

A scenic landscape featuring a long, straight road stretching through a forested valley towards two prominent, flat-topped mountains under a clear blue sky. The road is paved and has a yellow center line. The surrounding area is filled with green trees and shrubs. The mountains in the background are dark green with reddish-brown peaks. The sky is a clear, bright blue.

Raw Material Needs and US Environmental Policy





Based on current rates of use, each American born today will consume 3.19 million pounds of metals, minerals, and fuels in their lifetime.



Source: Minerals Education Coalition (2020)

But while high consumption is widely embraced . . .

. . . there is much less enthusiasm for acceptance of responsibility for the impacts of our consumption.

Esthetics
Recreation

Traffic
Wilderness values

Noise
Tourism



**Impacts on ground and
surface water**

Air quality

Wildlife

Rare & endangered species

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**. . . But, raw materials must
come from somewhere.**

**To support its domestic consumption,
the U.S. is a massive net importer of
industrial raw materials.**

Of 85 minerals and metal products reported by the US Geological Survey, the U.S. was a net importer of 74 of them in 2020, including 33 of 35 minerals deemed critical to U.S. national security. For 58% of metals and minerals, net imports were 50% or more.



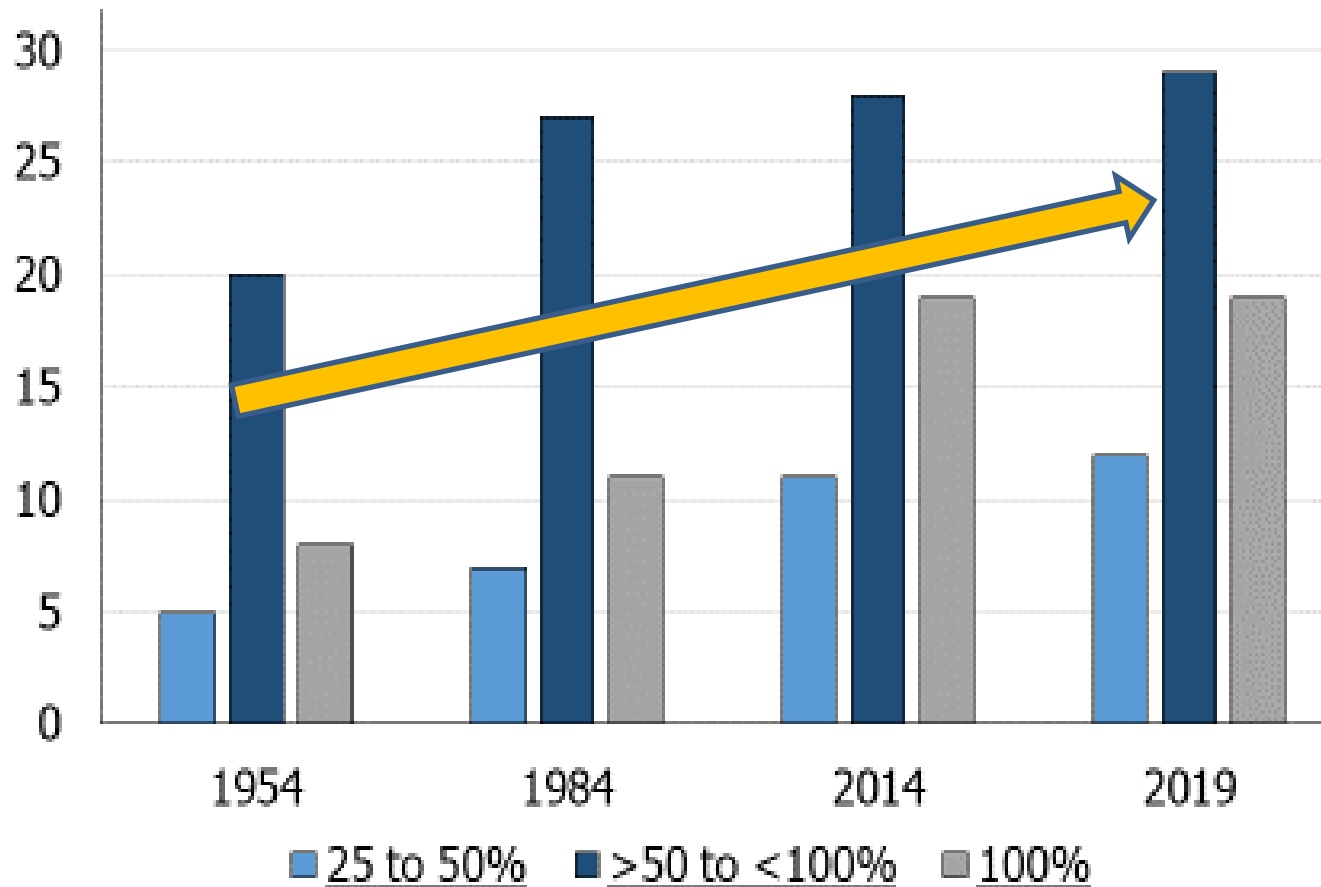
We are also a net importer of wood and wood products.

The United States is also a net importer of durable and non-durable goods of all kinds.



