The International Resource Panel: 10 Key Messages on Climate Change

The way the global economy manages natural resources deeply influences the Earth's climate. How we extract these resources and how much we make use of them essentially determines the emissions of greenhouse gases (GHG). How we dispose of the resulting wastes increasingly conditions the ability of nature's sinks such as soils, forests and oceans to absorb them. Whether we seek to reduce GHG releases by means of mitigation approaches, or we try to secure the sustainability of our food, water, energy and livelihoods through adaptation measures, appropriate management of natural resources lies at the centre of virtually all viable solutions to climate change.

A very large part of global energy use (and therefore GHG emissions) is tied directly to the acquisition, processing, transport, conversion, use and disposal of resources. And very significant savings in both energy and emissions are possible at each of these stages in the resource management chain.

Raising resource productivity through improved efficiency and reducing resource waste through measures such as reuse, recycling and remanufacturing can greatly lower both resource consumption and GHG emissions. Such measures also confer additional, highly desirable social benefits such as more equitable access to resources and invaluable environmental gains such as reduced pollution.

Decoupling economic growth and human wellbeing from resource use has, therefore, to be an integral part and prime concern of climate policy.

This note draws on the findings of the United Nations' expert panel on natural resources – the International Resource Panel (IRP) – to highlight some key policy-relevant messages on how sustainable management of natural resources can contribute to global efforts to combat climate change.

International
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Panel

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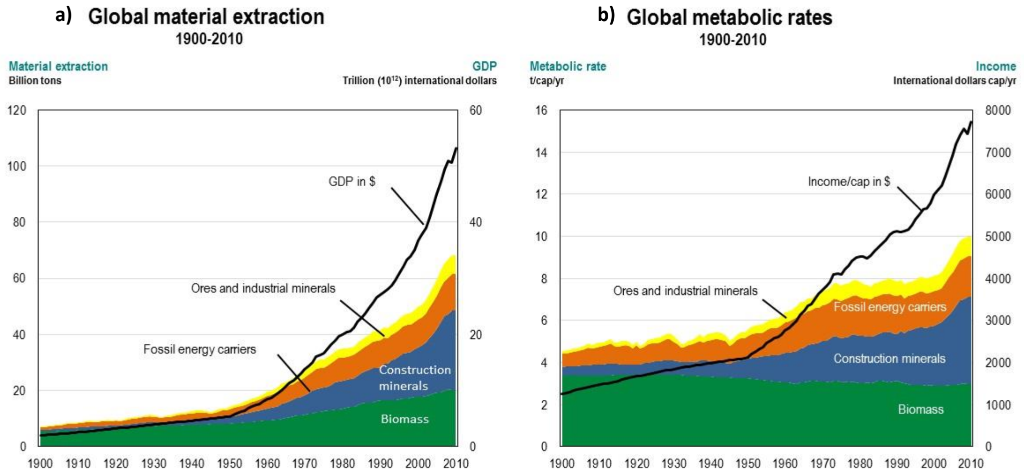
A ‘whole system’ perspective is crucial in the design and implementation of any policy regime that seeks to mitigate GHG emissions urgently and sustainably.

1

With the rapid rise of population and per capita income, the 20th century witnessed growth in annual extraction of construction materials by a factor of 34, of ores and minerals by 27, of fossil fuels by 12, of biomass by 3.6, and of total material extraction by 8 times (Figure 1a). During this period, average resource use per capita (the ‘metabolic rate’) doubled to reach 9 tons in 2000, although of course this masks wide variations both between and within countries (Figure 1b).[i] UNEP (2010)[ii] showed that consumption of food and beverages (31 per cent), housing (24 per cent), and transport (19 per cent) were the highest contributors to global warming. These economic activities also exert other environmental and resource pressures. Clearly, reducing consumption in these categories, or increasing their resource and environmental efficiency, could result in large co-benefits of GHG mitigation and environmental improvement. On the production side, fossil fuel combustion and agriculture have the highest GHG emission, and also other environmental impacts such as mineral resource depletion, eutrophication, and toxicity – and therefore constitute priority areas for intervention.

Figure 1: The global material metabolism of societies 1900-2009, in relation to GDP growth[iii].

