10th December 1948 the General Assembly of the United Nations adopted and proclaimed the Universal Declaration of Human Rights. This comprises of 30 articles outlining human rights such as the right to life, liberty and security of person.

- The International Labour Organisation (ILO) aims to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue in handling work-related issues. In 1944 ILO members adopted the Declaration of Philadelphia, which states that labour is not a commodity and sets out basic human and economic rights under the principle that "poverty anywhere constitutes a danger to prosperity everywhere".

- For seven consecutive years, business leaders have identified human rights as a top sustainability priority for their companies.

- According to the ILO's global estimates on forced labour, an estimated 21 million people are in forced labour, more than half of whom are women and girls. One quarter of these 21 million people are children below the age of 18.

- The UN Human Rights Council endorsed the Guiding Principles on Business and Human Rights by consensus in 2011. Guiding Principle 11 states: "Business enterprises should respect human rights. This means that they should avoid infringing on the human rights of others and should address adverse human rights impacts with which they are involved."

/17

ACCOUNTABLE GOVERNANCE

Everyone must have access to accountable, transparent and participatory governance systems.

WHAT IS ACCOUNTABLE GOVERNANCE?

Accountable governance refers to systems, checks and balances that require individuals and organisations to account for, explain or justify their actions, both voluntary and legal.

WHY IS THIS CRITICAL?

Accountable governance refers to systems, checks and balances that require individuals and organisations to account for, explain or justify their actions, both voluntary and legal.

Lack of accountability and transparency is the most important cause of corruption, the cost of which is huge, adding an estimated 10% or more to the costs of doing business in many parts of the world. It also accelerates the depletion of natural resources, which business and society rely on.

IMPLICATIONS:

- MUST be transparent and accountable
- COULD seek to raise standards on visibility and transparency

ACCOUNTABLE GOVERNANCE

/17

KILLER FACTS

- In 2015 the UK ranked 10th in a list of countries in terms of perceived level of public sector corruption. Denmark tops the list.
- Illegal tax evasion, shady deals for natural resources and laundered money mean that a total of between $972 billion and $2.02 trillion flows out of developing countries every year.
- 51% of respondents to the Accenture Digital Citizen Survey believe that the ability to interact digitally with government would encourage them to be more engaged with government while 49% say that digital interactions would make the government more transparent.
- Following the emissions scandal, Moody's rating agency downgraded Volkswagen's debt, citing "serious internal controls and governance issues".
- Corruption accelerates the depletion of natural resources, notably primary forests and inshore fishing grounds, which many communities rely on for their livelihoods. The government of Indonesia has estimated that lost forest revenue costs the nation up to US$4 billion a year or around five times the annual budget for the Indonesian department of health.
- In developing countries at large, corruption raises the cost of connecting a household to a water network by as much as 30%, inflating the cost by more than US$48 billion – equivalent to half of what the world spends on international aid each year.
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- From 1 October 2013 the Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013 will require all UK quoted companies to report on their greenhouse gas emissions as part of their annual Directors' Report.

/18

EVIDENCE

Evidence should be valued by society and form a core foundation of sound decision-making.

WHAT IS EVIDENCE?

Something that provides grounds for belief or disbelief.

WHY IS THIS CRITICAL?

Having a solid, reliable foundation of evidence that helps us understand the world is vital to making the right decisions and successful policy for the long term. This constitutes careful examination of the evidence base, particularly in controversial areas, and includes scientific evidence as well as experiential evidence. In addition, measuring the right factors is vital because it helps us understand how something works and so how to improve it; 'what is measured is managed' and 'what isn't measured isn't managed.' For example, to reduce the carbon impact of an activity we need to understand how the carbon emissions are generated, the various options for reducing them, and the impact of those options on carbon emissions, economics and performance.

Public understanding of the scientific basis for environmental concerns such as climate change is crucial to give governments a mandate for action and policy-making. It was scientific evidence of the depletion of the ozone layer that led to an international agreement to reduce CFCs, the main cause of ozone depletion. Business and manufacturers were then able to implement this agreement on a level playing field.

IMPLICATIONS:

- MUST be open and transparent about any evidence used and value social, environmental and economic factors.
- MUST take into account any relevant evidence in decision-making.
- SHOULD report impact of activities on society and environment through transparent and systematic measurement and evaluation.