U.S. Non-Fuel Mineral Net Import Reliance, 1954-2019

(Number of minerals on net import list by magnitude of import reliance)

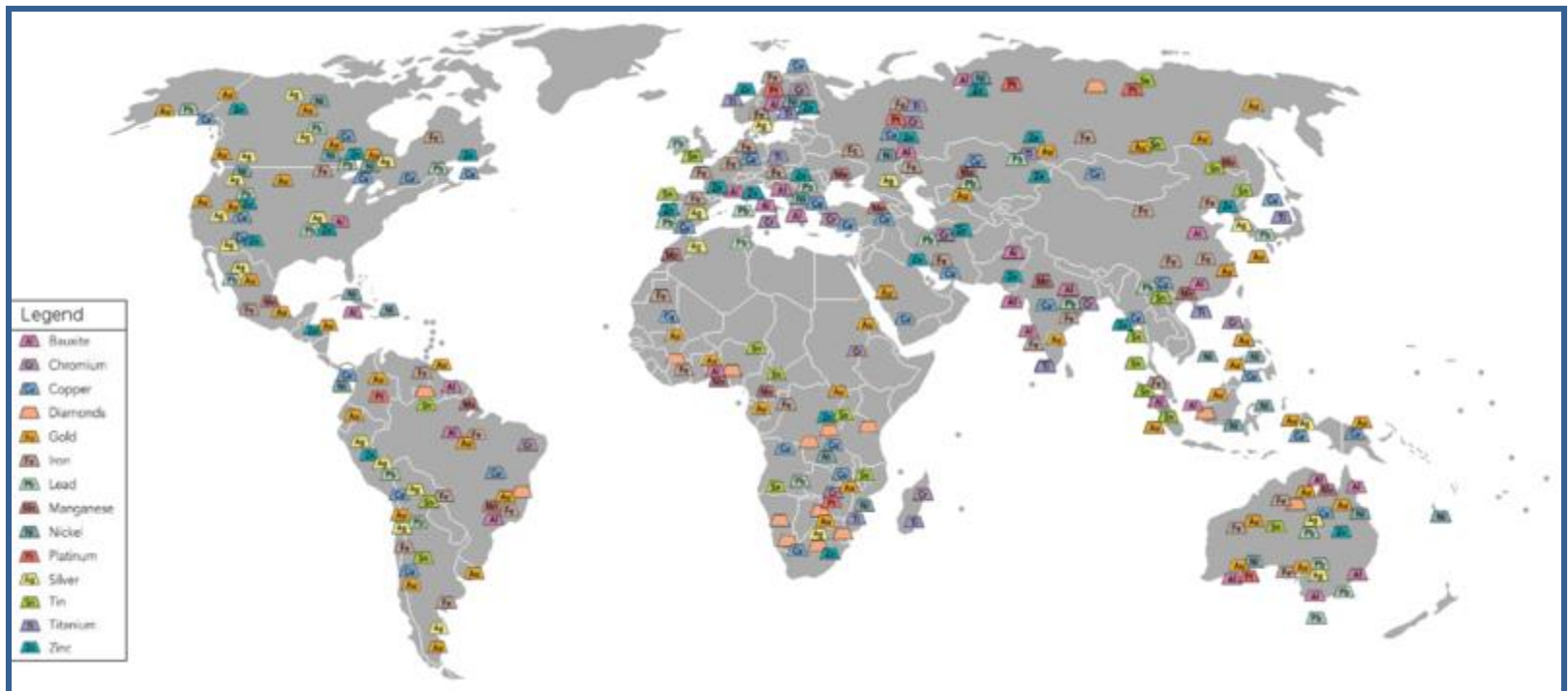


Source: USGS (2015, 2020)



Virgin raw material consumption and imports are rising even with current recycling efforts.

The U.S. is a net importer on a massive scale partly because many economically accessible resources lie outside U.S. borders . . .





. . . but also because environmental regulations and policies, and fierce opposition to local procurement of raw materials have created barriers to domestic production and increased associated costs.

“A common misconception is that the United States must import mineral commodities because no domestic resources exist. In general, the United States does not lack mineral resources. For example, it [the U.S.] has resources of 43 mineral commodities with high NIR [net import reliance].”

U.S. Geological Survey (2018)



Huge quantities of raw materials flow to the U.S. on a daily basis.



And in the process, environmental impacts are exported.

Local Decision Processes Related to Raw Material Extraction

Consideration is **never** given to potential impacts on alternative production regions, wherever they might be.

What are likely impacts to:

- natural, wild areas?
- scenic beauty?
- rare and endangered species?
- flora and fauna?
- ground and surface water?
- air quality?
- tourism?
- recreation?

