The Resource Revolution:

Meeting the needs of the next 3 billion middle class consumers

McKinsey Global Institute
Sustainability and Resource Productivity Practice

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McKinsey&Company

Summary

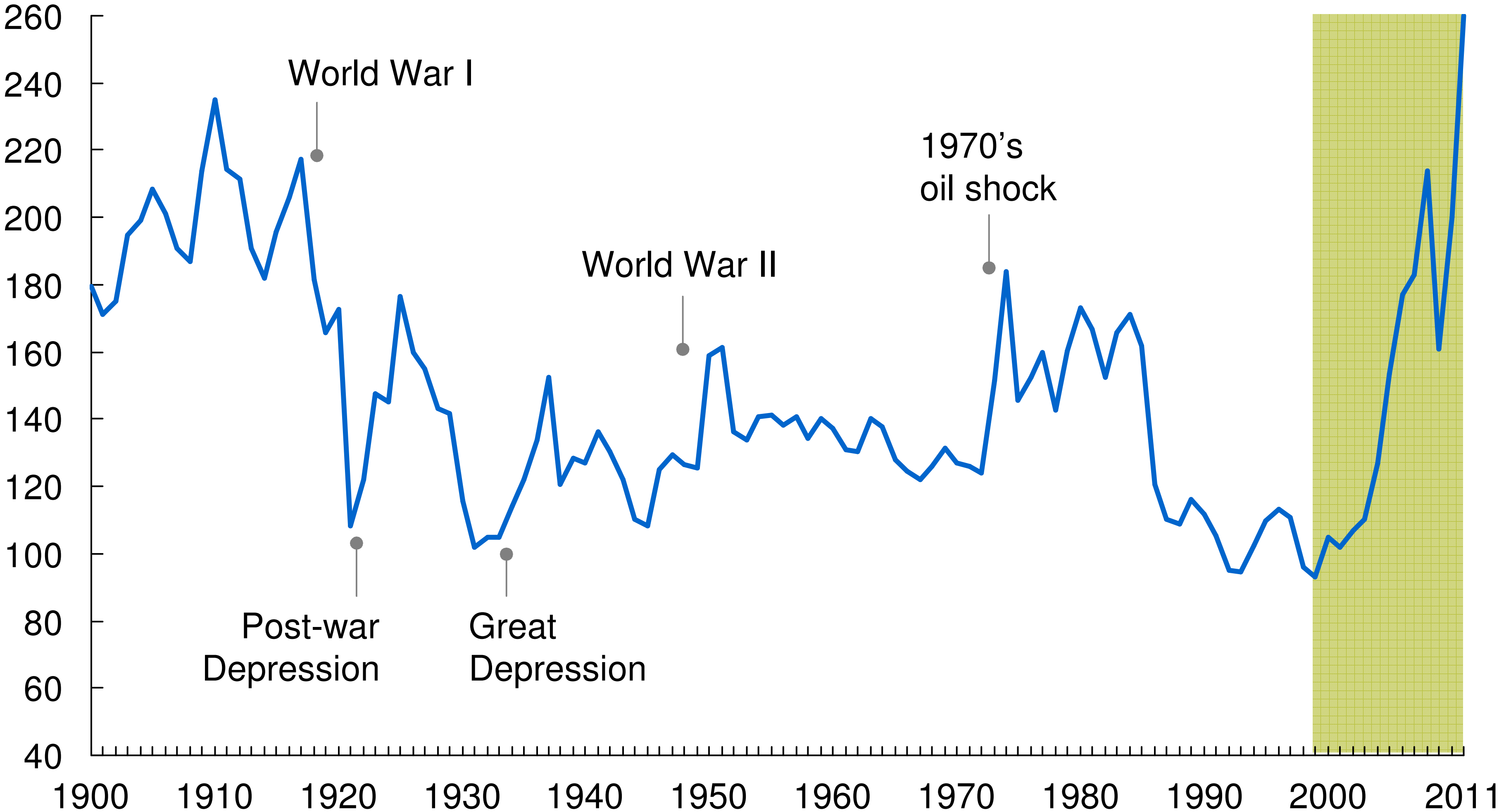
- The next twenty years will see an **35%** increase in resource demand, driven by **3 billion** new middle-class consumers

- A resource revolution is needed with **3 main components**
  1. Aggressively going after currently available productivity opportunities
  2. Enhancing access to resource supply
  3. Accelerating the next frontier of resource innovation

- There are **7 priority areas** for action to realize this resource revolution
  – 4 areas relate to "classic" market failures – e.g., lack of property rights, pricing of externalities, capital market failures, dealing with the public good nature of innovation
  – The other 3 areas go beyond standard market failures, and include the need for new, integrated institutional approaches to resource governance, building awareness of resource-related risks, and shaping mindsets and consumer behaviour

Since the turn of the century, commodity prices have significantly increased, offsetting all of the falls seen since 1900

MGI Commodity Index (years 1999–2001 = 100)[1]

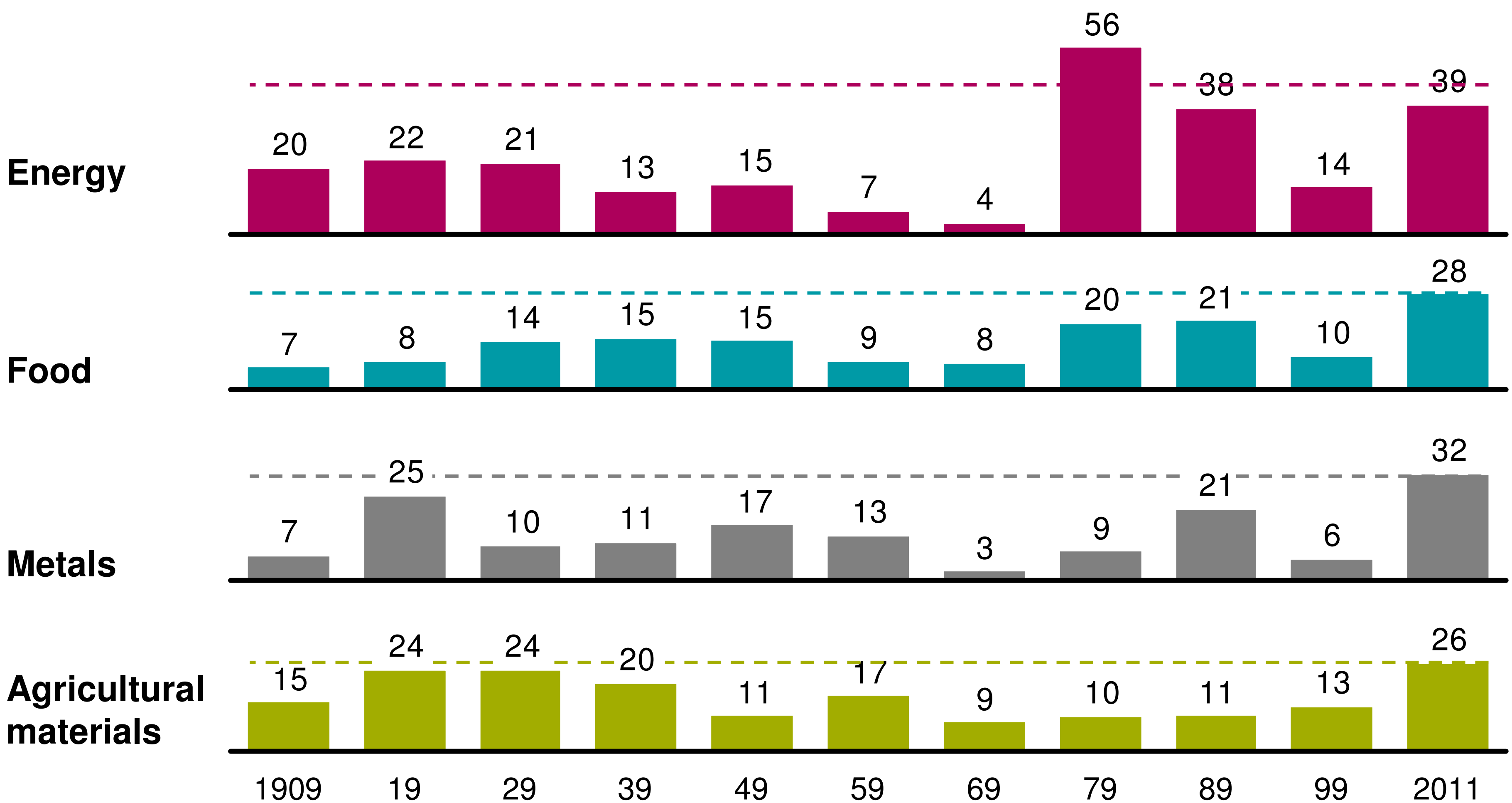


1 Based on arithmetic average of 4 commodity sub-indices of food, agricultural raw materials, metals and energy

Source: Grilli and Yang, 1988; Pfaffenzeller et al, 2007; World Bank Commodity Price Data; IMF primary commodity prices; OECD statistics; FAOStat; UN Comtrade; MGI Analysis