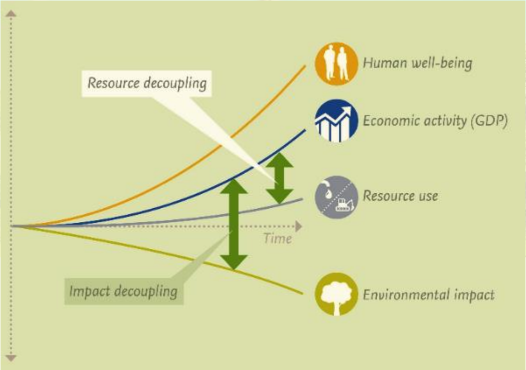


Decoupling economic growth from environmental and resource degradation, and creating a circular economy through reuse, recycling, and remanufacturing are key strategies for reducing both GHG emissions and other environmental and resource pressures.

2

Decoupling technologies could provide, globally, resource savings of USD 2.9 to 3.7 trillion each year by 2030. An estimated 60 to 80 per cent improvement in energy and water efficiency are technically possible and commercially viable in sectors such as construction, agriculture, food and hospitality, industry and transport. Designing products for longer service life (durability), miniaturization, recycling and ease of refurbishing are now well-known strategies for reducing demand on resources. Through decoupling (Figure 2), using currently available technologies and techniques, developing countries could cut the increase in annual energy demand by more than half over the next 12 years, while realizing their development goals. Such approaches include supercritical power generators, co-generating furnaces for metal smelting, sub-surface drip irrigation systems, innovative “systems of crop intensification” and many other technologies that can significantly reduce energy and/or water use at similar or higher levels of output. Remanufacturing – where a product is dismantled into its various components so that they may be reassembled into “like new” products – can reduce GHG emissions by up to 50 per cent, over new products.[iv]

Figure 2: Representation of resource decoupling and impact decoupling.