EVIDENCE

/18

KILLER FACTS

- Nike shared its Materials Sustainability Index with competitors through the Sustainable Apparel Coalition in 2010 to drive systems change and progress in their sector on sustainable sourcing.
- 1 in 3 business leaders don't trust the information they use to make decisions.
- In Europe, government administrators could save more than €100 billion (US$149 billion) in operational efficiency improvements alone by using big data.
- Evidence-based policymaking uses the best available research and information on program results to guide decisions at all stages of the policy process and in each branch of government. It identifies what works, highlights gaps where evidence of program effectiveness is lacking, enables policymakers to use evidence in budget and policy decisions, and relies on systems to monitor implementation and measure key outcomes, using the information to continually improve program performance.

/19

EQUITY

Enable fair and equal access to resources and opportunities.

WHAT IS EQUITY?

To be equitable is to be fair and reasonable.

WHY IS THIS CRITICAL?

Treating people with fairness, as equals, gives individuals an opportunity to make the most of their lives, regardless of their background or position in life. Legislation exists in many countries to protect individuals from discrimination on the grounds of age, gender, disability, pregnancy, religion etc. Inequality is also detrimental for society as a whole, and for the economy. The principal aim of economic development is to promote the welfare of the population. A fair distribution of resources, both globally and nationally, is essential to achieve this. Inequality and inequities are increasing globally and the Millennium Development Goals (MDGs) seek to address some of them. There is a huge disparity in the ecological footprint per capita between high and low-income countries. Unequal distribution of resources can lead to overexploitation of some resources and irresponsible management of others. This has a direct impact on the ability of people to meet their needs and to live well. Unfair access to resources damages global markets for goods and services, and can ultimately lead to political and social instability.

IMPLICATIONS:

- MUST seek to enable fair and equal access to resources and opportunities.
- SHOULD take responsibility for using and managing resources fairly, both for this generation and future generations.
- SHOULD think about how to distribute goods and services across society.
- SHOULD direct targeted action and necessities to those who need it most.

EQUITY

/19

KILLER FACTS

- In 2010, the Earth's total bio capacity was 18.1 billion global hectares (gha), or 2.6 gha per person, while humanity's Ecological Footprint was 12 billion gha, or 1.7 gha per person.
- If all people on the planet had the Footprint of the average resident of Qatar, we would need 4.8 planets. If we lived the lifestyle of a typical resident of the USA, we would need 3.9 planets. The figure for a typical resident of Slovakia, or South Korea would be 2, or 2.5 planets respectively, while a typical resident of South Africa or Argentina would need 1.4 or 1.5 planets respectively.
- In most countries, the gap between rich and poor is at its highest level for 30 years.
- In 2015, just 62 individuals had the same wealth as 3.6 billion people – the bottom half of humanity. This figure is down from 388 individuals as recently as 2010.
- The average footprint of the richest 1% globally could be as much as 175 times that of the poorest 10%.

/20

RESILIENCE

Society must build resilience of natural and human systems to cope with shocks and stresses.

WHAT IS RESILIENCE?

Resilience is the ability to absorb disturbances, evolve to cope with dynamic change and adapt and learn from the experience.

WHY IS THIS CRITICAL?

A system with a low resilience – whether a natural habitat, a city or the financial capital markets – can only cope with small shocks and stresses. All our systems are vulnerable to shocks and stresses, which are becoming more likely for two reasons. First, the current mode of unsustainable development is putting many natural and human systems under strain, resulting in extreme and unpredictable events (from droughts to civil unrest). Second, in our global society, shocks are transmitted further, faster and with greater complexity.

Building resilience is vital because predicting exactly what will happen is impossible. For example, the collapse of Lehman Brothers affected financial markets, the world economy and government debt, with further consequences on job prospects for young people, provision of public services and civil unrest. If the financial capital markets had been more resilient then these cascading effects could arguably have been reduced or avoided.

IMPLICATIONS:

- MUST Design and act for recovery and flexibility and not just for growth and efficiency, eg through building solutions that are adaptable, and a diverse and secure supply chain.
- SHOULD Be able to respond effectively, build ongoing processes for learning, recovery and flexibility into strategy.

RESILIENCE

/20

KILLER FACTS

- Social phenomena such as poverty, economic opportunities and identity can interact with ecosystem dynamics in mutually reinforcing ways, generating vulnerable pathways of development and undesirable states highly resilient to change. They are sometimes referred to as social-ecological traps.
- Persistent poverty can contribute to social-ecological traps. In the absence of alternative income sources, declining revenues from a resource aggravates poverty as the poor may be least able to change their livelihood.
- According to a study by Lloyd's combination of just three catastrophic weather events could undermine food production across the globe. These could lead to a 10% drop in global maize production, an 11% fall in soybean production, a 7% fall in wheat production and a 7% fall in rice production.
- Estimates show that the negative environmental impacts of the world's top 3,000 listed companies amount to around US$2.2 trillion annually.
- In 2010-2011 the global demand for climate adaptation goods and services was £65.8 billion.
- Every dollar spent reducing people's vulnerability to disasters saves around seven dollars in economic losses.