Resource price volatility is at an all time high, with the exception of energy in the 1970s

Annual price volatility[1]
%



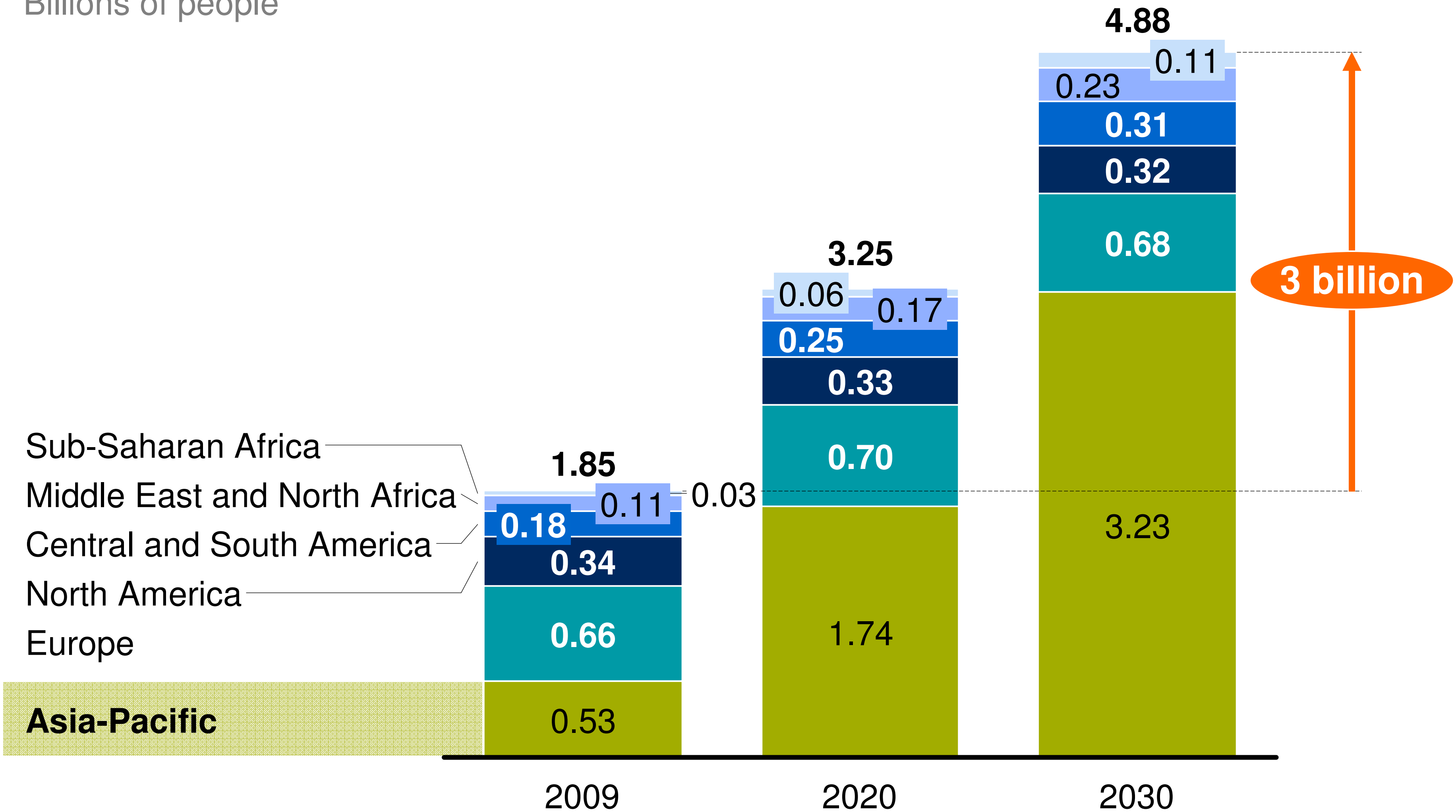
1 Calculated as the standard deviation of the commodity subindex divided by the average of the subindex over the time frame.

SOURCE: Grilli and Yang; Pfaffenzeller; World Bank; International Monetary Fund; Organisation for Economic Co-operation and Development statistics; UN Food and Agriculture Organization; UN Comtrade; McKinsey analysis

The emergence of 3 billion middle-class consumers will drive future demand

Global middle class[1]

Billions of people



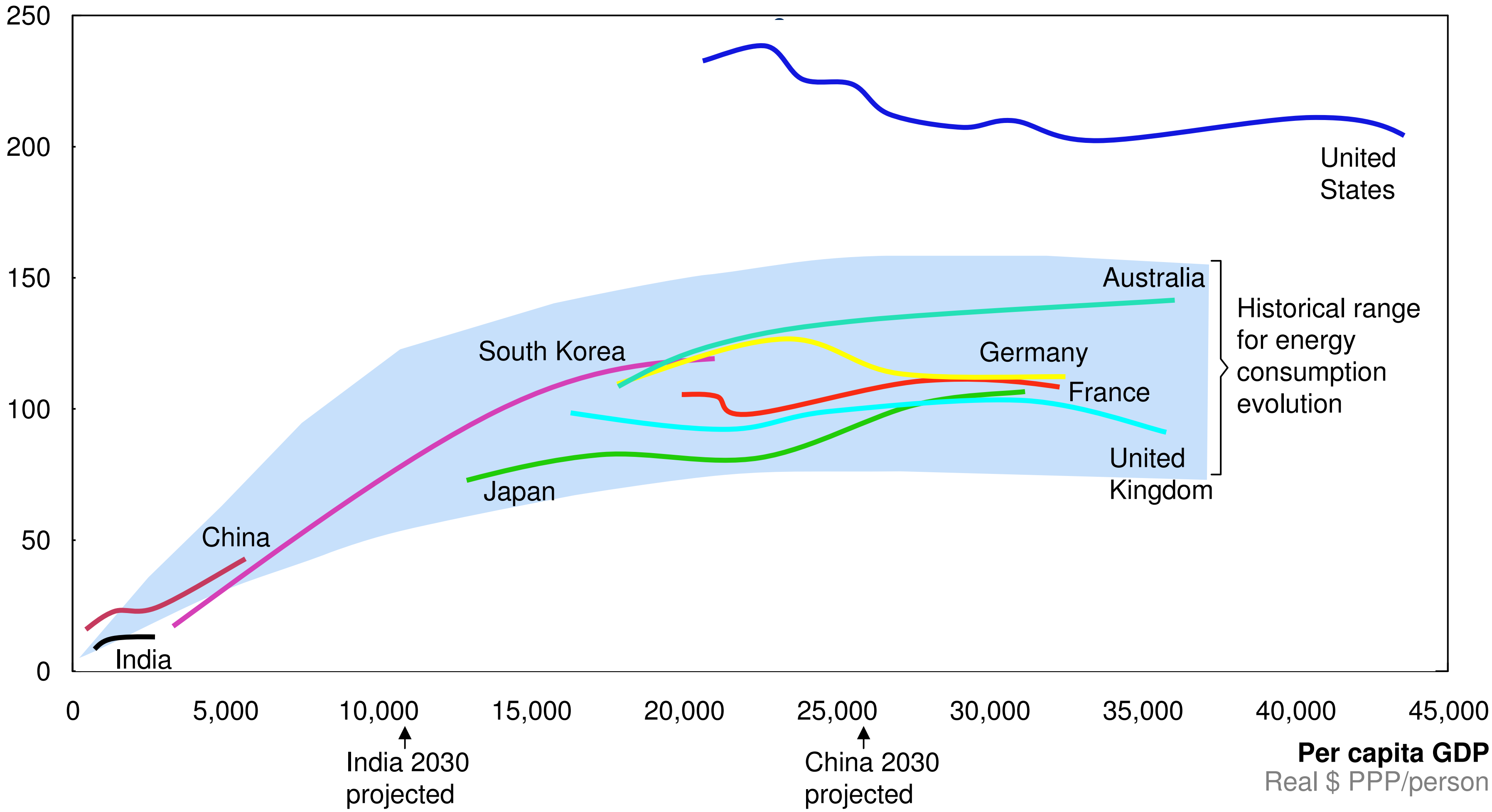
1 Global middle class defined as daily expenditures between $10 and $100 per person in purchasing parity terms.