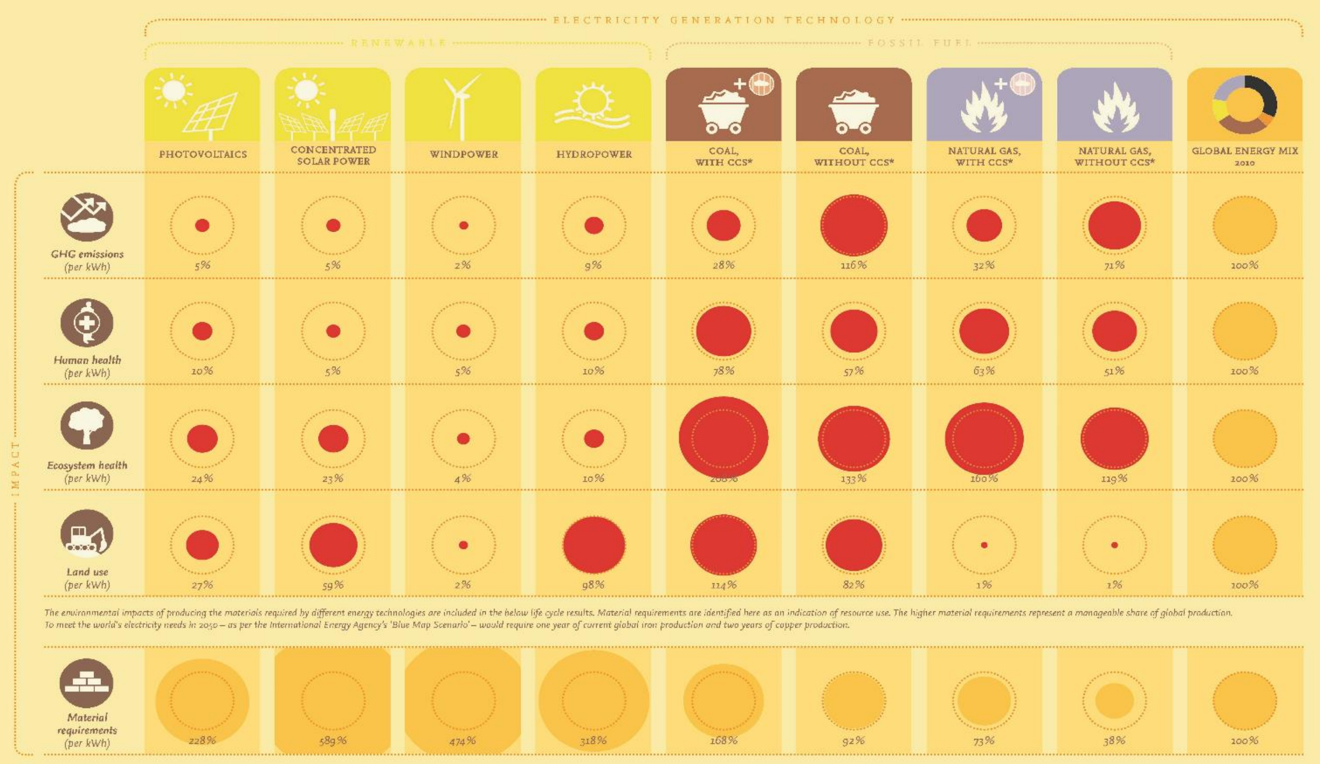


Both de-carbonization of electricity and improvements in the efficiency of electricity use are needed to help achieve the 2 degree Celsius target, and they provide substantial environmental co-benefits, while they can also entail some resource-related trade-offs.

3

Over their life-cycle, the GHG emissions from solar, wind and hydropower are around 90 per cent lower than fossil fueled power plants, and the pollution-related human health and environmental impacts are a factor of 3 to 10 lower (Figure 3). Carbon capture and storage (CCS) reduces GHG emissions from fossil fuel-based power plants, but increases resource use and other pollution-related impacts by between 20 and 80 per cent. Certain renewable technologies may aggravate particular ecological impacts associated with land and water use, and consumption of iron, cement, copper, noble metals and rare earths.[v] With respect to higher efficiency demand-side energy-conversion technologies such as LED lights and maglev (magnetic levitation) transport, these exhibit significant environmental co-benefits, though in some cases with considerable environmental or resource costs.[vi]

Figure 3: Comparison of electricity generation technologies and impacts.



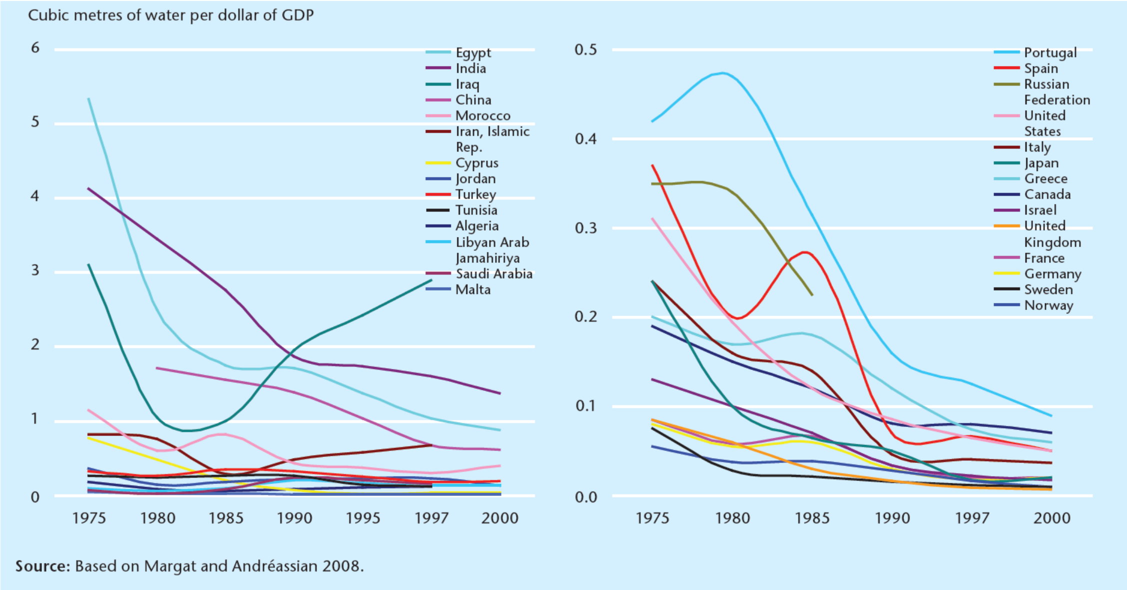
The environmental impacts of producing the materials required by different energy technologies are included in the below life cycle results. Material requirements are identified here as an indication of resource use. The higher material requirements represent a manageable share of global production. To meet the world's electricity needs in 2050 – as per the International Energy Agency's 'Blue Map Scenario' – would require one year of current global iron production and two years of copper production.