/21

EMPATHY

Empathy and understanding should be shown between people, communities and cultures globally.

WHAT IS EMPATHY?

Empathy is our ability to respond to how someone else is feeling, and comprehend the way they look at themselves and the world.

WHY IS THIS CRITICAL?

Some lifestyles lead to a greater depletion of the Earth's resources than others. Some people will be more vulnerable to changes in the Earth's ecosystems than others, and at different times. It is important for people to see themselves as connected to each other and to look beyond national, cultural, biological or religious differences. Historian Theodore Zeldin concluded, "learning to empathise with people different from ourselves is one of the most effective means of establishing equality that modern society possesses". Designing with empathy can lead to new innovative products or services that better meet the needs of society. Empathy will help to avoid or mitigate environmental or social collapses, and strengthen markets and economies for the future.

IMPLICATIONS:

- SHOULD encourage empathy and cooperation between businesses, countries and communities.
- SHOULD plan and design from an empathetic perspective
- COULD promote flow of information and knowledge between people and communities to enable empathy.

/21

KILLER FACTS

- Some of the most innovative and successful empathy development is taking place in schools. In countries such as Canada, the UK and the USA, children at both the primary and secondary level are now explicitly being taught empathy skills as a way of helping to reduce aggressive behaviour, boost academic achievement and create community cohesion.
- There are three kinds of empathy: cognitive, emotional & compassionate.
- Akio Morita of Sony and Steve Jobs of Apple were famous for never commissioning market research — instead, they'd just walk around the world watching what people did. They'd put themselves in the shoes of their customers.
- Cities and communities with robust social networks have been shown to be more resilient to disasters.

/22

INFORMATION

There must be universal access to information.

WHAT IS INFORMATION?

Information is knowledge that can be acquired in any manner.

WHY IS THIS CRITICAL?

Affordable access to information increases understanding and consequently guides behaviour and decision-making. The ongoing digital revolution will drive increased access to information. Open source data is leading to new business models and product innovation, for example transport platforms that enable personalised travel plans based on live data like myPTP. Information technology (IT) enables the media to contribute more to transparent, accountable politics by opening public debates and exposing corruption and abuse. The rise of social media platforms such as blogs and social networking have led to more individuals being involved in calling key institutions to account across the world.

Access to IT is closely linked to a country's level of economic development, for example, access to broadband is an important foundation for future growth in employment and productivity. Research by Vodafone suggests that, in a typical developing country, an increase of 10 mobile phones per 100 people boosts GDP growth by 6%.

IMPLICATIONS:

- Must support affordable and open flow of information and knowledge between people, business and communities.
- Should enable others to provide universal access to information.
- Could develop platforms for open, transparent sharing of information.

INFORMATION

/22

KILLER FACTS

- A lack of access to information can have damaging impacts in the health sector: more than 9 in 10 prescriptions for tuberculosis in India are incorrect, predisposing those patients and the general population to multi-drug-resistant tuberculosis in the future.
- Article 19 of the UN Declaration of Human Rights: Everyone has the right to freedom of opinion and expression; this right includes freedom to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers.
- At least 200 million women want to use safe and effective family planning methods, but are unable to do so because they lack access to information and services.
- Growth in government openness in recent years indicates enhanced understanding of the right to access public information. As of September 2013, at least 95 countries had nationwide laws establishing the right of, and procedures for, the public to request and receive government-held information.
- Principle 10 of the Rio Declaration on Environment and Development states that at the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes.

/23

INCOME

People must have the opportunity to earn income at a level sufficient to live well. There must be no extreme poverty.

WHAT IS INCOME?

Income is money or equivalent received in exchange for labour or services, sale of goods or as profit from investment. This is sufficient if it allows for the satisfaction of basic needs that include food, water and sanitation, energy, shelter, healthcare and education (on the basis that these are available). In 2008 an estimated 1.29 billion people lived below US$1.25 a day – living in what the World Bank defines as extreme poverty.

WHY IS THIS CRITICAL?