SOURCE: Organisation for Economic Co-operation and Development (OECD) Development Centre

Many countries have shown that as incomes rise, demand for resource increases—and a similar curve is likely in China and India

Per capita energy consumption
Million British thermal units/person, 1970–2008

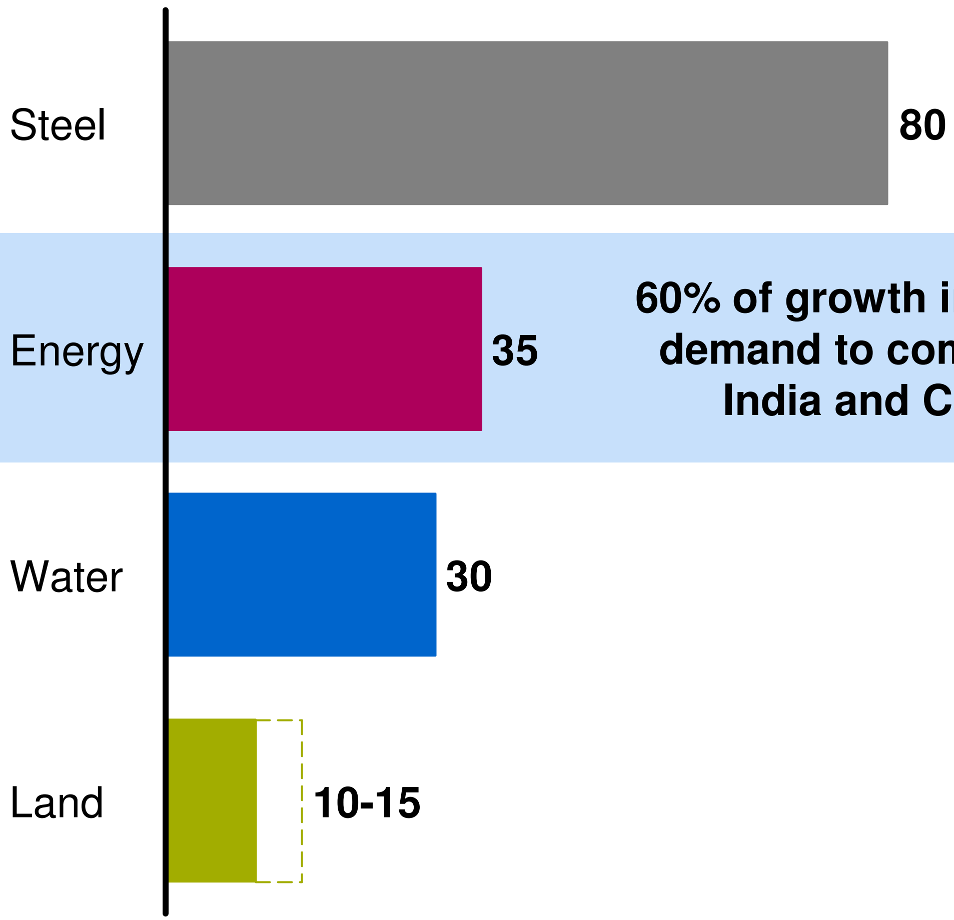
ENERGY EXAMPLE



SOURCE: International Energy Agency; Global Insight; McKinsey analysis

Demand is projected to grow by 10 to 80 percent across resources

Demand increase, 2010-30
%

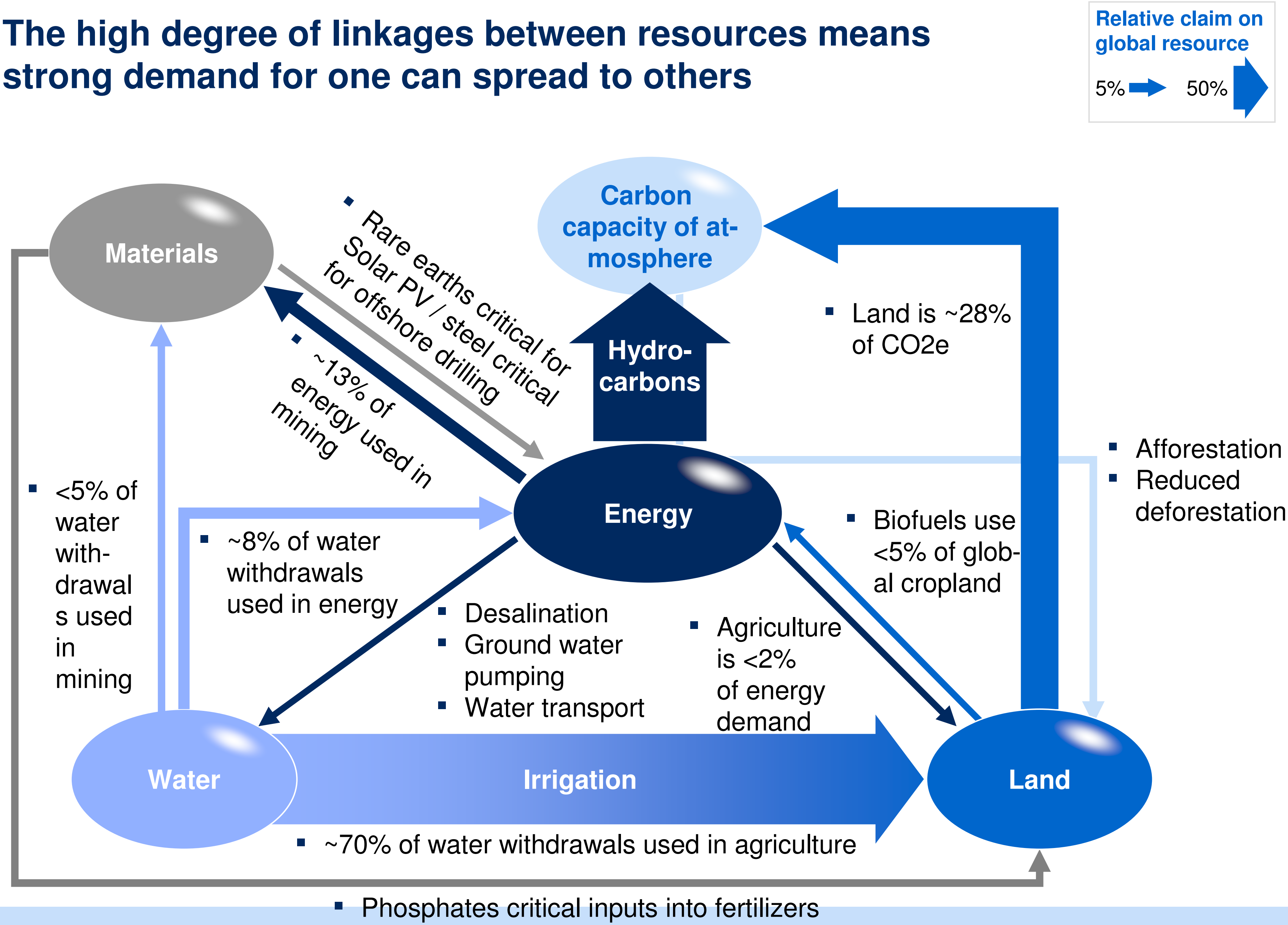


60% of growth in energy demand to come from India and China

2030 projected demand

Resource	2030 projected demand
Steel	2,290 million metric tons of iron ore
Energy	664 QBTU
Water	5.9 trillion cubic meters
Land	1.715-1.755 billion hectares of cropland