Water decoupling offers a major effective strategy to mitigate GHG emissions.

4

With increased population growth, urbanisation and changes in food consumption patterns, demand for water, globally and locally, is expected to increase rapidly during the coming decades, outstripping water supply by over 40 per cent by 2030 if no changes are made to the way water is used. Higher demand for water will also increase demand for energy, needed to pump it, transport it, treat it and use it. At the same time, freshwater withdrawals are needed for energy production, which currently account for 15 per cent of the world's total withdrawals, and are expected to increase by 20 per cent through to 2035. This highlights the many ways in which the resources of water and energy are inextricably linked. Given the highly wasteful practices in existing agriculture, industry and municipal water supplies, there is huge potential for saving water across a large spectrum of economic activities. Decoupling pressure on water resources from economic growth, from a life-cycle perspective, is key to conserving energy and thus reducing GHG emissions. It can also prevent shifting of water and energy intensive production activities and associated burdens to other countries. Although a few countries have already achieved some degree of decoupling of water use from economic growth in recent decades (Figure 4), the world as a whole needs to strengthen the efforts in this area. Interventions that can greatly improve energy efficiency of water use include judicious pricing of water, improved technologies for storage and treatment, and appropriate choice of crops.[vii]

Figure 4: The ratio of water use to GDP has been declining in many countries.



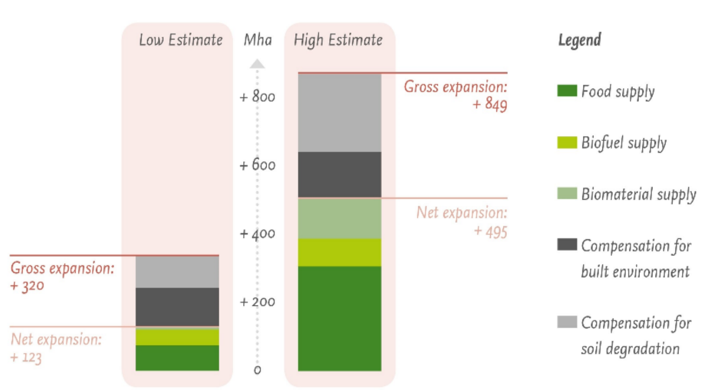
Source: Based on Margat and Andréassian 2008.

Land-use and land-based production systems need to be appropriately designed to greatly improve resource productivity, and thus minimize GHG emissions and environmental damage.

5

The growth of population and the economy create a high demand for conversion of cropland to urban settlements, industrial sites and infrastructure. This limits land available not only for food, but also for energy crops. To compensate for this, cropland tends to expand into grasslands, savannahs and forests, lowering crop and biomass yields, raising biodiversity loss and significantly increasing both land degradation and carbon emissions. From 2005 to 2050, a business-as-usual scenario would lead to a gross expansion of croplands by 320 – 850 million hectares (Mha) (an increase of 21 to 55 per cent) (Figure 5). About 160 to 320 Mha of these could be saved from conversion through a mix of strategies, including improved diets and less food waste, reduction of biofuel quotas, control of biomaterials demand, improved land use planning to avoid build-up on cropland, and investments into the regeneration of degraded soils. In many instances, agricultural land is used well below its sustainable potential. Better matching of land use with land potential could create opportunities for increasing biomass supply, needed to feed a growing and more affluent world population.[viii]

Figure 5: Expansion of cropland from 2005 to 2050 under BAU conditions for various demand and compensation factors.



Moving towards a more sustainable food system could both reduce GHG emissions and have substantial health benefits.

