PROVISIONING SYSTEMS FACTSHEET

Provisioning Systems Approach

Natural resources (land, water, metals, non-metallic minerals, fossil fuels, and biomass) are extracted and processed to meet the demand for goods and services, including food, housing, mobility and energy. The way resources are used also has significant impacts on people and planet.

"Provisioning systems" is a recently emerged approach that allows consideration of how ecological, technological, institutional and social elements interact to transform natural resources to satisfy demand. The approach considers all resources used across sectors that contribute to delivering the final services of a provisioning system. This means, for example, that energy used to grow food, to build housing or for mobility will be assigned to each of these respective systems. This approach enables an understanding of how resources are used to meet final demand and the related impacts of that use.

Taking a provisioning systems perspective can help identify less resource intensive ways of meeting human needs while delivering on sustainability goals. The Global Resources Outlook 2024 focuses on four resource-intensive provisioning systems: energy, food and nutrition, the built environment and mobility.

These factsheets provide information about the main sustainability challenges, material resource use and related environmental impacts, future outlook and recommendations for action across each of the four provisioning systems covered in the Global Resources Outlook 2024. The factsheets also highlight the stark differences in material resource use across regions and country income groups.

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FOOD & NUTRITION

What?

Resource use and corresponding supply chains that contribute to human nutrition, including each step in the food supply chain, from production to distribution, retail and consumption. Also the energy used to produce food.

Main challenges

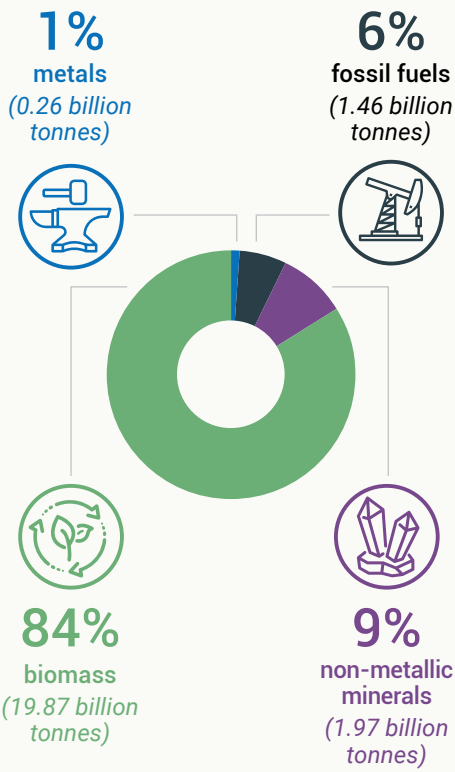
- Unsustainable diets
- High volumes of food loss and food waste
- Carbon-intensive supply chains
- Competition with other potential applications of biomass (e.g. biomass for energy)
- Environmental impacts, including climate, biodiversity and pollution impacts

Socio-economic indicators

33% of jobs
12% of value added

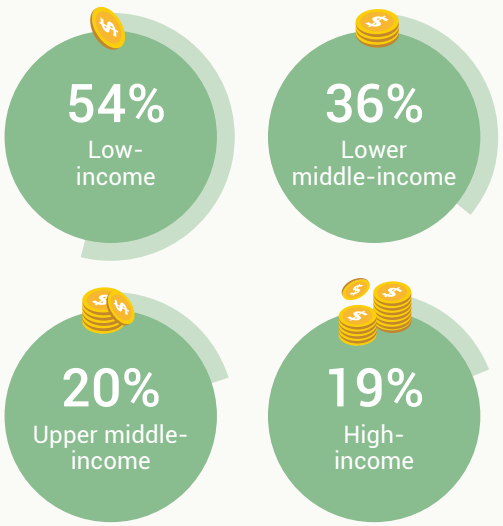
Material footprint of the food provisioning system (year 2020)

23.6 billion tonnes of material demand out of the total **100 billion tonnes** extracted in 2020 of which:



Percentage of the total material footprint of different income groups attributed to food provisioning system (year 2020)

Low-income and lower middle-income country groups have the highest material footprint for the food provisioning system



Material footprint per capita (year 2020)

The highest per capita material footprint of the food provisioning system is in high-income countries with **4.67 tonnes per capita**, comprising of **81% biomass**, **9% non-metallic minerals, 8% fossil fuels**, and **2% metallic minerals.**

Material footprint of provisioning system by region

On average, food provisioning is responsible for about 24% of the global material footprint

Food provisioning systems contribute differently to overall regional material footprints, contributing close to half of the overall footprints in Africa and Latin America and the Caribbean.

% of the regional material footprints (year 2020)

46% Africa	**20%** Asia-Pacific	**35%** EECCA	**21%** Europe
49% Latin America and the Caribbean	**16%** North America	**21%** West Asia	**24%** World

Environmental impacts

Out of the four main provisioning systems covered in the GRO24, the food provisioning system is the biggest contributor of global water stress and land-related biodiversity loss.