The high degree of linkages between resources means strong demand for one can spread to others



Source: McKinsey analysis

These resource trends pose several risks to global growth and welfare

IMF estimates that a **10 percent** increase in the price of crude reduces global GDP by 0.2%-0.3% in one year

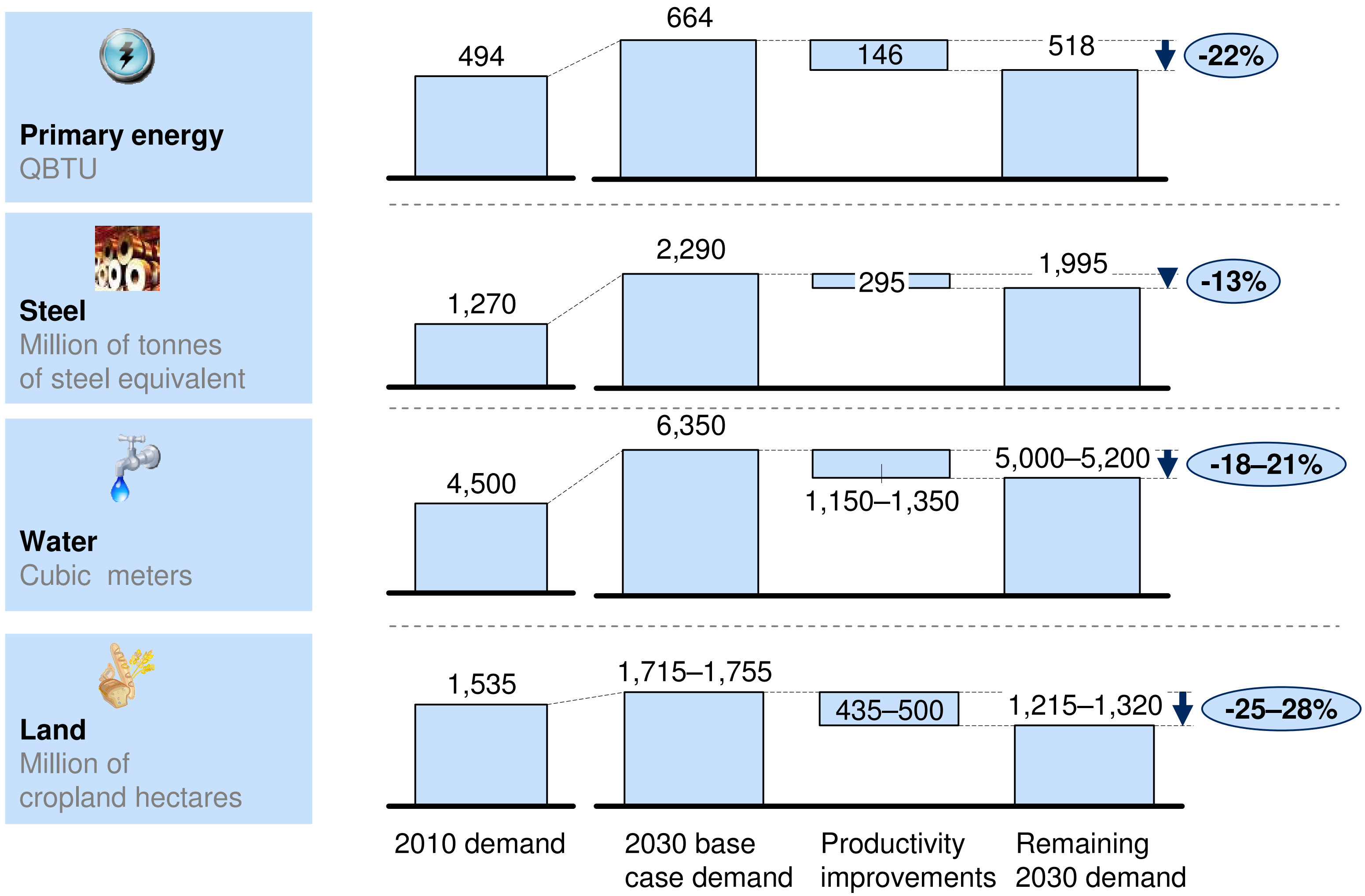
World Bank estimates that recent food price increases drove **44 million people** into poverty

The world is currently subsidizing its resources by at least $0.9 to **$1.3 trillion**. At least 8 countries commit 5% or more of their GDP to energy subsidies

Just four countries—Iran, Iraq, Saudi Arabia, and Venezuela—hold almost **50 percent** of known oil reserves

The Stern Review forecasts climate change scenarios which could result in economic losses equivalent to a **20 percent** reduction in current per capita consumption

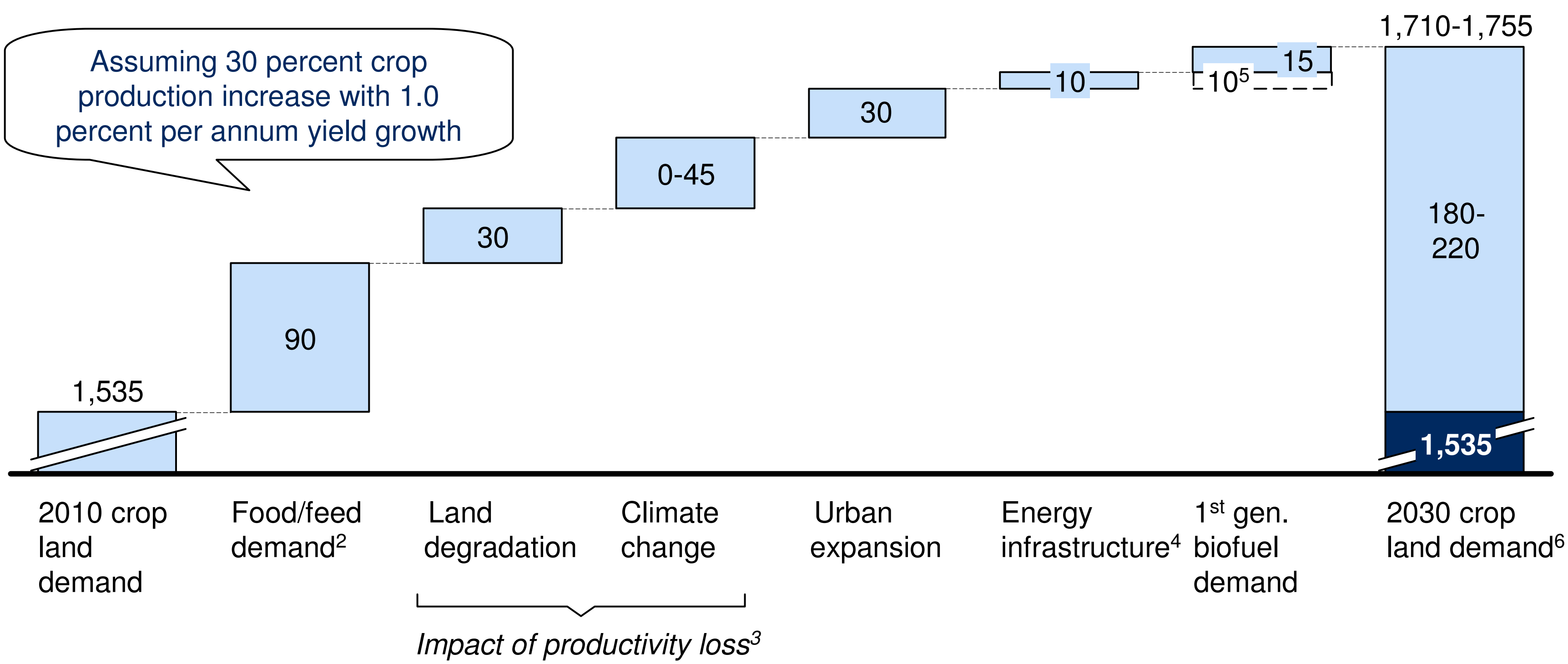
There are productivity opportunities that could meet 13 to 28 percent of resources demand



