Sustainable Energy for All

Global Tracking Framework 2015

WORKSHOP ON

Capacity Development for Mainstreaming Energy Sustainable Development Goals (SDGs), Targets and Indicators into Statistical Programmes in Selected Latin American Countries

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Panama City, Panama

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Sustainable Energy for All (SE4ALL)

SE4ALL is a multi-stakeholder partnership between governments, private sector, and civil society, co-chaired by UN Secretary General and WB President.

By **2030**, SE4ALL aims to:

1. Achieve universal access to modern energy services
2. Double the rate of improvement in energy efficiency
3. Double the share of renewable energy in the global energy mix

How can progress towards these objectives be tracked?

GTF: A growing Partnership

2013

15 partners

2015

23 partners

ESMAP

International Energy Agency

IIASA

ipeec International Partnership for Energy Efficiency Cooperation

PRACTICAL ACTION

IRENA International Renewable Energy Agency

REN21 Renewable Energy Policy Network for the 21st Century

UNDP

UNEP

UNIDO

UN-Energy

UNITED NATIONS FOUNDATION

WORLD ENERGY COUNCIL CONSEIL MONDIAL DE L'ENERGIE

World Health Organization

GLOBAL ALLIANCE FOR CLEAN COOKSTOVES

SIWI

United Nations Statistics Division

UNDESA

UN WOMEN

FAO FIAT PANIS

Global Water Partnership

UNEP RISØ CENTRE

ENERGIA INTERNATIONAL NETWORK ON GENDER AND SUSTAINABLE ENERGY

The launch of the first Global Tracking Framework 2013 was widely covered in the global press

Why 1.2 billion people still don't have access to electricity
(Washington Post Blog)

Energy access
(The Economist Blog)

Five surprising facts about energy poverty
(National Geographic)

Step-up energy investments by >$600bn pa
(The Economic Times of India)

Global Tracking Framework puts numbers to Sustainable Energy Goals
(All Africa)

About 1.2 billion people lack access to electricity
(Ghana Business News)

Bangladesh third most power starved country
(Bangladesh News 24)

Why wait for our grandchildren?
(Gulf News)

Energy gains burned by burgeoning population
(Al Jazeera)

Global energy poverty highlighted by report
(The Environmental Blog)

Energy transformation falling short
(Renew Economy)

Taking the long view on renewables growth
(Power Engineering International)

Vienna Energy Forum sees launch of SE4ALL tracking framework *(IISD)*

Governments face uphill struggle to hit UN energy goals
(RTCC)