The relative contribution of the food provisioning system to total global environmental impacts by impact category (2022):

- **21%** of total climate impacts
- **7%** of total PM2.5 health related impacts
- **67%** of land related biodiversity loss impacts
- **56%** of water stress impacts

Outlook under the Sustainability Transition scenario

All provisioning systems become more resource efficient, with aggregate resource use increasing for the food system, reflecting healthier and more sufficient diets as well as global population growth.

- Global material footprint of the food provisioning system by 2060: **~30 billion tonnes** (up from 23.6 billion tonnes in 2020).
- Material footprint per capita of the food provisioning system by 2060: **27% increase** from 2020 levels alongside increases in food security.

These actions together can decrease the land needed for food by 5% compared to 2020 levels while more equitably ensuring adequate nutrition for all.

-5%

Recommendations to achieve better performing food provisioning systems

- Reducing the demand for the most impactful food commodities
- Dietary changes to move away from animal protein
- Reducing food loss and food waste
- Protecting and restoring productive land while meeting demand for nutrition

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BUILT ENVIRONMENT

What?

Constructed spaces for human activity, where people live and work, and the energy embodied in their construction. Built infrastructure used by other systems would not fall into this system. For example, rail infrastructure and roads form part of the mobility provisioning system.

Main challenges

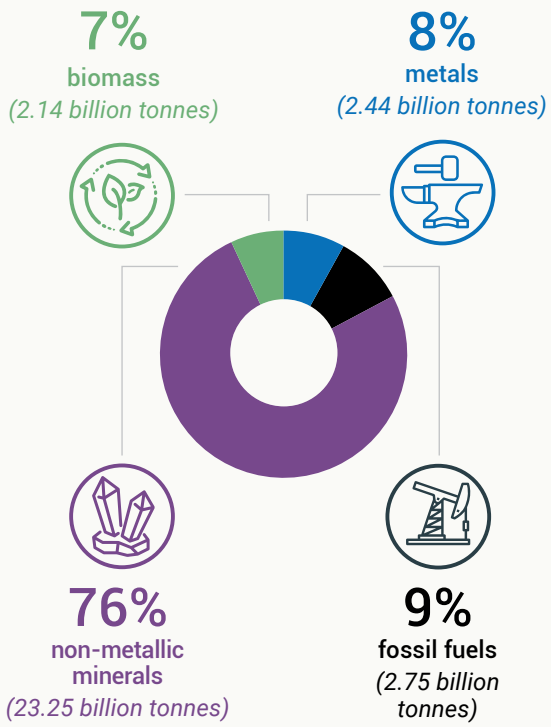
- The high emissions embodied in construction
- The lock-ins in buildings with high energy demand
- The high floor area and energy demand per capita
- Competition with other uses of biomass

Socio-economic indicators

13% of value added
15% of jobs

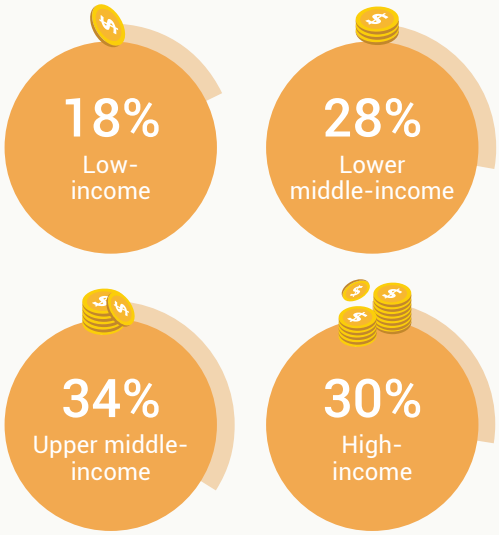
Material footprint of the built environment provisioning system (year 2020)

30.6 billion tonnes of material demand out of the total **100 billion tonnes** extracted in 2020 of which:



Percentage of the total material footprint of different income groups attributed to the built environment provisioning system (year 2020)

Upper middle-income country groups have the highest material footprint for the built environment provisioning system



Material footprint per capita (year 2020)

The highest material footprint per capita is in high-income countries, with 7.19 tonnes per capita, shared between **71% of non-metallic minerals**, **11% of metallic minerals, 10% of fossil fuels** and **8% of biomass.**

Material footprint of provisioning system by region

On average, the built environment provisioning system is responsible for about 31% of the global material footprint

Built environment provisioning systems contribute differently to overall regional material footprints. This ranges from around a quarter of the material footprint in Africa and the EECCA regions, and close to 35% for Asia-Pacific and West Asia.