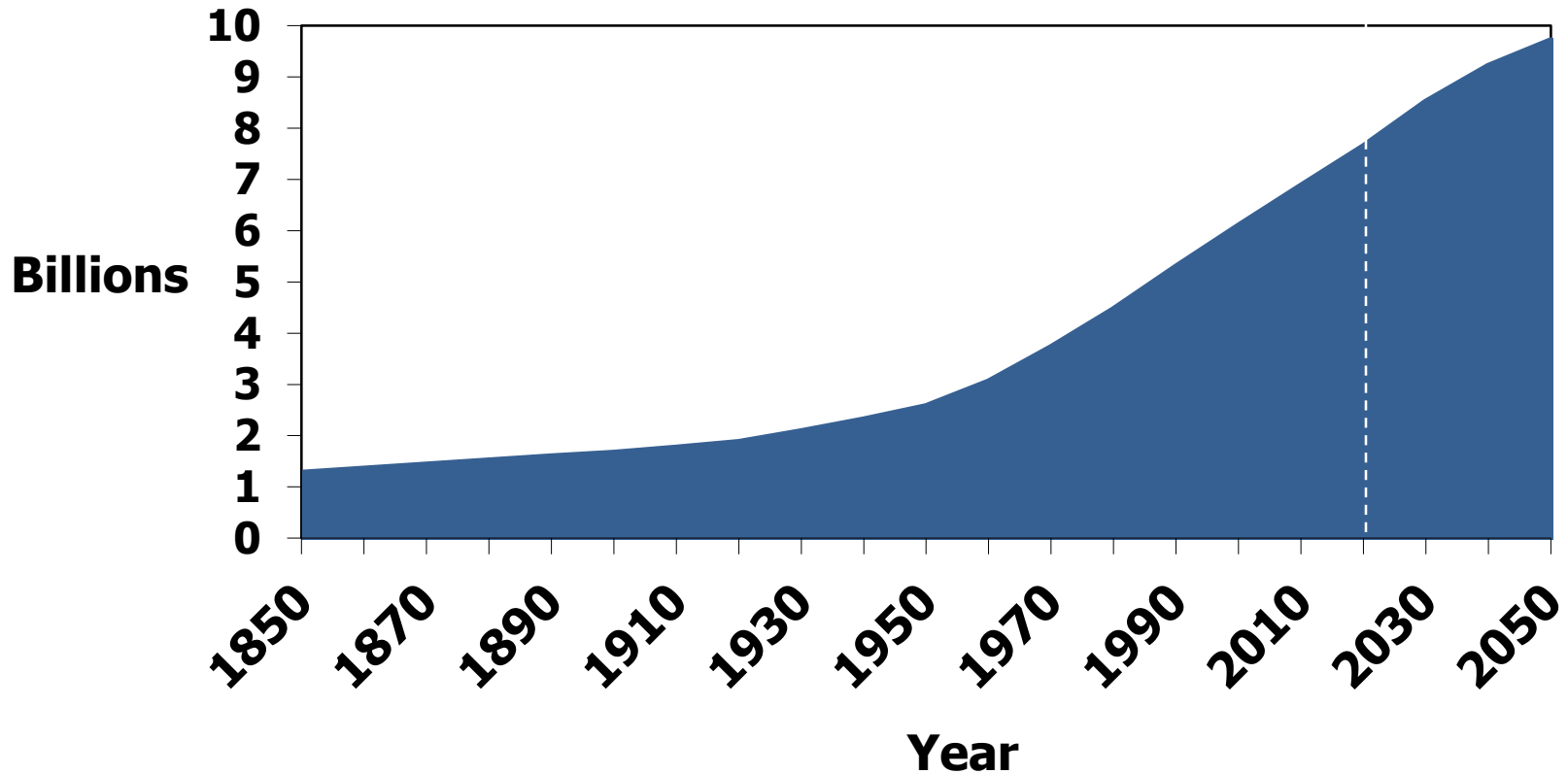


People and environments all over the world are impacted by first-world consumption, and often negatively.

