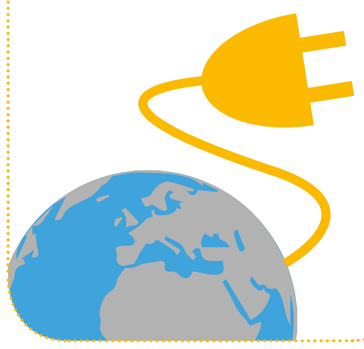
How energy choices influence the human future

DEMAND FOR ENERGY

Increasing energy demand

World **energy demand** is expected to **double by 2050**.



Drivers for energy demand

Growing population from 7 billion today to 9 billion by 2050.

Industrialization, especially in emerging markets.

Globalization and **increasing global trade** (including transportation).

Growing middle class with **changing consumption patterns**.

Results of energy demand

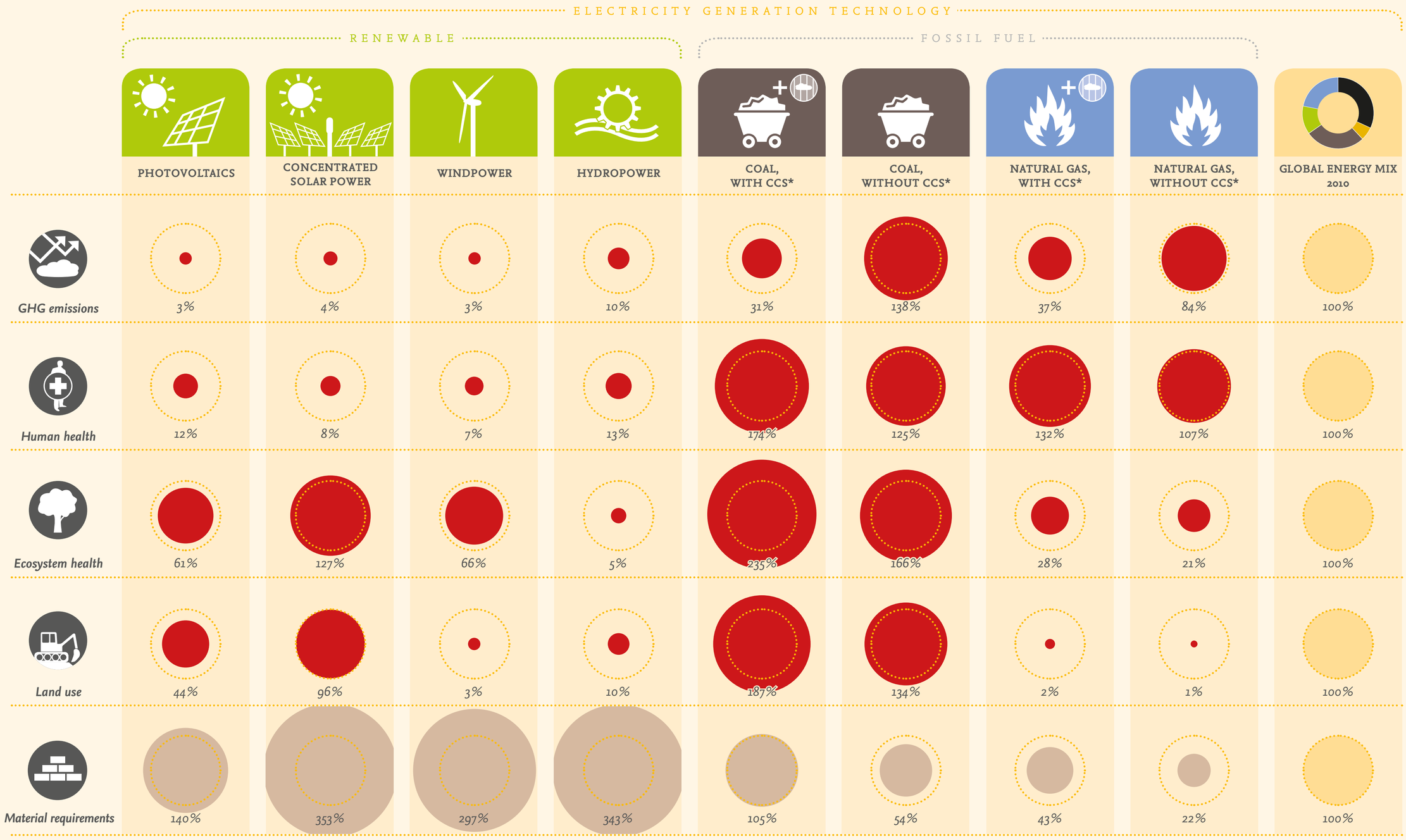
Electricity production is responsible for 25% of total anthropogenic **greenhouse gas emissions**.

Massive investment will be needed to meet the energy needs of 9 billion people and at the same time reduce greenhouse emissions, air pollution, toxicity, impacts on land, water and other parts of ecosystems.

The key to sound future energy decisions lies in being able to determine the right mix of technologies for local or regional situations, as well as the best policy objectives.

COMPARISON OF TECHNOLOGIES AND IMPACTS

This infographic compares electricity generation technologies and highlights the environmental benefits, and trade-offs of each technology. The graphic presents an overview over the life cycle impacts and material requirements per unit of electricity produced by different technology groups compared to the global electricity generation mix in the year 2010. Indicators for materials are shown for reference; the environmental impacts associated with material production are already included in the results for the other indicators.



* *Carbon capture storage (CCS) technology entails the capture of CO_2 from large anthropogenic sources, transport of the CO_2 to an underground storage reservoir and long-term isolation from the atmosphere.*

SUMMARY

Throughout the life cycle the **GHG emissions** of renewable energy sources are 5-6% those of coal or 8-10% those of natural gas.

The **human health** impacts from renewable energy are only 10-30% those from state-of-the art fossil fuel power.

Damage to the **environment** from renewable energy technologies is 3 to 10 times lower than from fossil fuel based systems.

Coal- or gas-fired systems with **carbon capture and storage (CCS)** are a promising way to reduce greenhouse emissions, but have other impacts that need to be considered, such as their additional energy demand, lifetime security and environmental impacts.

Policy can minimize the ecological impacts of power generation through the proper selection, design and operation of mines, wells and power plants.

Natural gas combined cycle plants, wind power, and roof-mounted solar power have low **land use** requirements, while coal-fired power plants and ground-mounted solar power require larger areas of land.

Potential solutions for additional **material requirements** include material recycling, alternative technologies, materials efficiency and new sources. The literature does not agree on the severity of potential supply constraints for critical materials.

Site-specific environmental concerns include the ecological impacts of coal mines, hydropower dams and wind power. Impacts vary greatly depending on the significance of the habitat affected and its species, and may often be reduced by mitigation, proper site selection or offsets.

SOURCES & CONTACT

This document highlights findings from the report on green energy and should be read in conjunction with the full report. References to research on which this infographic is based are listed in the full report:

- UNEP (2015): Green Energy Choices: the Benefits, Risks and Trade-Offs of Low Carbon Technologies for Electricity Production.

The International Resource Panel was established in 2007 to provide independent, scientific assessment on the sustainable use of natural resources and the impacts of resource use over the full life cycle.

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