% of the regional material footprints (year 2020)

24% Africa	**33%** Asia-Pacific	**25%** EECCA	**32%** Europe
23% Latin America and the Caribbean	**29%** North America	**34%** West Asia	**31%** World

Environmental impacts

Climate impacts more than doubled between 1995 and 2022, especially due to the infrastructure build-up in Asia, which is likely to occur also in other developing regions, where such infrastructure is necessary.

- **18%** of total climate impacts
- **18%** of total $PM_{2.5}$ health related impacts
- **9%** of land related biodiversity loss impacts
- **6%** of water stress impacts

Outlook under the Sustainability Transition scenario

The stock of materials in the built environment at global level will continue to grow until 2060 under all scenarios. The key reason is that in many parts of the world basic infrastructure still needs to be built up, given the expected economic and population development.

- Global material footprint of the built environment provisioning system by 2060: ~**38 billion tonnes** (up from 30.4 billion tonnes in 2020)

Taken together, these measures can decrease building material stocks by 25% by 2060, leading to a 30% decrease in energy demand, and 30% decrease in GHG emissions compared to current trends

-25%

Recommendations to achieve better performing resource-intensive provisioning systems

- Assuring sustainability of the new building stock
- Retrofitting the existing building stock
- Decarbonizing material production
- More intensive use of buildings

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MOBILITY

What?

The mobility provisioning system includes land, sea and air mobility and associated infrastructure for transporting people and goods, and the energy for their manufacture and running. It also includes household vehicle fuel.

Main challenges

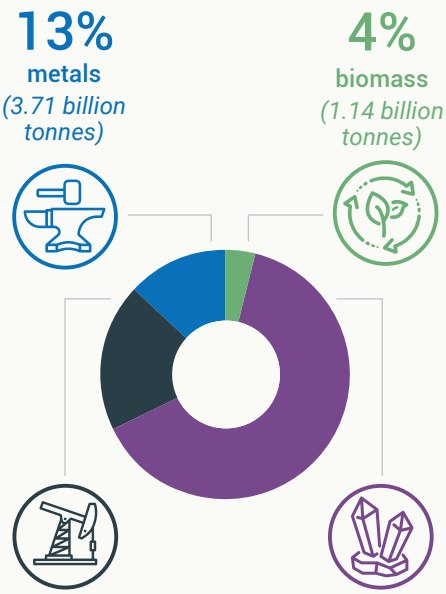
- New lock-ins in motorized mobility, long travel distances, high travel frequency and carbon-intensive vehicles.
- The electrification of transport and mobility will further add to global metals demand.
- Private car transport is infrastructure-dependent, where roads, servicing and parking facilities take vast amounts of public space at the expense of social and environmental uses.

Socio-economic indicators

7% of jobs
9% of value added

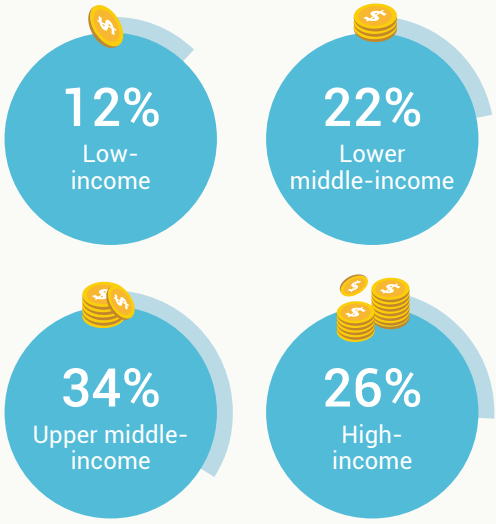
Material footprint of the mobility provisioning system (year 2020)

28.6 billion tonnes of material demand out of the total **100 billion tonnes** extracted in 2020 of which:



Percentage of the total material footprint of different income groups attributed to the mobility provisioning system (year 2020)

Upper middle-income country groups have the highest material footprint for the food provisioning system



Material footprint per capita

The highest material footprint per capita is in the upper middle-income countries with **6.48 tonnes per capita**, comprising of **71% non-metallic minerals, 14% fossil fuels, 12% metallic minerals, 3% biomass.**

Material footprint of provisioning system by region

On average, mobility provisioning is responsible for about 30% of the global material footprint

Mobility provisioning systems contribute differently to overall regional material footprints, contributing the most to material footprints in Asia and the Pacific followed by West Asia:

% of the regional material footprints (year 2020)

16% Africa	**34%** Asia-Pacific	**19%** EECCA	**24%** Europe
17% Latin America and the Caribbean	**25%** North America	**30%** West Asia	**29%** World

Environmental impacts

The relative contribution of the mobility provisioning system to total global environmental impacts by impact category (2022):

- **7%** of total climate impacts
- **6%** of total $PM_{2.5}$ health related impacts
- **5%** of land related biodiversity loss impacts
- **2%** of water stress impacts

These actions together can reduce related material stock requirements (-50%), energy demands (-50%) and GHG emissions (-60%) by 2060 compared to current trends

-50%

Outlook under the Sustainability Transition scenario

- Global material footprint of mobility provisioning system by 2060: **30 billion tonnes** (up from 28 billion tonnes in 2020)

Recommendations to achieve better performing resource-intensive provisioning systems

- Cities moving towards active mobility and public transportation.
- Reducing carbon-intensive frequent travelling modalities.
- Decreasing emissions intensity of transport modalities

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ENERGY

What?