Changing Realities

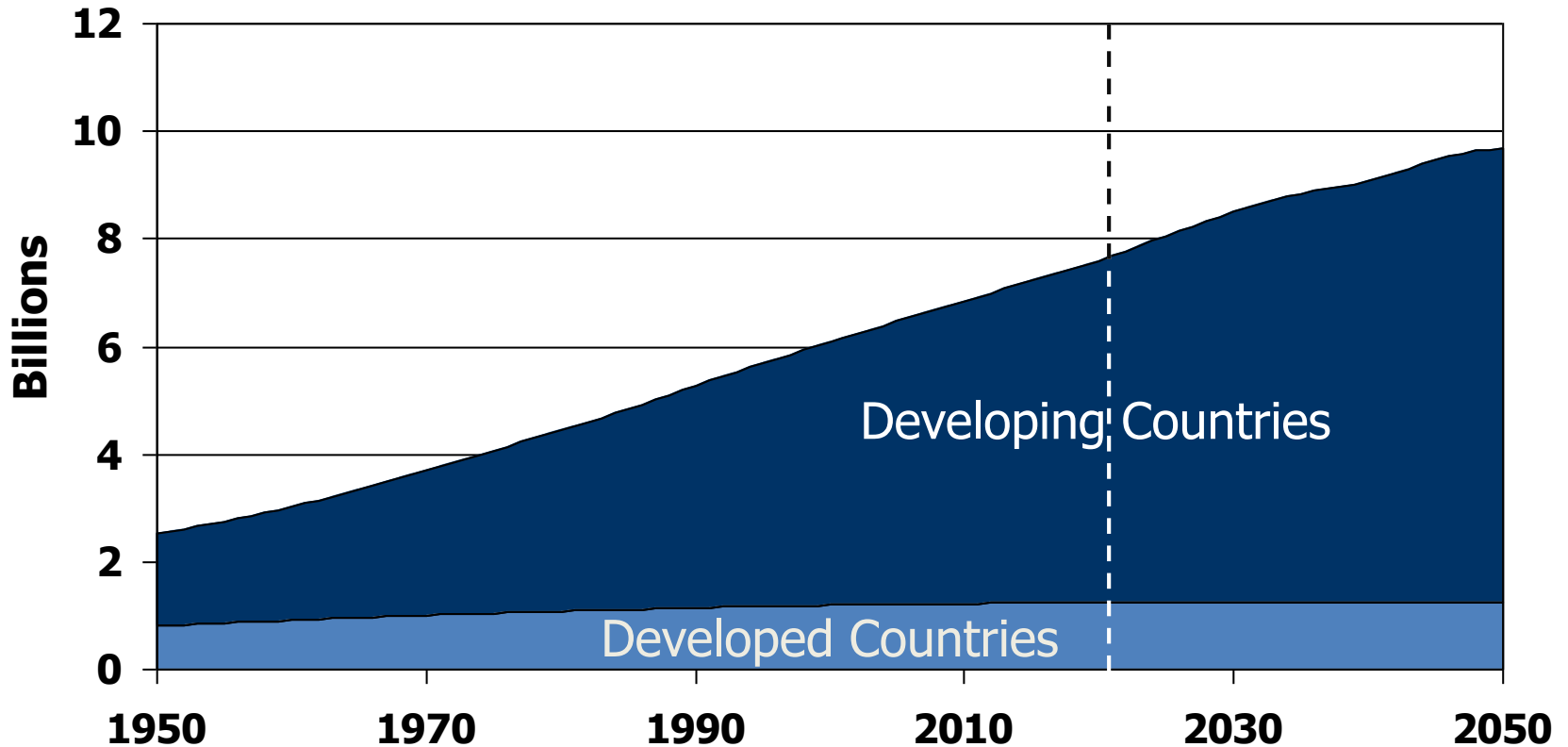
World Population 1850-2050

(Medium projection of growth assumed after 2020)



Source: United Nations (2020)

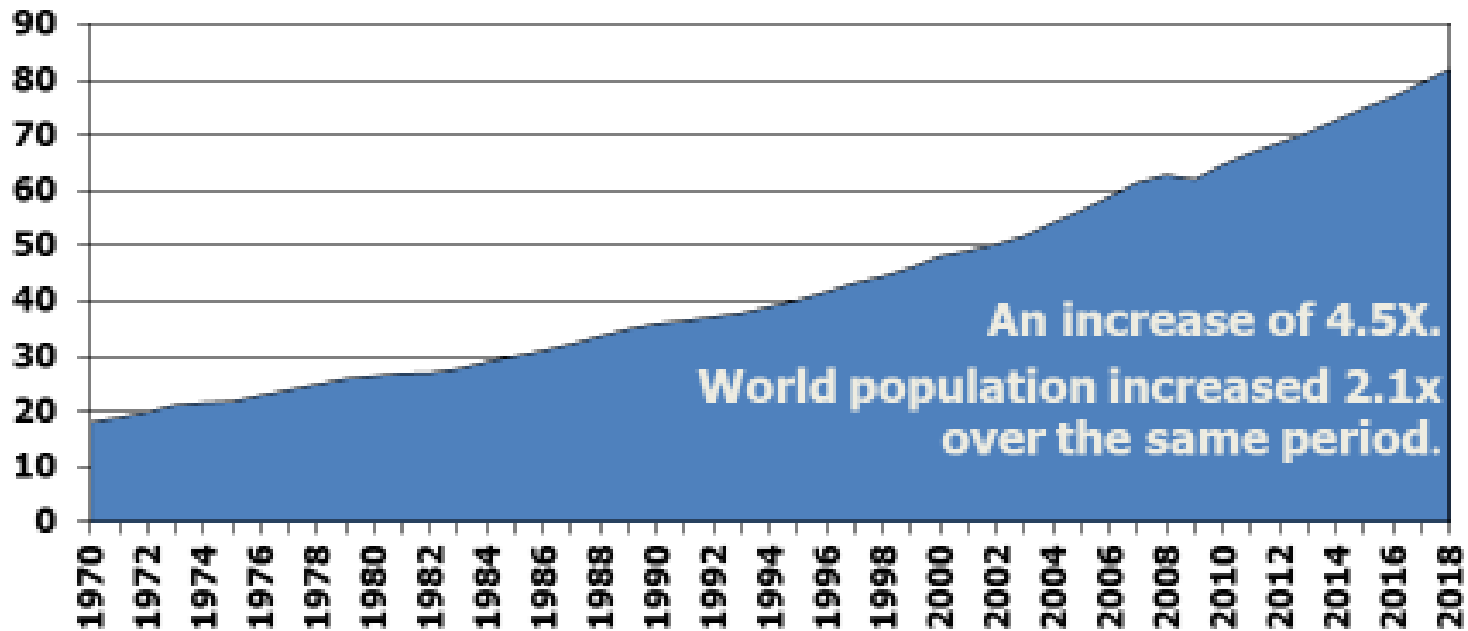
World Population Projection by Level of Economic Development



Source: United Nations (2020)

Gross World Product, 1970-2018

Trillions of 2015 U.S. dollars



Source: United Nations Statistics Division (2020)
(<http://unstats.un.org/unsd/snaama/dnllist.asp>)