Most people work in order to earn money. Yet, in many parts of the world, access to adequate and regular income is not guaranteed. Evidence from a range of studies suggests that there is a correlation between income inequality and health and social problems. Insufficient income can lead to extreme poverty, one of the most critical barriers to human development. This is the most important barrier to accessing education, and uneducated people (especially women and girls) are less likely to attain productive employment, access family planning resources and achieve gender equality. When these are out of reach it can lead to a vicious cycle of further poverty.

The OECD traces rising inequality around the world to a decline in income redistribution: lower taxes on the rich combined with lower benefits for the poor widen the income gap. The International Monetary Fund has found that greater income equality positively correlates with stronger economic growth, concluding that a 10% decrease in inequality increased the expected duration of economic growth by 50%. Income security allows us to provide for events such as sickness, old age, unemployment and maternity. Around the world, the majority of older people lack a secure income, and fewer than one in five people over 60 receive a pension.

IMPLICATIONS:

- MUST offer at least a living wage to all employees regardless of gender, age, experience or other factors.
- SHOULD support pro-poor and sustainable economic growth policies.
- COULD develop products, services and business models that address the needs of the poor.

INCOME

/23

KILLER FACTS

- The Marmot Review, found that in England, people living in the poorest neighbourhoods will, on average, die 7 years earlier than people living in the richest neighbourhoods.
- Global inequalities in wealth are at their highest level for 20 years and are growing, according to a report by Save The Children.
- An independent study of the business benefits of implementing a Living Wage policy in London found that more than 80% of employers believe that the Living Wage had enhanced the quality of the work of their staff, while absenteeism had fallen by approximately 25%.
- In 2012, 896 million people lived on less than $1.90 a day, compared with 1.95 billion in 1990, and 1.99 billion in 1981.
- By 2030 around one billion people in China could be middle class — as much as 70% of its projected population. India's middle class is expected to grow steadily over the next decade, reaching 200 million by 2020.
- There are now over 170 studies of income inequality in relation to various aspects of health. Life expectancy, infant mortality, low birth weight and self-rated health have repeatedly been shown to be worse in more unequal societies.
- The richest 85 people in the world are as wealthy as the poorest 3 billion; the richest 1% own nearly half of global wealth.

/24

MOBILITY

Ensure that everyone has the ability to access goods, education, services, people and work.

WHAT IS MOBILITY?

The ability to meet society's need for people to be able to move around and maintain social and economic connections. This includes physical movement, but also other solutions such as ICT-based platforms and virtual mobility.

WHY IS THIS CRITICAL?

Mobility is a key enabler to participate in society and the economy. It shapes the way in which we build our communities, where we work and spend our leisure time. People's mobility, particularly in developed countries, has increased drastically and we are travelling further than ever before. A number of factors are driving this trend, such as decreasing cost of travel in many places and urban sprawl. There are already one billion cars on the road, and this is expected to grow to two billion in the next 10 years. This has significant consequences, with transport emissions accounting for 26% of CO_2 emissions globally.

In addition, urban air pollution causes 800,000 premature deaths each year, and the increasing time we spend travelling can dislocate people from communities. The Eddington Transport Study (2006) outlined the way transport enabled economic prosperity through improved business efficiency, stimulating business investment and innovation, and attracting trade for example. However, the study also forecast that congestion could cost the UK economy alone £22 billion per annum by 2025.

IMPLICATIONS:

- MUST balance the mobility needs of business and society with the planet's ability to support them.
- MUST prioritise mobility systems that are low carbon, safe, affordable, efficient and promote healthy lifestyles. These must be absolute improvements.
- SHOULD reflect the full environmental and social costs in mobility pricing.
- SHOULD explore different business models to fulfil needs for access.

MOBILITY

/24

KILLER FACTS

- In 2014, it is estimated that transport accounted for 28% of the UK's greenhouse gas emissions. Between 2013 and 2014, transport emissions increased by 1.%t (1.2 Mt).
- In 2015 average new car CO2 emissions in the UK fell to a new low of 121.4g/km, a 26.4% drop on 2007 (pre-recession performance) and a 2.6% reduction on 2014.
- US based research has shown that for many vehicle trips the environmental cost of the parking infrastructure sometimes equals or exceeds the environmental cost of the vehicles themselves. Evaluating life-cycle effects, including health care and environmental damage costs, the researchers determine that emissions from parking infrastructure cost the US between $4 and $20 billion annually, or between $6 and $23 per space per year.
-
- The combined annual cost of traffic gridlock in Europe and the US will soar to $293.1 billion by 2030, almost a 50 percent increase from 2013, driven mainly by urban population growth and higher living standards as a result of increased GDP per capita. Over this period, the total cumulative cost of traffic congestion for these economies is estimated to be a staggering $4.4 trillion.
- In 2006 there were 346,610 members of carsharing clubs, sharing 11,501 vehicles. As of October 2014, carsharing was operating in 33 countries, five continents, and an estimated 1,531 cities with approximately 4.8 million members sharing over 104,000 vehicles. Europe, the largest carsharing region measured by membership, accounts for 46% of worldwide membership and 56% of global fleets deployed.