High impact countries will have to double share of renewables *(Greenwise)*

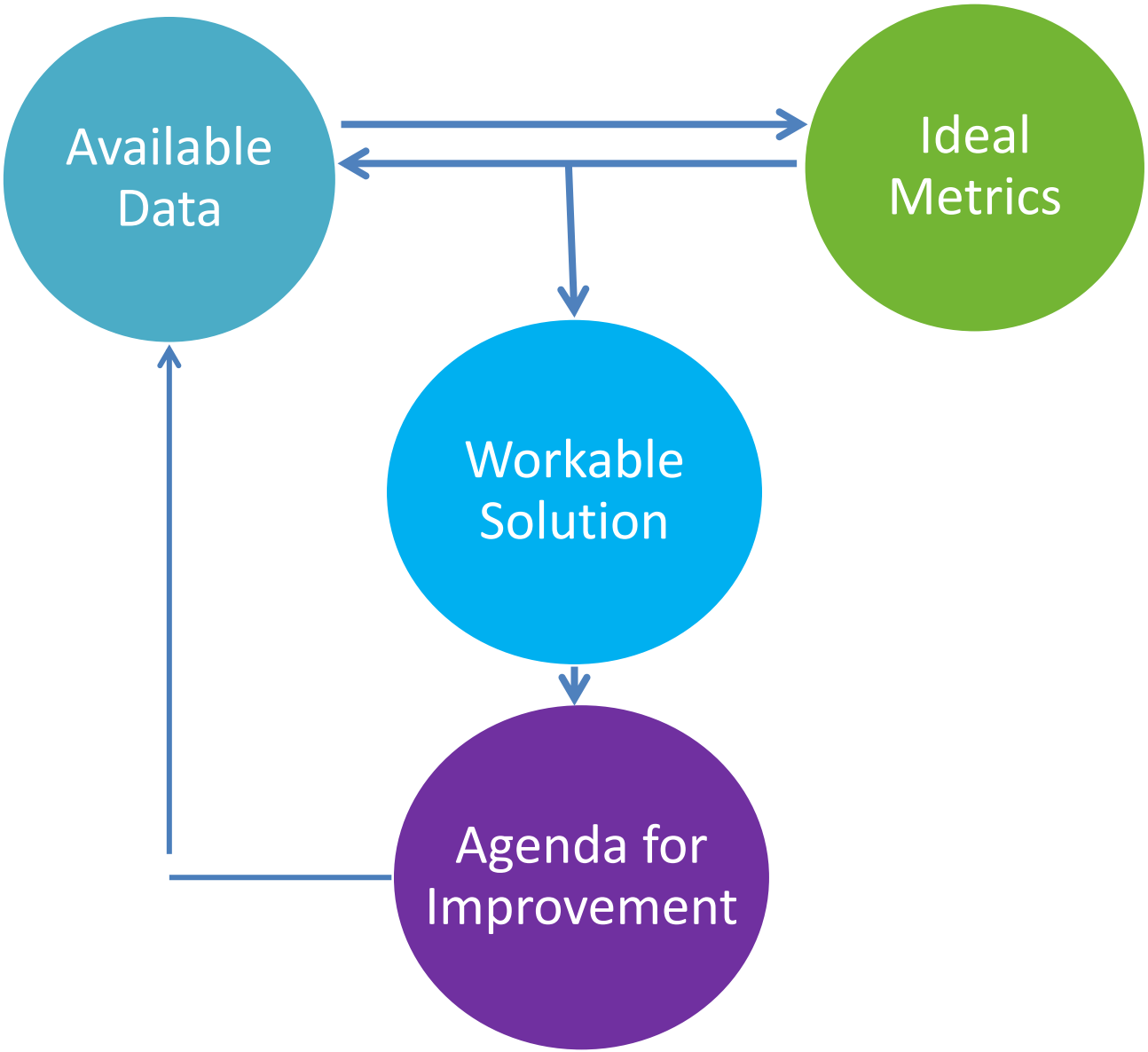
Renewables need global injection
(Renewable Energy news)

What is the Global Tracking Framework

The GTF is an **initial system for regular reporting** based on indicators that are technically rigorous and feasible to compute from existing global data bases, and that offer scope for progressive improvement over time.

El Marco de Seguimiento Global propone un sistema para seguimiento periodico de los objectivos del SE4ALL basado en indicadores cuya medicion es factible via metodologias rigurosas, y que ademas ofrece una plataforma para el mejoramiento progresivo de este sistema