SOURCE: McKinsey analysis

However, failing to capture these opportunities could result in a large increase in demand for resources - 175 million to 220 million hectares of additional cropland in the case of agriculture

Business as usual cropland demand[1] by 2030
Million hectares

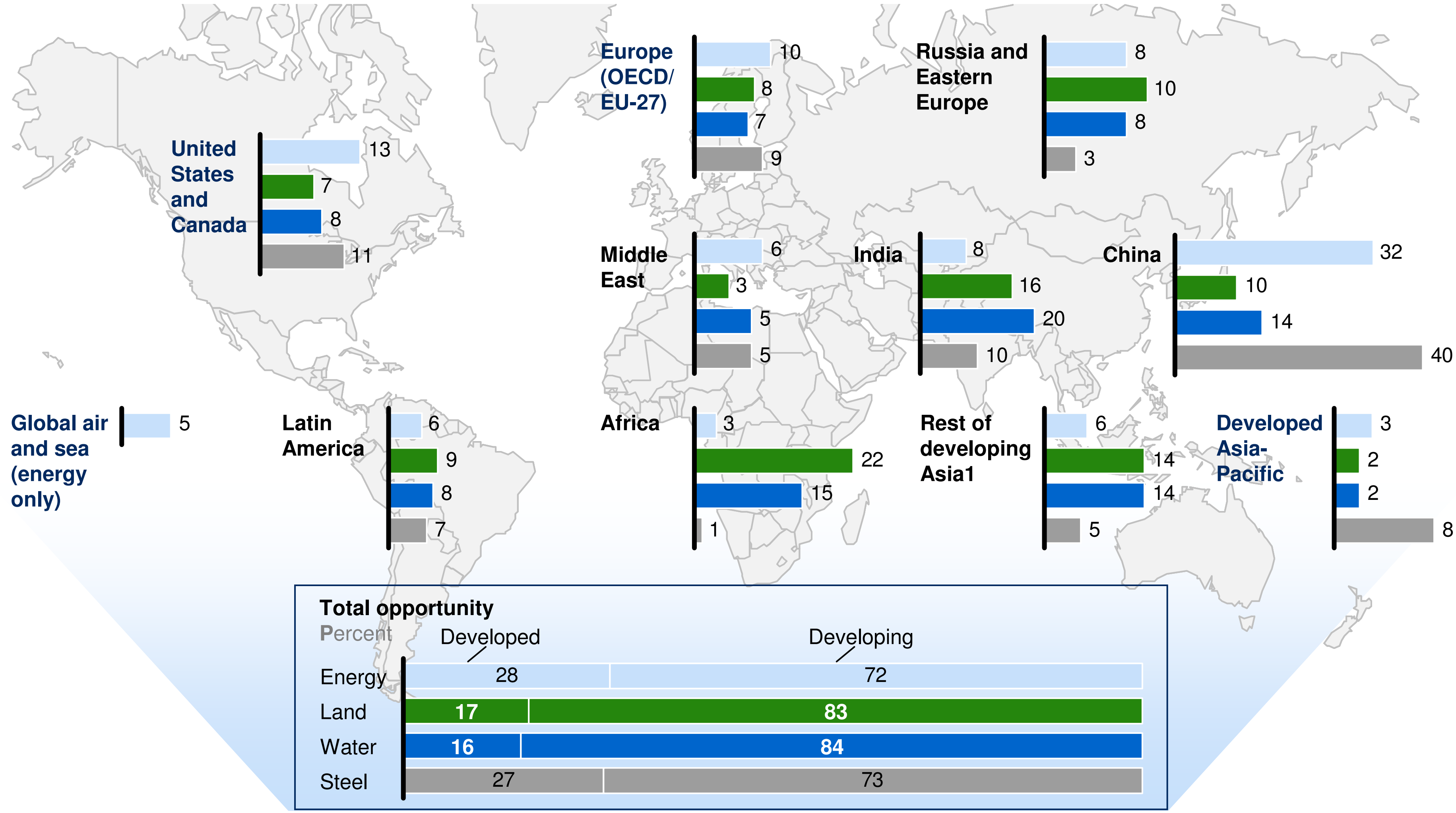


1 Defined as "arable land and permanent crops" by the UN Food and Agriculture Organization.
2 As 30–80 percent of biomass input for biofuel production is fed back to livestock feed, the cropland required to produce feed crops would be reduced by about 10 million hectares.

SOURCE: International Institute for Applied Systems Analysis; UN Food and Agriculture Organization; International Food Policy Research Institute; Intergovernmental Panel on Climate Change; Global Land Degradation Assessment; World Bank; McKinsey Agriculture Initiative; McKinsey analysis

Developing countries account for 70 to 85 percent of the productivity opportunities

% of total productivity opportunity by resource and region



1 Rest of developing Asia includes Central Asia (e.g., Uzbekistan), South Asia (e.g., Bangladesh), Southeast Asia (e.g., Laos), and North Korea.
2 Includes water savings from water-specific levers as well as water savings from improved agricultural productivity.
3 For steel, the chart represents all the demand-side levers and the scrap recycling lever, but excludes supply- and conversion-side levers.

SOURCE: McKinsey analysis

15 key groups of opportunities represent over 70% of the resource savings

2030 potential savings

Water | Land | Steel | Energy

	Total resource benefit[1] by opportunity area 2010 USD billion	Average cost efficiency[2]	"Metrics that matter" for monitoring progress
Building energy efficiency	691	0.5	Weather adjusted building efficiency, *kWH/m2/degree day*
Commercial farm yields	236	0.5	Commercial farm yield relative to agro-ecological potential, *%*
Food waste	221	0.6	Food waste in value chain (e.g., post harvest), *%*
Urban densification	171	0.5	Public transport use, *% of commuters metro/bus*
Reducing leakage	166	0.2	Municipal water leakage, *%*
Transport efficiency	154	0.6	Fuel efficiency, *litres/kilometre*
Alternative drive trains	152	1.7	Penetration of key alternative drive trains, *%*
High strength steel adoption	132	0.4	High strength steel penetration, *%*
Smallholder farm yields	127	0.4	Smallholder farm yield relative to agro-ecological potential, *%*
Improved energy extraction	120	0.5	Recovery rate of a given reserve, *%*
Iron and steel energy efficiency	117	0.2	Energy efficiency of steel production, QBTU/tonne
Reducing land degradation	98	0.6	Net rate of land degradation, *hectares per year*
Petroleum and gas energy efficiency	87	0.6	Energy efficiency of P&G production, QBTU/tonne
Improved power conversion	83	0.4	Conversion efficiency of coal and gas fired power plants, *%*
Improved irrigation techniques	68	0.3	Adoption of micro-irrigation technologies, *%*
Other	902	0.7	