6

Globally, food systems account for around a quarter of the global GHG emissions, partly caused by emissions from agriculture itself, and partly due to land use changes. Important means of reducing GHG emissions from the food sector are: reduction of food losses and waste (currently about one third of the harvest is lost), shift demand from animal to plant-based products (especially relevant in affluent societies, but increasingly in developing countries as well), technical measures in agricultural systems (especially in rice cultivation and livestock production), leguminous crops replacing nitrogen fertilizer, and finally a lower use of fossil fuels in the transport, processing, packaging, cooling and preparation of food. In many cases there could be co-benefits for biodiversity and resource use, as well as for food security and human health (for example, current high intake levels of meat in high income countries having adverse health effects). Transitioning to a more sustainable food system and reducing associated GHG emissions would require technical, economic and behavioural change on the part of consumers and other powerful players such as retailers and food companies, as well as governments.[ix]

Metals require high amounts of energy – but are also essential components of almost all technologies; understanding their environmental impacts, scarcity, and recyclability is crucial for large-scale deployment of low-carbon technologies.

7

Mining and refining of metals is currently responsible for around 8 per cent of the total global primary energy consumption, plus many local environmental and health problems from release of toxic substances. High grade metal ores are increasingly scarce and require ever-larger amounts of energy and water to extract and process them. However, producing a kilogram of metal from recycling often requires less than half as much energy (and therefore carbon emissions) as converting it from ore. Recycling of primary metals such as iron, zinc, copper and aluminum is already very high (60 to 90 per cent), and it is quite high (around 50 to 70 percent) for precious metals – including gold, silver and platinum. On the other hand, specialty metals – lithium, used for batteries; gallium, germanium, indium and tellurium, used for solar cells; and rare earth metals, used for catalysts, as battery constituents and as permanent magnets for power drives and wind turbines – which are crucial for low-carbon technologies, are hardly recycled at the moment (often below 1 per cent). This is owing to a lack of recycling logistics, sorting and pretreatment infrastructure, technologies and suitable legal frameworks. Recycling, particularly of specialty metals, thus presents an important policy gap for governments to fill and investment opportunity for industry to seize, with a need to develop new business models and engage small and medium enterprise (SMEs). Greater investment in research and development and strengthening legislative systems and infrastructure in the area of metals recycling, can increase recycling rates, with corresponding energy savings and other environmental, social and health benefits (Figure 6).[x,xi]

Figure 6: Policy options for sustainable metal management.

Reduce impact of mining by greening the global primary metal sector:
- Enforce environmental impact assessment and environmental monitoring in all phases.
- Strengthen advanced mining concepts and the use of best available technology (BAT) through multilateral agreements.

Support sustainable production:
- Conduct Life-Cycle Assessment (LCA) as an essential strategy of sustainable metals management.
- Support recycling friendly product design.
- Enhance technology transfer, accelerated by international recycling conferences, technological implementation programmes in emerging economies and developing countries.

Support enabling framework:
- Enhance government support for data acquisition and analysis, recycling technologies research and other research, and development efforts is thus a priority.
- Introduce appropriate legislative framework; and continuous improvement of legislative systems.
- Increase consumer awareness.
- Promote multidisciplinary systemic education approaches, research and development.

Improve recycling as key to sustainable metals management:
- Promote recycling based on best available technology (BAT).
- Build technological capacity and infrastructure on metallurgy to improve recycling rates.
- Promote higher end-of-life recycling rates of metals by supporting the development of necessary infrastructure, especially optimized collection schemes.

Cities and their infrastructure should be designed in ways that they are less resource and emission intensive and which create a less polluted, healthier environment for their residents.

8

Cities produce 80 per cent of global GDP on just 2 per cent of the land surface. Urban areas currently account for 60 to 80 per cent of global energy consumption, 75 per cent of carbon emissions, and more than 75 per cent of the world's natural resources. Through well-designed urban infrastructures there are major opportunities for cities and nations to achieve the same or an improved level of well-being with less resource consumption and lower GHG emissions. In Lagos, Nigeria, for example, the introduction of a Bus Rapid Transit (BRT) system has contributed to a 13