As with Population, Economies of the Developing Nations are Growing Most Rapidly

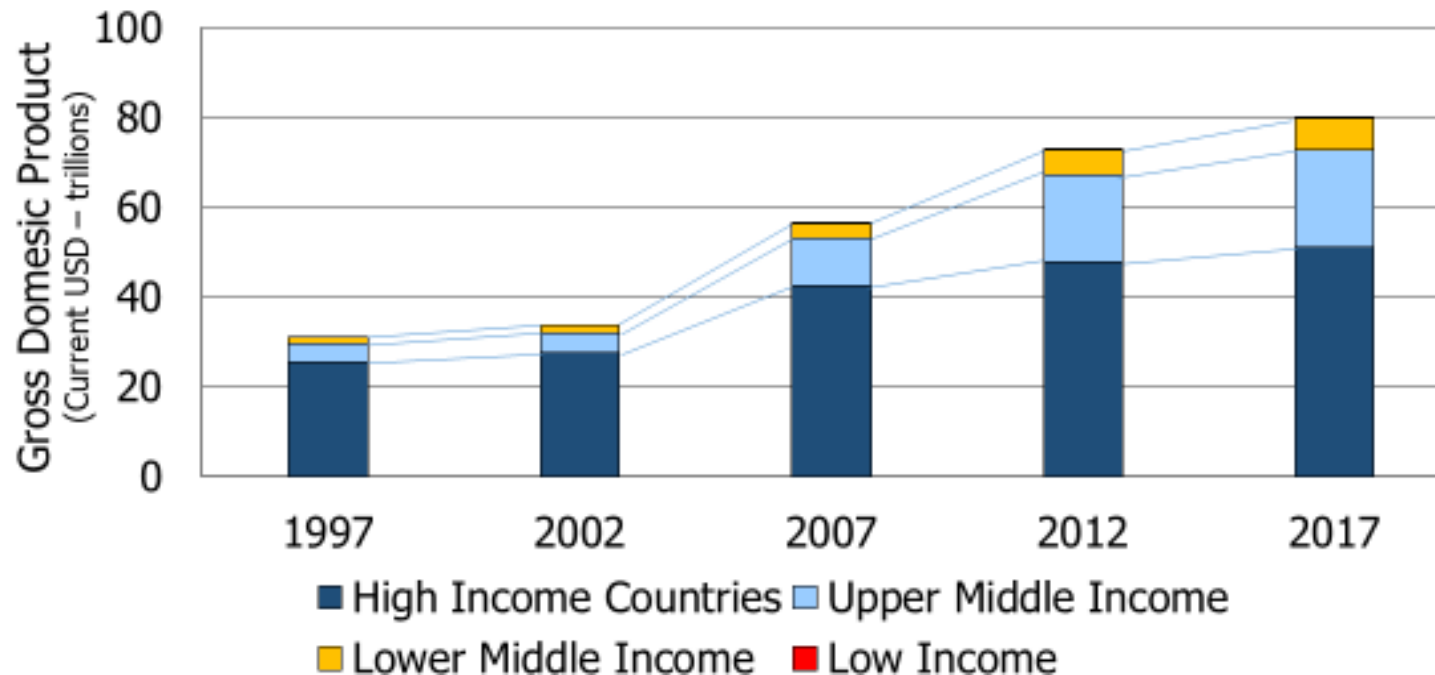
Historical and Projected Growth of World GDP by Level of Economic Development

	Annual Percent Change				
	1993-2000	2001-2008	2009-2012	2013-2016	2021 proj.
Advanced Economies	3.1	2.1	1.1	2.4	3.9
Emerging & Developing Countries	4.1	6.6	5.7	6.7	6.0
World	3.5	4.0	3.3	4.6	5.2

Source: IMF (2021)

Share of Global Economy Attributable to Country Groups by Income Level, 1997-2017

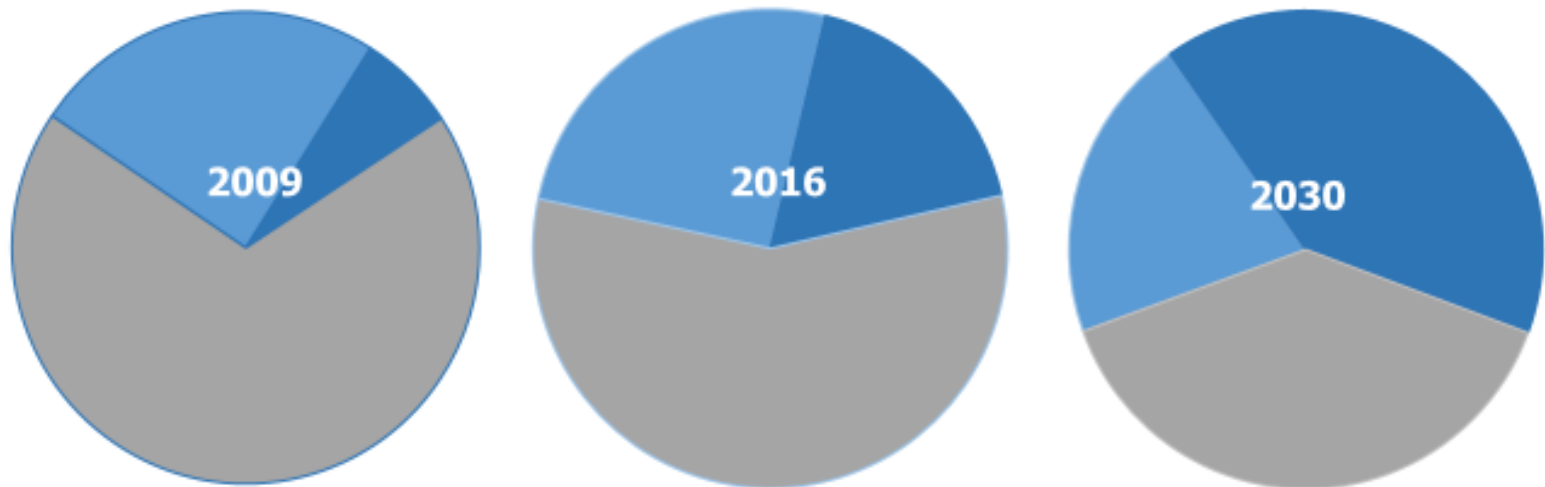
GDP values are expressed in current USD, meaning that comparisons in each year are based on the value of a dollar in that year.