/25

SKILLS

Build skills and capabilities for individuals to participate in the economy and society.

WHAT ARE SKILLS?

A skill is the learned capacity to carry out a task for predetermined results.

WHY IS THIS CRITICAL?

Skills enable people to participate in society and the economy. Without basic skills, it is difficult, if not impossible, for people to engage with many of the social foundations that make up a sustainable economy. For instance, universal access to information is almost useless without literacy and numeracy; resilient communities depend on people having good interpersonal skills.

Good skills are vital for an organisation's success, particularly management and leadership skills. Investing in individual skills attracts workforce, improves productivity and morale and retention of staff, as well as attracting investors. People's skills are vital to their job prospects, and therefore to their ability to earn and participate in the economy. The skill of knowing how to learn enables everyone to grow, flourish and adapt.

IMPLICATIONS:

- MUST enable people to gain the basic skills for participating in society and the economy - these will often be delivered through education and experience.
- SHOULD invest and build wide-ranging skills and capacity of individuals to realise their potential.
- SHOULD build the skill of how to learn.

SKILLS

/25

KILLER FACTS

- Skill mismatch is one of the main challenges faced by economies. Some people are over-skilled for their current jobs – they are capable of handling more complex tasks and their skills are underused – while others are under-skilled for their current jobs – they lack the skills normally needed for their job.
- A one standard deviation increase in maths test scores at age 10 is associated with earning 13.0% more per week at age 30.
- Worldwide, the average age of farmers is about 60, including in developing countries, and many amongst them are women and poorly educated. Older farmers are less likely to introduce new, transformative production techniques.
- Based on current patterns of educational attainment and demand growth, employers in advanced economies could face a shortage of 16 million to 18 million college-educated workers in 2020, despite rising college-completion rates.

/26

HEALTH

People must have the opportunity to lead healthy, active lives and have access to reproductive healthcare.

WHAT IS WATER AND SANITATION?

To have sound mental and physical wellbeing that allows individuals to participate to their full potential in society and the economy.

WHY IS THIS CRITICAL?

Keeping people healthy is essential to leading a fulfilling life and contributes to a wide range of positive social and economic outcomes. For example, good health is linked to economic growth, political stability and reduced likelihood of conflict. There is a growing body of research highlighting that happiness preserves good health and a shift is starting in the UK towards preventative healthcare. Fundamental components of a healthy lifestyle include adequate nutrition, exercise, healthy environments, access to preventative and restorative care, and reproductive healthcare. Access to adequate levels of these (eg through education) is critical to protecting human welfare and sustaining economic and social development. Currently, over 100 million people fall into poverty every year because they have to pay for healthcare. Roughly 215 million women in developing countries continue to use ineffective methods of birth control or none at all. By addressing the unmet need for contraceptive information and services, roughly 22 million unplanned births, 25 million abortions and over 150,000 maternal deaths per annum could be avoided.

Increasingly, health systems will need to respond to differing demands and priorities. By 2020 there will be over a billion people aged over 65 on the planet, placing further pressure on healthcare systems. Projected effects of climate change, such as food and water insecurity and changing patterns of disease will have huge implications on healthcare and lifestyle choices.

IMPLICATIONS:

- MUST Enable access to adequate nutrition and healthcare.
- MUST Devise cost-effective care approaches.
- MUST Provide education about healthy lifestyle choices and reproductive rights.
- COULD Develop products and services to manage chronic conditions at home.individuals to realise their potential.