A pragmatic approach

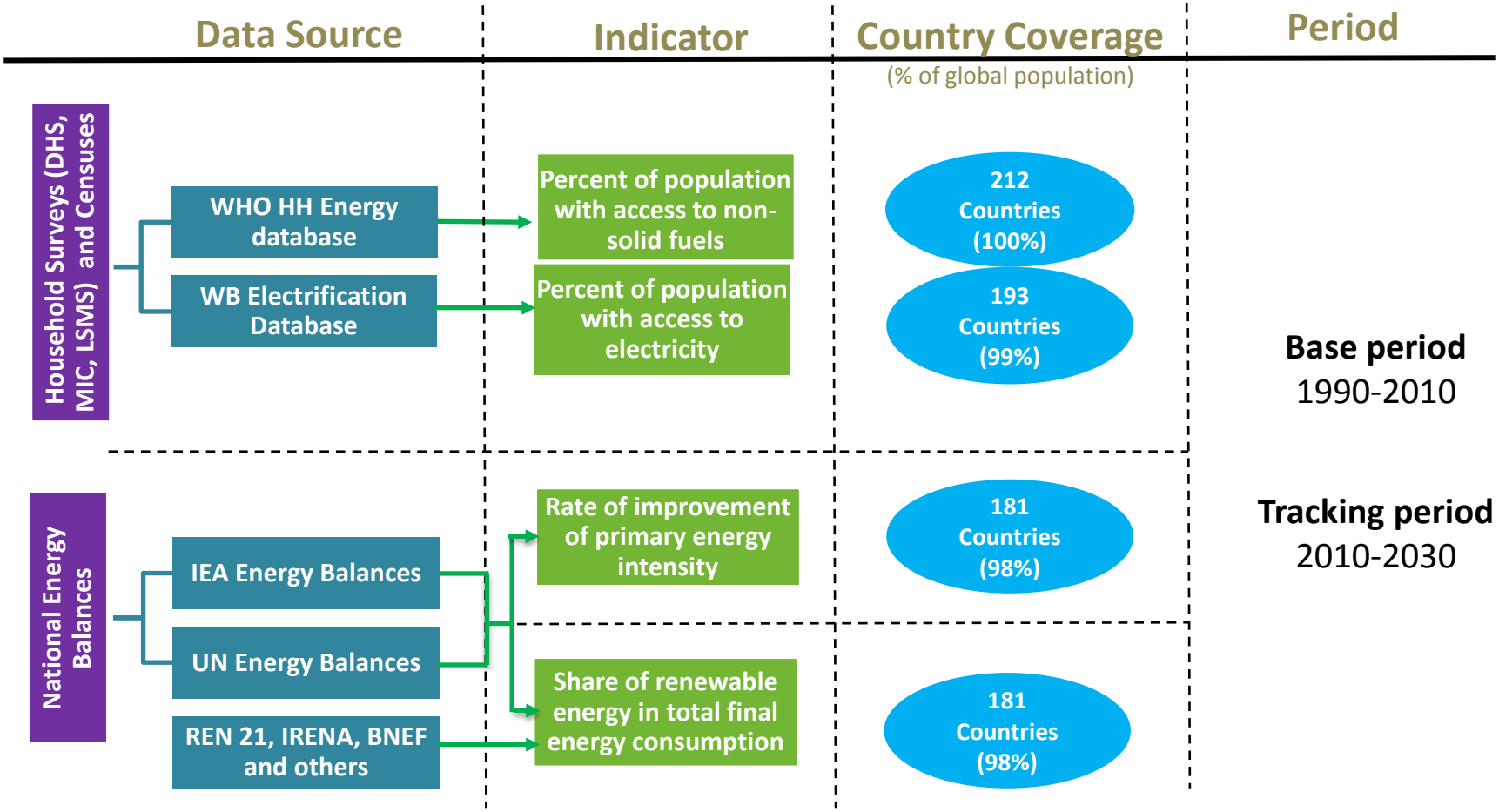


Data Platform and Main Indicators

- **Data platform**
  - 180+ countries covering 98% of global population
  - 20 year history 1990-2010 (2010 is baseline year)
  - GTF 2015: tracks 2 years (2010-2012)
  - Main sources are household surveys and national energy balances
  - Collated from primary data held by IEA, UN, WB, WHO

- **Central indicators (proxies)**
  - Percentage of population with an electricity connection
  - Percentage of population making primary use of non-solid fuels
  - Percentage of total final energy consumption from renewable sources
  - Compound annual growth rate of primary energy intensity