Source: World Bank (2019)

Percent of World Population Included Within Economic Middle Class

■ Global Middle Class – Represented by areas in blue (Asia in darker blue)
■ Rest of World



Source: Graphic developed based on Kharas (2017)



**Raw Material Demand
is Growing Rapidly
Worldwide**



World Growth in Consumption of Principal Raw Materials, 1961-2018

(Population growth during this period: 2.5x)

<u>Steel</u>	<u>Cement</u>	<u>Aluminum</u>	<u>Plastics</u>	<u>Wood</u>
5.4x	18.6x	16.4x	42.2x	2.0x

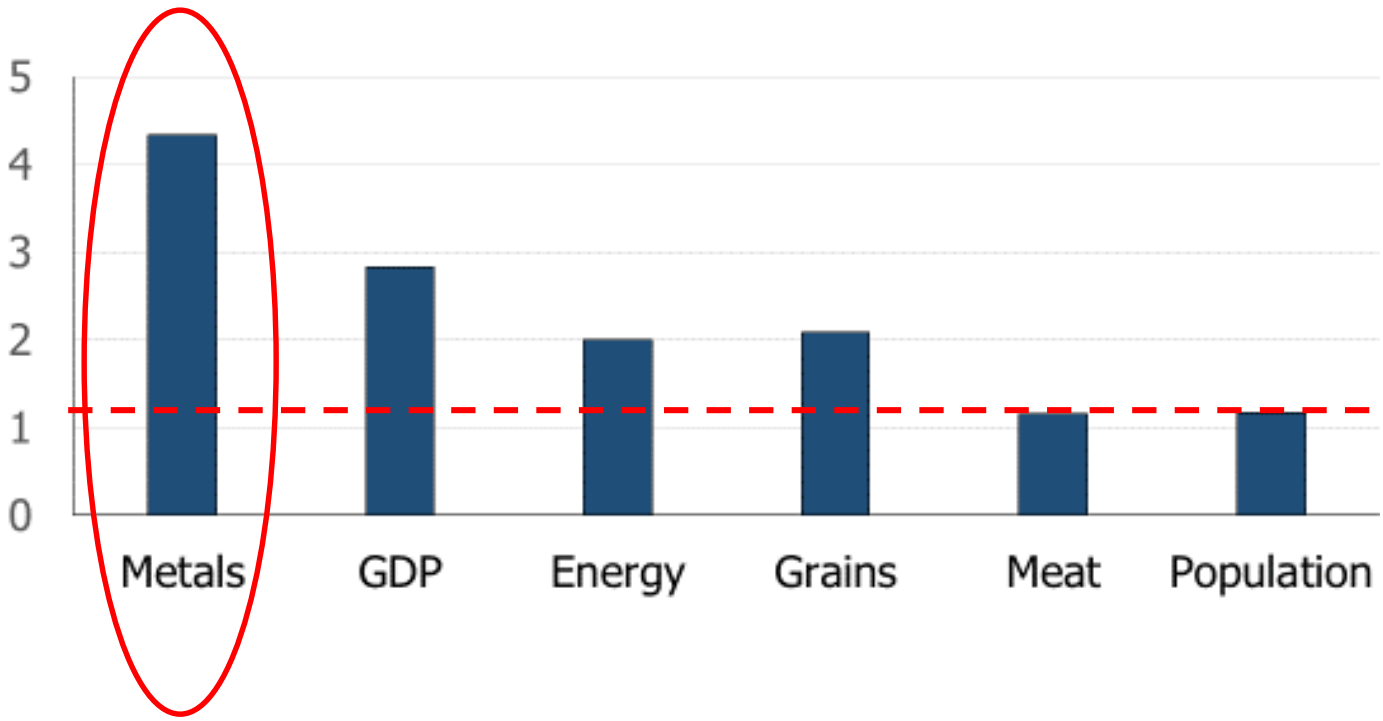
* Crude steel is the first solid steel product upon solidification of molten steel. Two-thirds of crude steel production is from iron ore.

**Industrial roundwood is that part of the annual timber harvest which is used in producing goods such as building materials, furnishings, paper, and other wood products.

Source: Data for wood from FAO (2020); for cement from Morgan (1986) and from PR Newswire (2020); for aluminum from the Institute of Geological Science (1966) and from the British Geological Society (2020); for steel from the International Iron and Steel Institute (1978) and from the World Steel Association (2019); and for plastics from Plastics Europe (2016) and the Association of Plastics Manufacturers in Europe (2019).