HEALTH

/26

KILLER FACTS

- About 100 million people globally are pushed below the poverty line as a result of health care expenditure ever year.
- According to estimates by WHO and UNAIDS, 35 million people were living with HIV globally at the end of 2013. That same year, some 2.1 million people became newly infected, and 1.5 million died of AIDS-related causes.
- Globally, tobacco use killed 100 million people in the 20th century, much more than all deaths in World Wars I and II combined. Tobacco-related deaths will number around 1 billion in the 21st century if current smoking patterns continue.
- Health spending is estimated to have increased by 2.8% in 2013 — an increase from 2% in 2012 — to total US$7.2 trillion, or 10.6% of global gross domestic product (GDP). As the global economy recovers from prolonged recession, health spending is expected to accelerate, rising an average of 5.2% percent a year in 2014-2018, to US$9.3 trillion.
- Nearly 10% of global diseases and 6.3% of all deaths could be prevented just by improving water supply, sanitation, hygiene, and management of water resources. By improving these conditions millions of child deaths from diarrhoea, malaria, malnutrition, and drowning could be prevented each year.
- Cardiovascular diseases are the leading causes of death in the world. At least 80% of premature deaths from cardiovascular heart disease and strokes could be prevented through a healthy diet, regular physical activity and avoiding the use of tobacco.
- Globally, an estimated 350 million people of all ages suffer from depression. Although there are known, effective treatments for depression, fewer than half of those affected in the world (in many countries, fewer than 10%) receive such treatments.
- According to scientist Aubrey de Grey, the first person to live to 150 has already been born.

/27

EDUCATION

Learning and empowerment & opportunity through education must be universal to all.

WHAT IS EDUCATION?

The process of acquiring knowledge and understanding.

WHY IS THIS CRITICAL?

Education provides children and adults with the tools for learning. Literacy, in particular, is at the heart of basic education, and is essential for eradicating poverty, reducing child mortality, curbing population growth and achieving gender equality. An estimated 776 million adults – or 16% of the world's adult population – lack basic literacy skills. About two thirds are women. Most countries have made little progress in this area in recent years.

The education and training of a country's workforce is a key factor in determining productivity levels and business growth. The benefits of education are also felt through lower crime, increased civic participation, better health and so on. There are huge disparities in the quality of education that children receive, which has knock-on effects on life skills and opportunities.

IMPLICATIONS:

- MUST support universal access to free primary and secondary education, and ensure marginalised groups, such as girls and rural dwellers, have full access to educational opportunities.
- SHOULD improve standards and consistency of education.
- COULD use schools as critical hubs for wider community activities.
- COULD include sustainable development issues in teaching and learning

EDUCATION

/27

KILLER FACTS

- If all students in low-income countries acquired basic reading skills, 171 million people could be lifted out of poverty, equivalent to a 12% cut in world poverty.
- Enrolment in primary education in developing countries has reached 91% but 57 million children remain out of school.
- The current funding shortfall to achieve 12 years of free, safe, quality education for every child is estimated to be US$39 billion a year. This is equivalent to just 8 days of global military spending.
- In at least 63 countries around the world, girls from poor households are significantly less educated than other sectors of society.
- By 2030, 3.4 million new teaching posts will be needed to universalize primary education in addition to the 23.9 million teachers to be replaced from attrition.
- Today, nearly 17% of the world's adult population is still not literate; two thirds of them women, making gender equality even harder to achieve.

/28

WATER AND SANITATION

There must be universal access to safe drinking water and effective sanitation.

WHAT IS WATER AND SANITATION?

Safe drinking water is suitable for human consumption and meets WHO guidelines or national standards. Effective sanitation comprises hygienic sewage disposal for a clean and healthy living environment.

WHY IS THIS CRITICAL?

Safe water and hygienic sanitation are essential for health. Today, 780 million people lack access to clean water. Worldwide, 84% of people have access to improved sources of drinking water, but the longer term future is less certain: 47% of the world's population will be living under severe water stress by 2030, a situation that will almost certainly be exacerbated by climate change.

People living in informal settlements (ie slums) often pay 5-10 times more per litre of water than wealthy people living in the same city. Some 2.5 billion people worldwide still do not have access to improved sanitation with serious health implications – 3.4 million people die each year and approximately one in four children under the age of five is underweight partly as a consequence of this. The economic benefits of investing in improving water and sanitation are between US$3 to US$34 for each US$1 invested.

The World Health Organization estimates that halving the proportion of those globally without access to safe drinking water and adequate sanitation by 2015 is estimated to result in 272 million more school attendance days a year. The value of deaths averted, based on discounted future earnings, would amount to US$3.6 billion a year.

IMPLICATIONS:

- MUST Support access to water supplies and sanitation facilities.
- MUST Not pollute water supplies.
- SHOULD Deploy affordable technologies to address water and sanitation issues.