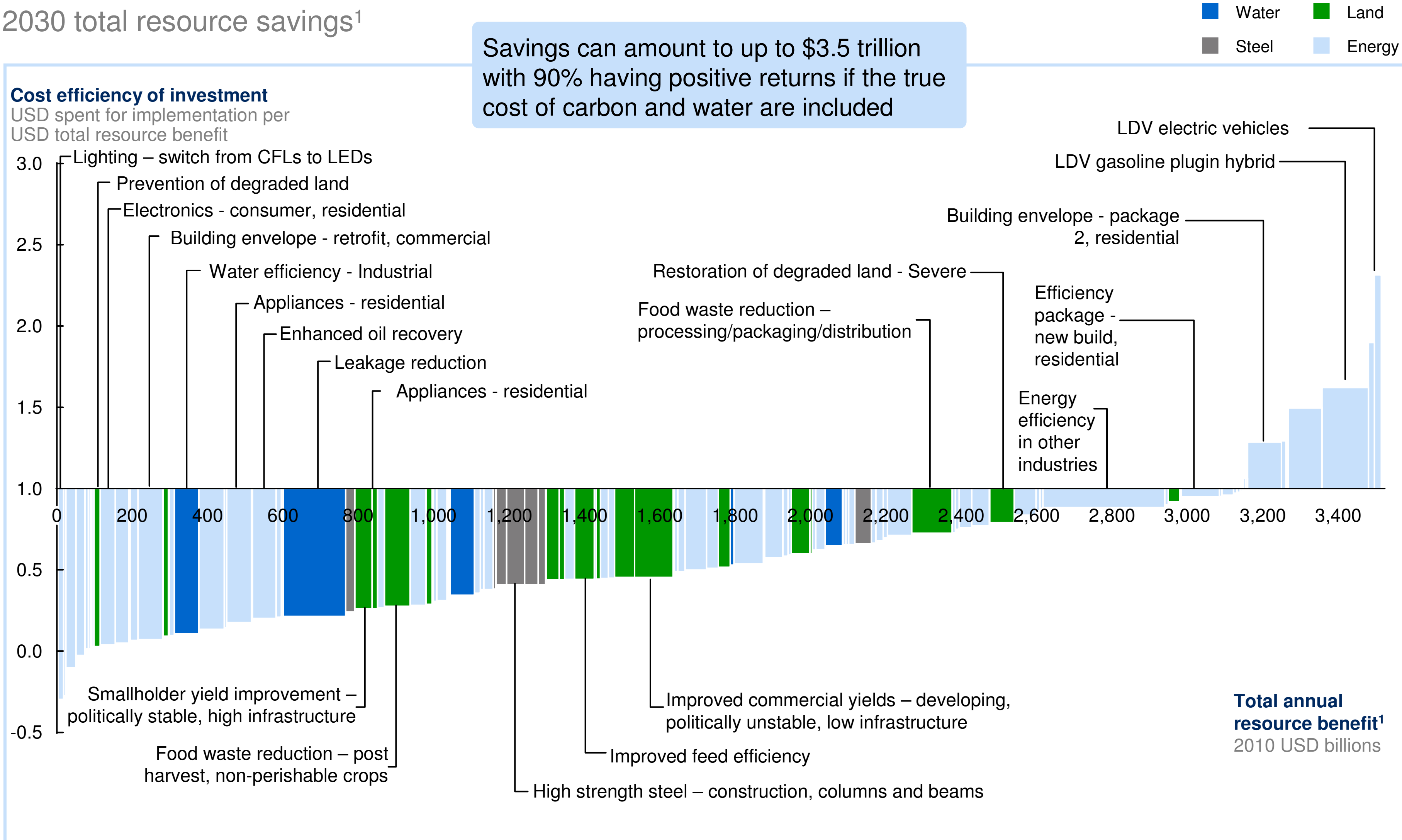
1 Based on current prices for energy, steel, and food plus unsubsidized water prices and a shadow cost for carbon
2 Annualised cost of implementation divided by annual total resource benefit
3 Includes feed efficiency, industrial water, air transport, municipal water, steel recycling, waste water reuse, and other industrial energy efficiency

SOURCE: McKinsey Global Institute analysis

These opportunities can be laid out in a integrated resource cost curve

2030 total resource savings[1]

Savings can amount to up to $3.5 trillion with 90% having positive returns if the true cost of carbon and water are included



1 Based on current prices for energy, steel, and food plus unsubsidized water prices and a shadow cost for carbon at a discount rate of 4% per annum

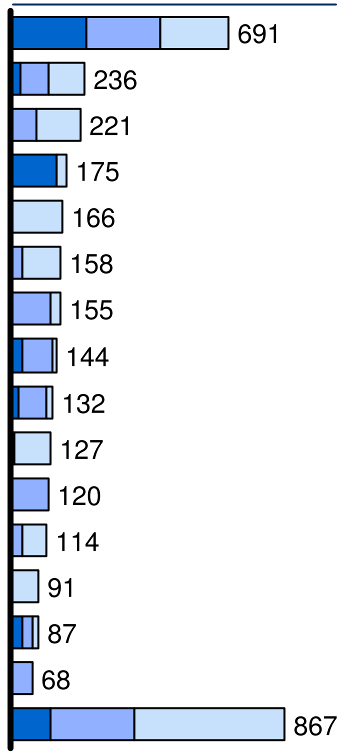
Achieving the main productivity opportunities will require overcoming a multitude of barriers

2030 potential savings by feasibility

Overall feasibility of implementation

- Readily achievable
- Some challenges
- Difficult

Total resource benefit[1] by opportunity area
2010 $ billion



Key barriers

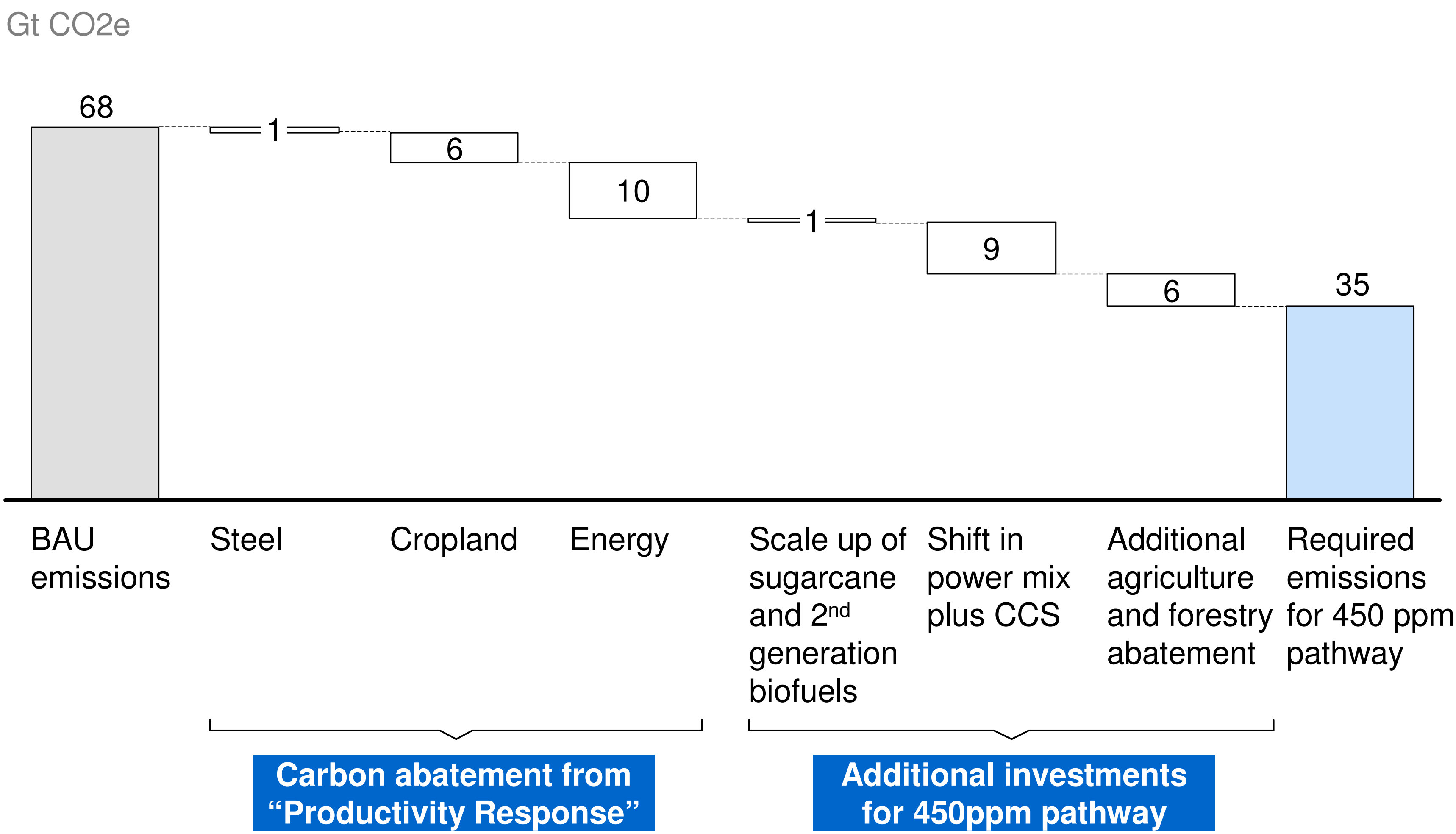
Opportunity area	Total resource benefit (2010 $ billion)	Capital intensity	Return on investment	Agency issues	Political feasibility	Information failures	Supply chain bottlenecks	Capital availability	Regulatory issues/ property rights	Technological readiness	Entrenched behaviors
Building energy efficiency	691	X		X		X					
Commercial farm yields	236	X				X		X	X		
Food waste	221	X					X	X			X
Urban densification	175	X				X					X
Reducing leakage	166	X		X		X					
Transport efficiency	158	X	X		X						
Alternative drive trains	155	X	X		X					X	
Iron and steel energy efficiency	144					X	X				X
High strength steel adoption	132					X					X
Smallholder farm yields	127					X	X	X	X		X
Improved energy extraction	120	X	X		X				X		
Reducing land degradation	114					X		X	X		X
Improved power conversion	91	X	X						X		
Petroleum and gas energy efficiency	87			X	X	X					X
Improved irrigation techniques	68	X				X					X
Other[2]	867										