Global Commodity Average Annual Demand Growth (Percent) 1997-2017

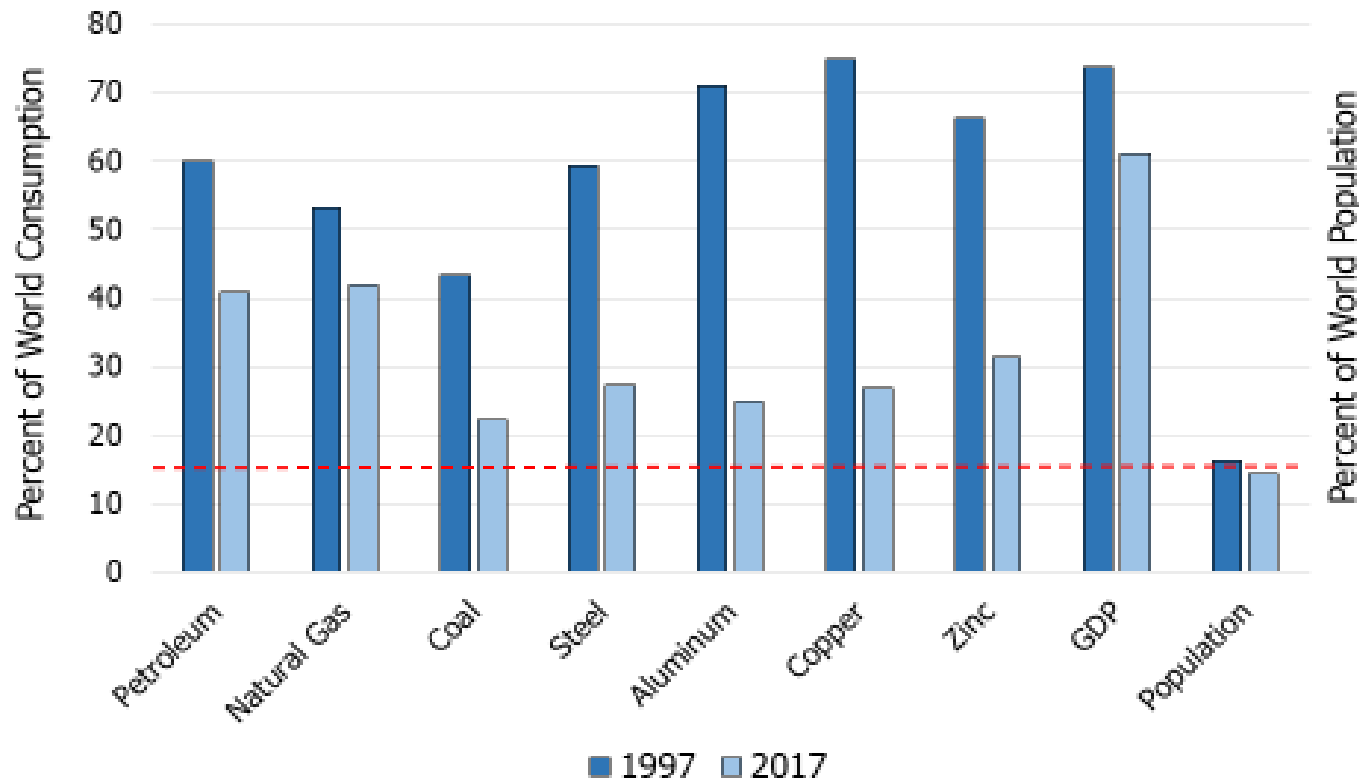
(Red dashed line is average annual population growth over that period)



Source: World Bank (2018). Meat data from OECD/FAO (2018).

Advanced Economies Share of World Consumption of Basic Energy and Mineral Resources, 1997 and 2017

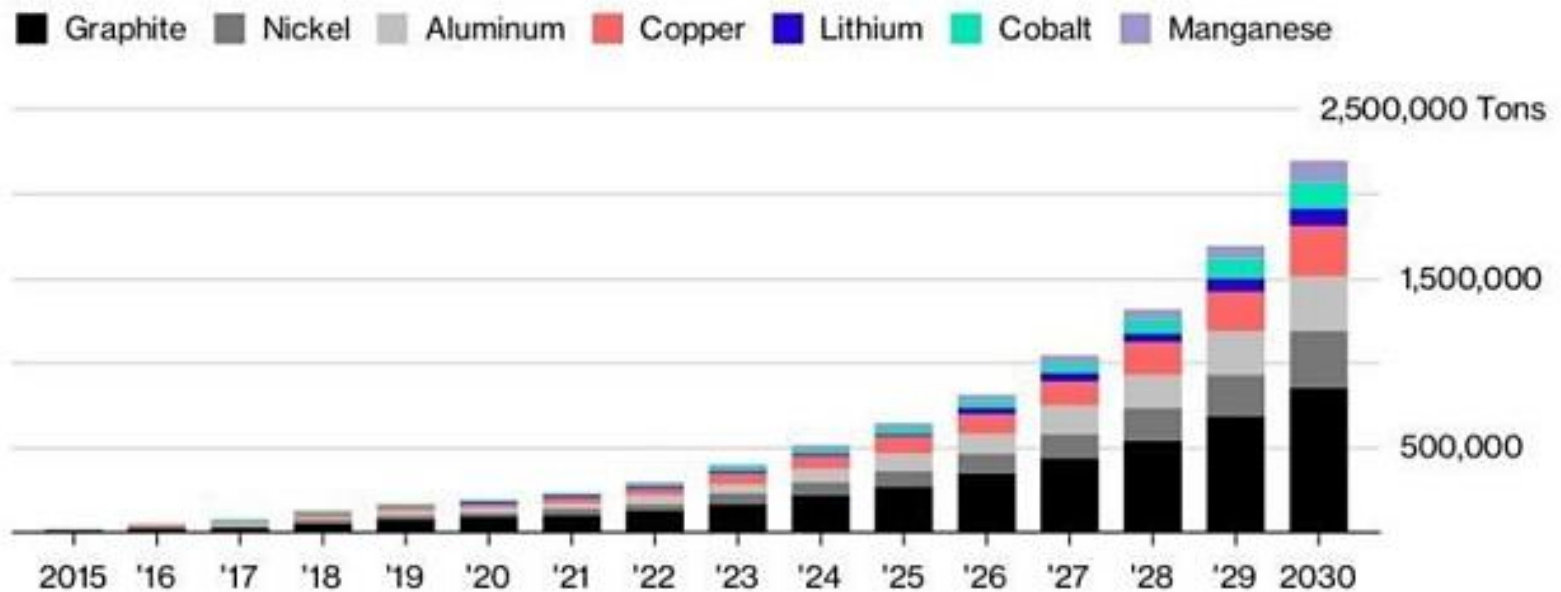
(Red dashed line is percent of world population accounted for by developed countries)