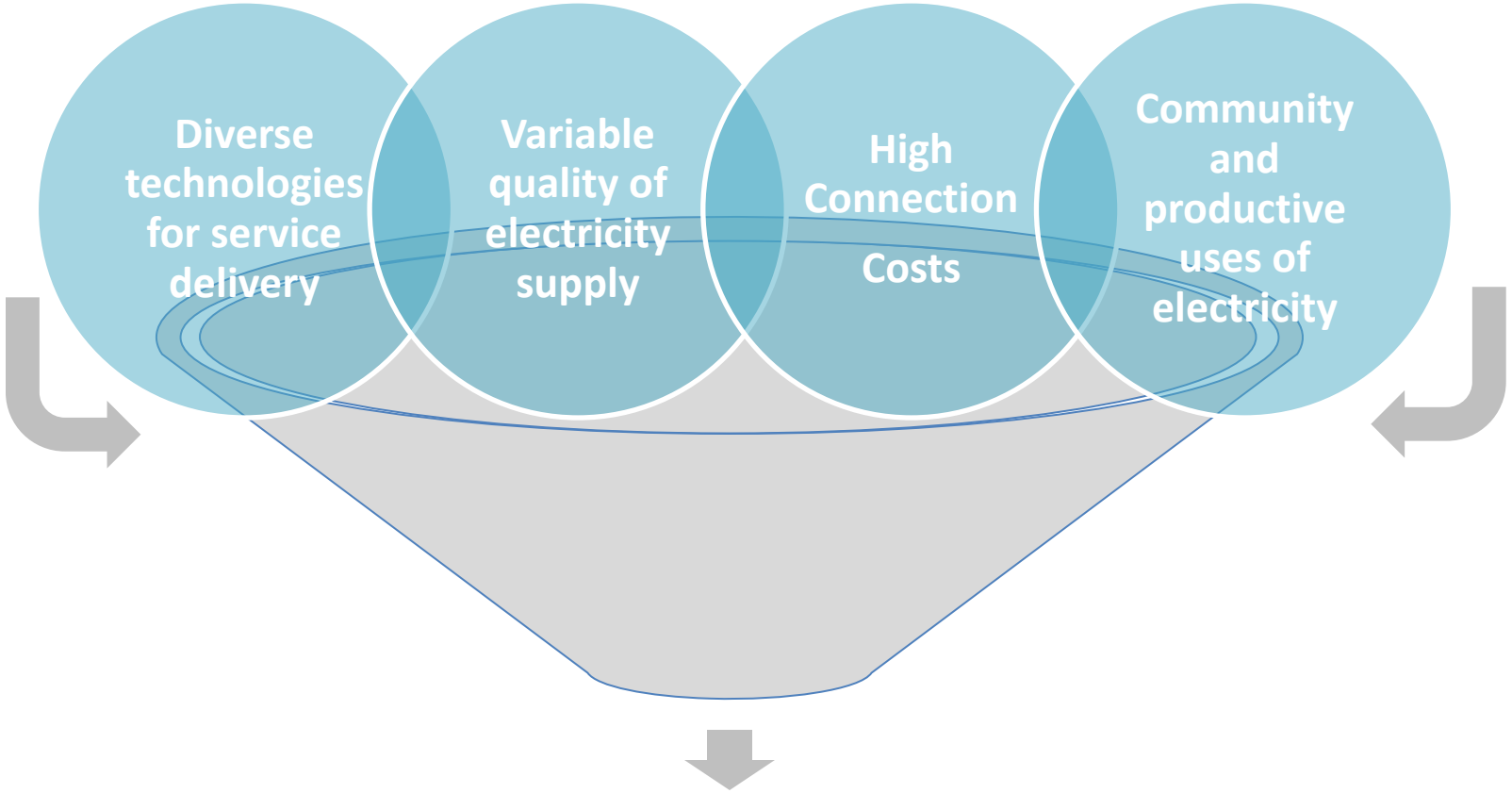
Building global databases using available sources