1 Based on current prices for energy, steel, and food plus unsubsidized water prices and a shadow cost for carbon.
2 Includes feed efficiency, industrial water, air transport, municipal water, steel recycling, waste water reuse, and other industrial energy efficiency.

SOURCE: McKinsey analysis

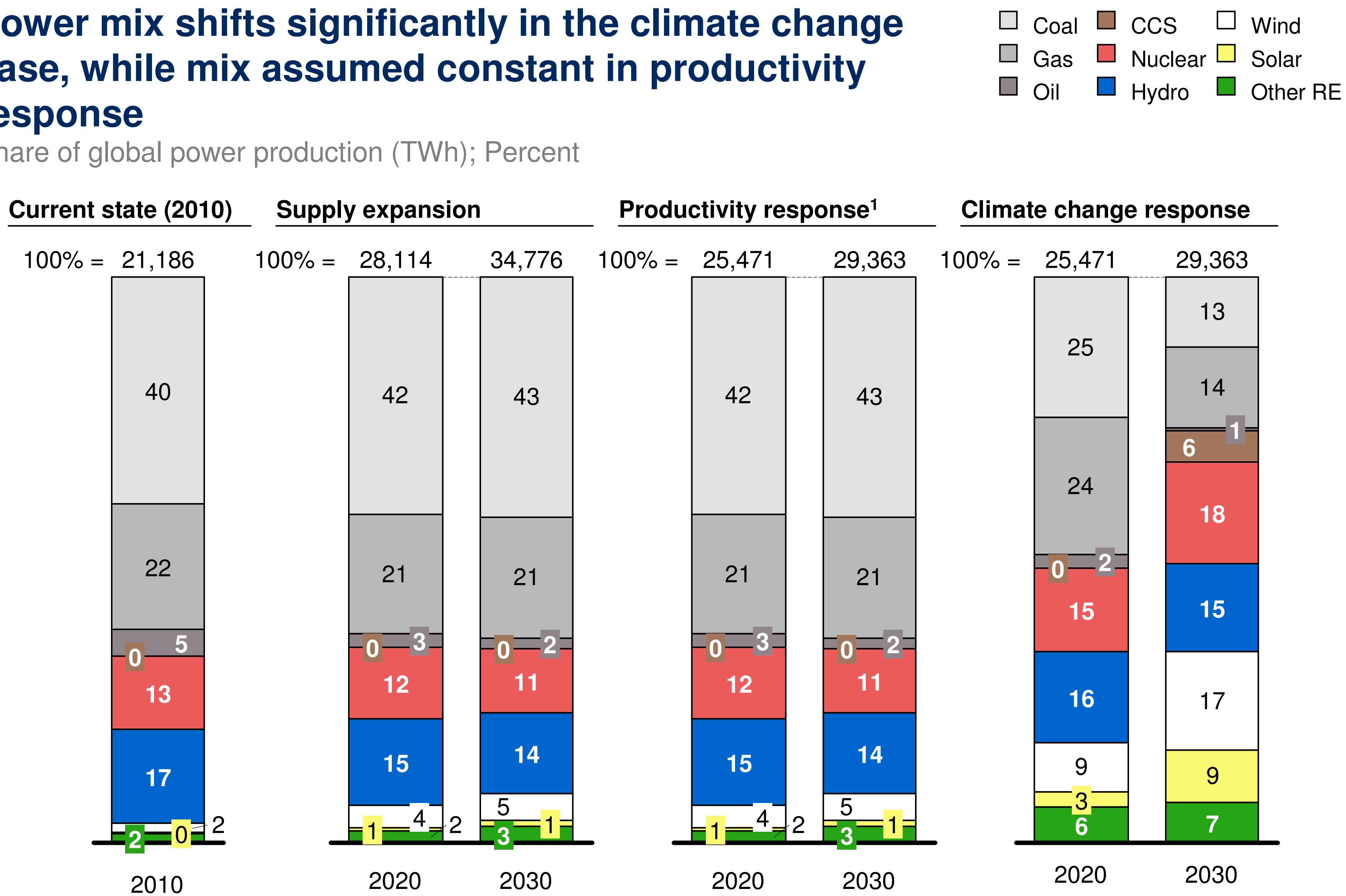
A shift in energy mix and pursuing additional land carbon abatement can be used to close the remaining gap to a 450ppm pathway

Carbon emissions footprint, 2030



Power mix shifts significantly in the climate change case, while mix assumed constant in productivity response