Production, conversion and supply of energy for end-consumer and industrial activity, and its associated infrastructure. Most energy use is allocated to other provisioning systems.

Main challenges

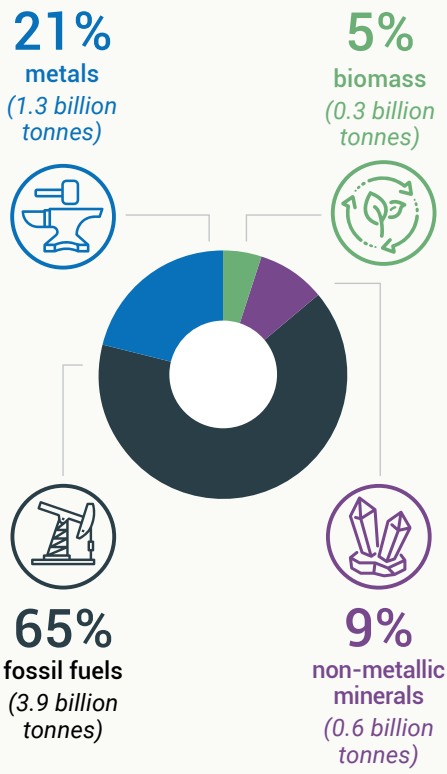
- Carbon lock-ins in industries and infrastructure
- High energy demand from other provisioning systems
- Limited supply of decarbonized electricity supply and low-carbon fuels
- High demand of materials for the low-carbon transition
- Competition for the use of biomass
- Unequal access to energy is also one of the barriers to meet the SDGs.

Socio-economic indicators

2% of jobs
3% of value added

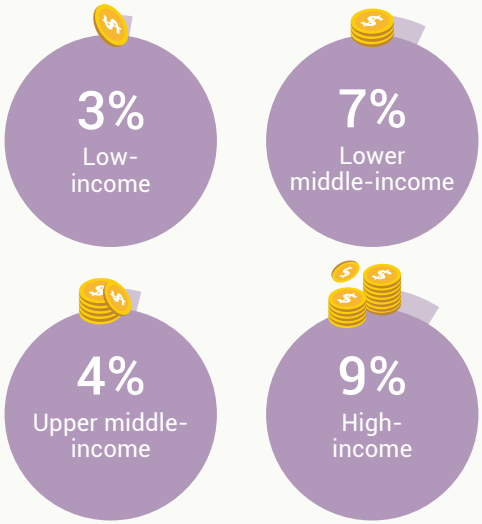
Material Footprint of the Energy provisioning systems (year 2020)

6.12 billion tonnes of materials demand out of the total **100 billion tonnes** extracted in 2020 of which, of which:



Percentage of the total material footprint of different income groups attributed to the energy provisioning system (year 2020)

High-income country groups have the highest material footprint for the energy provisioning system



Material footprint per capita

The highest material footprint per capita is in the high-income countries (**2.26 tonnes per capita**, comprising of **72% fossil fuels, 18% metallic minerals, 7% non-metallic minerals,** and **3% biomass**.

Material footprint of energy provisioning system by region

The EECCA, Europe and North America regions have close to double the world average material footprint of the energy provisioning system

% of the regional material footprints (year 2020)

4% Africa	5% Asia-Pacific	11% EECCA	10% Europe
4% Latin America and the Caribbean	10% North America	4% West Asia	6% World

Environmental impacts

Per unit of electricity generated, coal power causes on average more than ten times higher mining-related biodiversity impacts than all renewable energy technologies.

The relative contribution of the energy provisioning system to total global environmental impacts by impact category (2022):

- 13% of total climate impacts
- 5% of total $PM_{2.5}$ health related impacts
- 8% of land related biodiversity loss impacts
- <1% of water stress impacts

A sharp decrease in energy demand could lead to reductions of climate impacts by more than 80 per cent

-80%

The outlook for material footprint (MF) resource use in the Sustainability Transition scenario

- Global material footprint of energy provisioning system by 2060: **2 billion tonnes** (up from ~6 billion tonnes in 2020)

Recommendations to achieve better performing resource-intensive provisioning systems

- Decarbonizing electricity supply through the scaling up of low-resources renewable energies
- Decarbonizing fuels