WATER AND SANITATION

/28

KILLER FACTS

- Between 1990 and 2015, the proportion of the global population using an improved drinking water source has increased from 76% to 91%. 2.6 billion people have gained access to improved drinking water sources since 1990, but 663 million people are still without. The Sustainable Development Goal target is to achieve universal and equitable access to safe and affordable drinking water for all by 2030.
- Health-care facilities need proper sanitation and must practice good hygiene to control infection. Data from 54 low and middle income countries, representing 66,101 facilities, show that 38% of health care facilities do not have an improved water source, 19% do not have improved sanitation and 35% do not have water and soap for hand washing.
- It has been recorded that more than 1 billion people were affected by droughts in the period 1995 -2015; that is more than 25% of all people affected by all types of weather-related disasters worldwide even though drought accounted for less than 5% of all natural hazards.
- In 2015 it was estimated that 2.4 billion people globally had no access to improved sanitation facilities. Of them, 946 million defecate in the open.
- Each day, nearly 1,000 children die due to preventable water and sanitation-related diarrhoeal diseases.
- In 2012, the World Health Organization estimated that the global economic return on sanitation spending is US$5.5 for every US$1 invested, more than double the economic return on water spending.
- Experts estimate that by 2080, 43-50% of the global population will be living in water-scarce countries, compared to 28% today.

/29

SHELTER

There must be adequate shelter for all.

WHAT IS SHELTER?

The Habitat Agenda defines 'adequate housing' as "more than a roof over one's head". It also means adequate privacy; space; physical accessibility; security; security of tenure; structural stability and durability; lighting, heating and ventilation; as well as associated adequate basic infrastructure, such as water supply at an affordable cost.

WHY IS THIS CRITICAL?

Adequate shelter provides security and warmth, which enable people to live well. It is a cornerstone for the realisation of human rights, for livelihoods and for poverty reduction.

Good affordable housing is in short supply, both in the developed world and developing countries. According to UN Habitat more than a billion people "still lack adequate shelter and are living in unacceptable conditions of poverty". It is estimated that 78% of the world's urban population are low-income families living in slums, and the absolute number of slum dwellers is rising due to rural-urban migration and population growth. Households need an average of 8 to 12.5 times their annual income to buy a house in developing countries.

The provision of housing impacts local economies through the economic activity it generates (eg construction), and the provision of spaces for living, working and leisure activities.

IMPLICATIONS:

- Must provide adequate housing available to all and a stable market for housing.
- Should raise standards of homes so that they are more accessible, flexible for different needs, environmentally sustainable, affordable and so on.
- Could enable others to provide adequate housing.

SHELTER

/29

KILLER FACTS

- Adequate shelter must provide more than four walls and a roof. At a minimum it must meet criteria including security of tenure, availability of services, materials, facilities and infrastructure, affordability, habitability, accessibility, location and cultural adequacy.
- Sustainable housing offers a great spectrum of opportunities to promote economic development, environmental stewardship, quality of life and social equality, while mitigating the precarious convergences of the problems related to population growth, urbanisation, slums, poverty, climate change, lack of access to sustainable energy, and economic uncertainty.
- As of 2014, 54% of the world's population lives in urban areas, a proportion that is expected to increase to 66% by 2050. Projections show that urbanisation combined with the overall growth of the world's population could add another 2.5 billion people to urban populations by 2050, with close to 90% of the increase concentrated in Asia and Africa, according to a United Nations report.
- McKinsey estimate that under current trends, by 2025 the number of households that occupy unsafe and inadequate housing or are financially stretched by housing costs could reach 440 million—or 1.6 billion people.
- More than 30-50% of total material use in Europe goes to housing.
- About 1.6 billion people live in substandard housing and 100 million are homeless.
- Developing countries will be building the equivalent of a city of a million people every five days from now to 2050.

/30

ENERGY

There must be fair and equitable access to sustainable energy.

WHAT IS ENERGY?

Energy is the ability or capacity of a physical system to do work. Energy exists in many forms such as heat, kinetic, chemical or mechanical energy, light, potential energy and electrical.

WHY IS THIS CRITICAL?

Access to and use of energy in various forms is fundamental to achieving and maintaining quality of life. For example, energy is a pivotal factor in reducing poverty – without it, opportunities for education and employment are limited. According to the UN, over three billion people in developing countries rely on traditional biomass for cooking and heating, and 1.5 billion people are without electricity.