Share of global power production (TWh); Percent

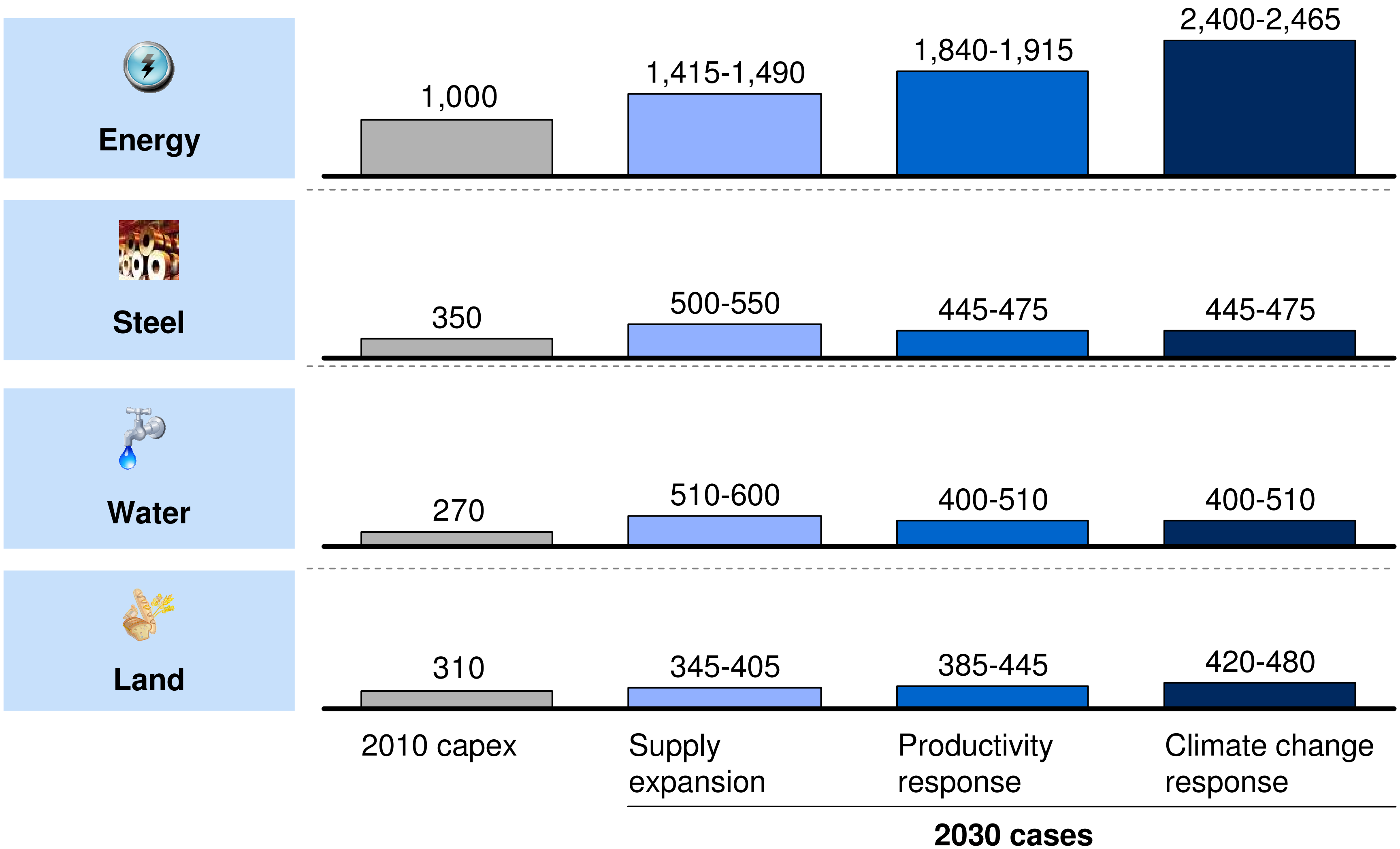


1 Production mix is based on total electricity demand and scaled in proportion to the BAU production mix

SOURCE: McKinsey analysis (carbon cost curve v3.0)

Capital investment will increase significantly under all three cases

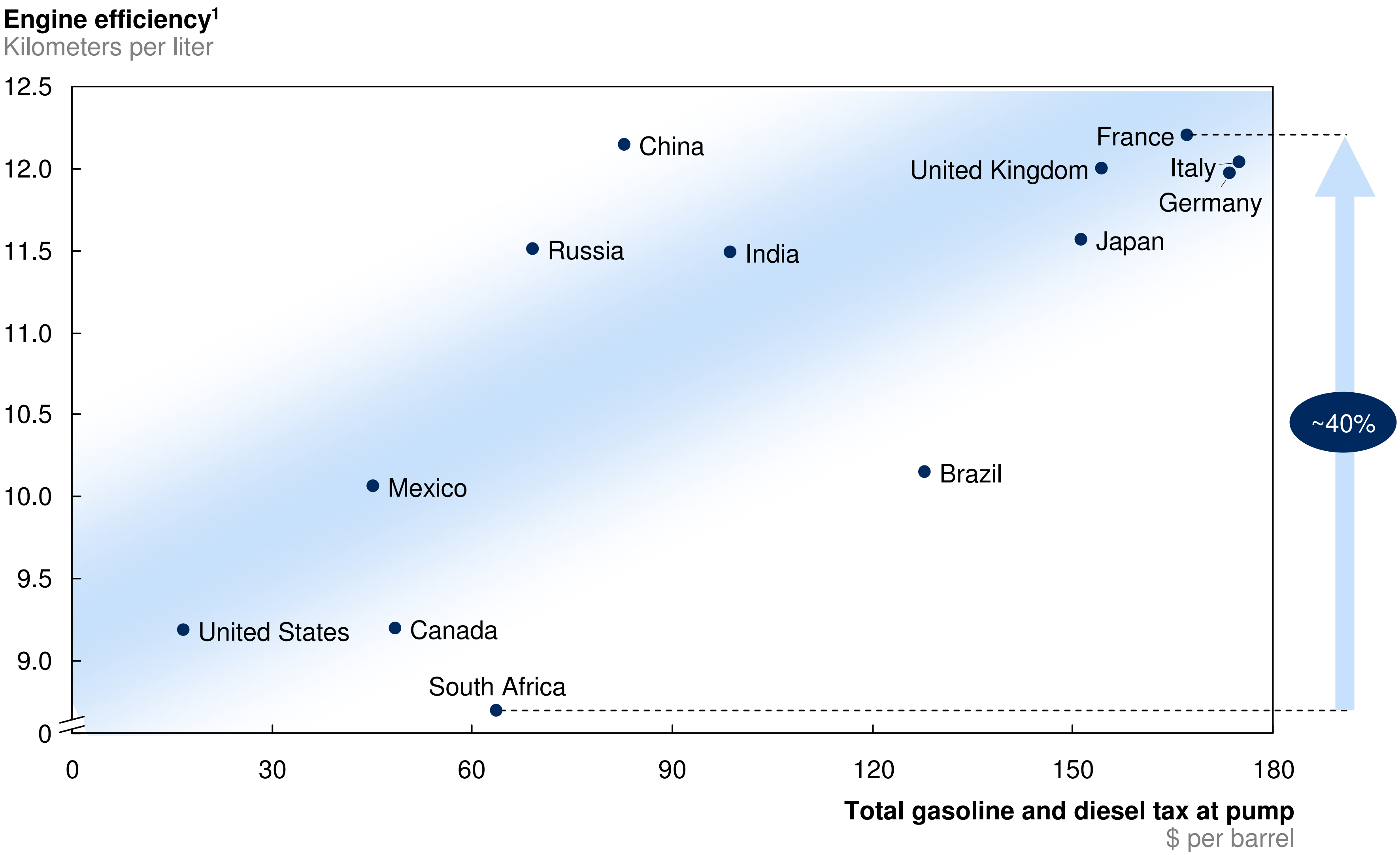
Average annual capital expenditure requirements[1]; USD billions; 2010-2030; 2010 dollars



1 Does not include capex for BAU productivity improvements; includes impact of Capex flareups due to supply constraints

SOURCE: McKinsey Global Institute analysis

Price signals drive productivity: The 40 percent variation in engine efficiency across many G-20 countries relates closely to the cost of fuel



1 Light-duty vehicles only.

SOURCE: McKinsey analysis

There are 7 priority actions to capture this resource revolution

Address classic "market failures"	Ensure competitive investor returns	Address property rights and agency issues	Support access to capital	Accelerate and deepen innovation systems
Address "critical enablers"	Build awareness of risks			
	Create efficient and integrated institutional approaches			
	Develop skills and address mindsets			

There is a need to tackle these issues in a holistic way: Agriculture example

- Large barrier
- Medium barrier
- Small barrier

	Over 70% of agriculture productivity opportunities have an IRR>10%	Lack of clear property rights make it difficult to invest in equipment and expand farm size	Annual investment in agriculture may need to increase by 50% and over 80% of opportunities are in developing countries	Public R&D to agriculture has fallen and is lower than in other sectors (e.g., automotive)
Address classic "market failures"	Ensure competitive investor returns	Address property rights and agency issues	Support access to capital	Accelerate and deepen innovation systems

Address "critical enablers"

- Build awareness of risks — Lack of early warning systems on food availability, including linkages with other resources
- Create efficient and integrated institutional approaches — Limited mechanisms to share best practice across countries; lack of core capabilities in many agriculture ministries
- Develop skills and address mindsets — Large behavioral change needed to support new technologies (e.g., post-harvest waste)