Source: World Bank (2018). Data for steel from International Iron and Steel Institute (2002 and 2019) for years 1997 and 2017.

Growth in electric vehicle demand will drive sharp increases in consumption of a number of critical metals

Cobalt to lithium demand is forecast to soar as electric vehicle markets expand



Source: Bloomberg New Energy Finance (2019)

As this situation unfolds, the developed nations are focusing on areas where economically and technically available resources are concentrated. Evaluation has determined that:

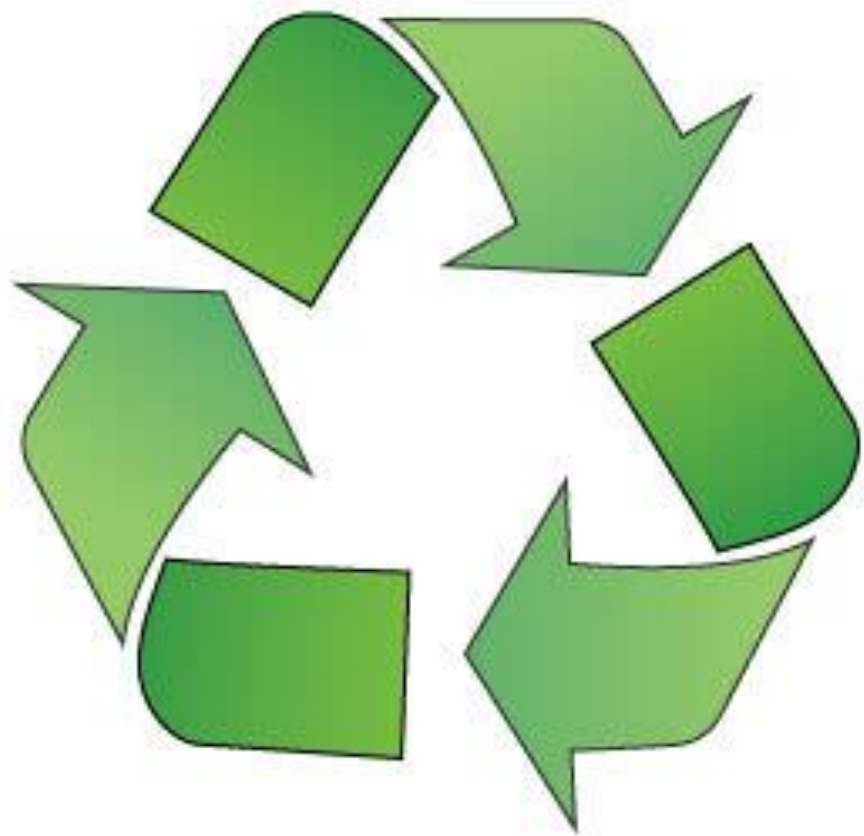
- **A large portion of available mineral deposits are located in the developing countries.**
- **Well over half of global exploration for minerals is occurring in the developing countries.**
- **Developing countries have accounted for almost all increases in global mineral production in recent years.**
- **Consumption of minerals is rising rapidly within developing countries.**



**A recent assessment concluded that,
as a consequence of these trends**

**“the developed countries of the world,
traditionally the dominant consumers of
minerals, as well as major producers,
are finding themselves progressively
marginalized.”**

EU Polinares Project (2012)





UNEP recently (2011) examined global recycling rates for 60 critical metals and metalloids.

Of the 60, recycling rates for over two-thirds were less than 50%, and for over one-half, less than 1%.



Technology

Changing Course



Sustainability

*If we want things to stay as they are,
things will have to change.*

Giuseppe Tomasi Di Lamperdusa
The Leopard

What to Do?

As the world's largest per capita consumers we have a responsibility to take the lead in solving this problem.

We need to

- **moderate our consumption,**
- **take more responsibility for the impacts of our consumption,**
- **move toward a closed-loop society,**
- **develop low-impact substitutes for critical materials,**
- **develop new, renewable resources,**
- **or a combination of these things.**

What to Do?

- **Develop greater awareness of the local and global impacts of our consumption.**
- **Think about issues of global equity and consider how we might view the situation were the shoe on the other foot.**
- **Think carefully about what characteristics or actions should define an environmentally-concerned citizen, political leader, or environmental organization, and withhold support from those seeking to maintain the current state of affairs.**

What to Do?

- **Consider the risks of maintaining the present course and assuming that world markets and economic systems will take care of whatever social and resource allocation issues arise.**
- **Examine resource supply concerns and related environmental issues, and seek to lower barriers to domestic raw material procurement.**



Questions?

Turkmenistan Central Salt Basin