The provision of energy is a global industry. The price of hydrocarbons (oil, gas and coal) dictates the fate of many other industries and is a significant factor in geopolitical security. The poorest quarter of humanity consumes less than 3% of worldwide primary energy supply; whilst the US, with less than 5% of the world's population, claims more than 27% of primary commercial energy. World Energy Outlook 2011 predicts energy demand to rise by one third from 2010-2035, with 90% growth in demand from non-OECD countries.

Current forms of usable primary energy supply are unsustainable; resources are depleting and, for hydrocarbons, may become potentially unusable due to their effects on global climate. The International Energy Agency estimates that $48 billion needs to be invested each year if universal access to energy is to be achieved by 2030.

IMPLICATIONS:

- MUST Use energy as efficiently as possible.
- SHOULD Explore innovative solutions in energy supply, demand, storage and distribution to provide fair and equitable access to energy.
- SHOULD Seek to achieve a greater level of self-sufficiency by generating own low or zero-carbon energy.
- COULD Be an effective voice for the establishment of sustainable energy systems

ENERGY

/30

KILLER FACTS

- Whilst between 1990 and 2010, the number of people with access to electricity has increased by 1.7 billion, one in five people still lack access.
- To provide universal modern energy access by 2030 annual average investment needs to average US$48 billion per year, more than five-times the level of 2009. The majority of this investment is required in sub-Saharan Africa.
- Climate change presents increasing challenges for energy production and transmission. A progressive temperature increase, an increasing number and severity of extreme weather events and changing precipitation patterns will affect energy production and delivery.
- Water needs for energy production are set to grow at twice the rate of energy demand.
- Nearly 40% of the world's population rely on wood, coal, charcoal, or animal waste to cook their food breathing in toxic smoke that causes lung disease and kills nearly 2 million people a year, most of them women and children.
- Globally, energy efficiency represents about 40% of the greenhouse gas reduction potential that can be realised at a cost of less than €60 per metric ton of carbon dioxide equivalent.
- Despite the growth in low carbon sources of energy, fossil fuels remain dominant in the global energy mix, supported by subsidies that amounted to US$523 billion in 2011, up almost 30% on 2010 and six times more than subsidies to renewables.
- The July 2012 Indian grid failure affected 600 million people.

/31

NUTRITION

There must be access to adequate nutrition for all.

WHAT IS NUTRITION?

On average a person needs about 1,800 kcal per day as part of their minimum energy intake, as well as a wide range of nutrients, from iron to vitamin C, to maintain health.

WHY IS THIS CRITICAL?

In 2010, one in seven people were malnourished as a global average. Malnutrition is the underlying cause of 3.5 million deaths among mothers and children in the developing world each year. In 2016, one in nine people were malnourished as a global average.

Yet malnutrition is rarely a function of absolute lack of food; it is rather a problem of access to food supply. Financial crises and food price spikes exacerbate this situation, with the poor less able to afford adequate nutrition.

In contrast, by 2030 the number of overweight and obese adults is projected to reach almost two billion. Obese people are more likely to develop chronic illnesses such as diabetes and cardiovascular diseases, which cause 60% of all deaths worldwide.

IMPLICATIONS:

- MUST leverage agricultural practices and product distribution to maximise food security.
- SHOULD promote public policies which incentivise proper nutrition.
- SHOULD develop products, services and marketing approaches that improve nutritional outcomes.

NUTRITION

/31

KILLER FACTS

- About 165 million children globally are stunted (too short for their age group standard), according to 2011 figures, resulting from not enough food, a vitamin- and mineral-poor diet, inadequate child care and disease.
- Worldwide obesity has more than doubled since 1980.
- The World Bank says that scaling up nutrition programmes in high burden countries would cost just US$11.8 billion a year.
- Climate change and extreme weather will become a growing problem for global food security.
- Obesity can increase the risk of type 2 diabetes, some cancers, and heart and liver disease. There is also a significant burden on the NHS – direct costs caused by obesity are now estimated to be £5.1 billion per year.
- In the UK we throw away more than 7 million tonnes of food and drink every year from our homes - most of which could have been safely consumed.
- More than 40 million children under the age of five were overweight in 2010.
- By 2050, global demand for food is expected to have increased by 70–100%. 60 – 100%. Global cereal demand is increasing at 1.3% per year; average yields are growing at 0.9%.
- Today, we produce about four billion metric tonnes of food per annum. Yet due to poor practices in harvesting, storage and transportation, as well as market and consumer wastage, it is estimated that 30–50% (or 1.2–2 billion tonnes) of all food produced; nutrition that never reaches a human stomach.
- 44 million people were driven into poverty by rising food prices in the second half of 2010.

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