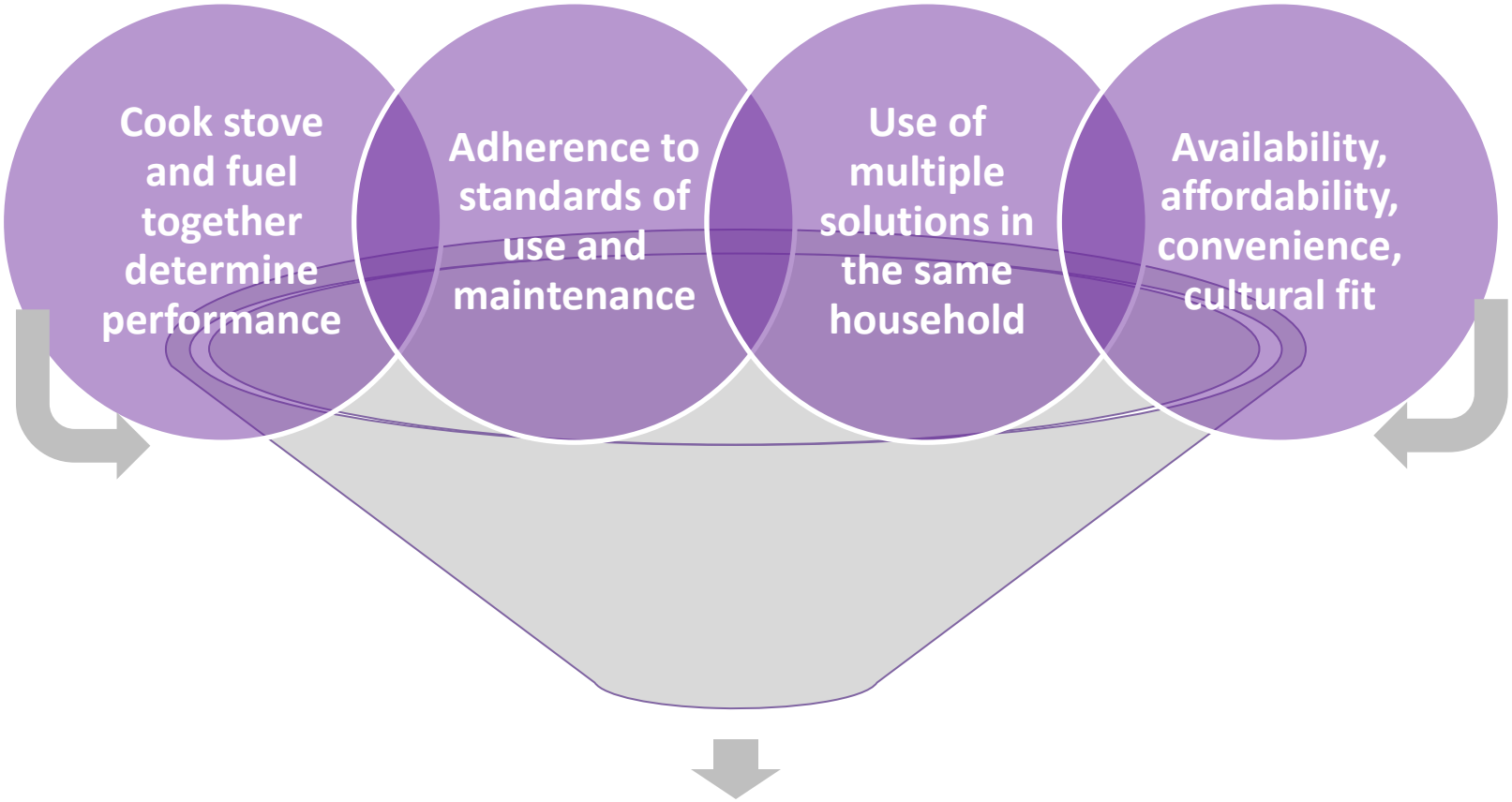
NOTE: IEA = International Energy Agency; UN = United Nations; REN 21 = Renewable Energy Network for the 21st Century; IRENA = International Renewable Energy Agency; BNEF = Bloomberg New Energy Finance; WDI = World Development Indicators (World Bank); GDP= gross domestic product.

ENERGY ACCESS

A workable solution for electrification

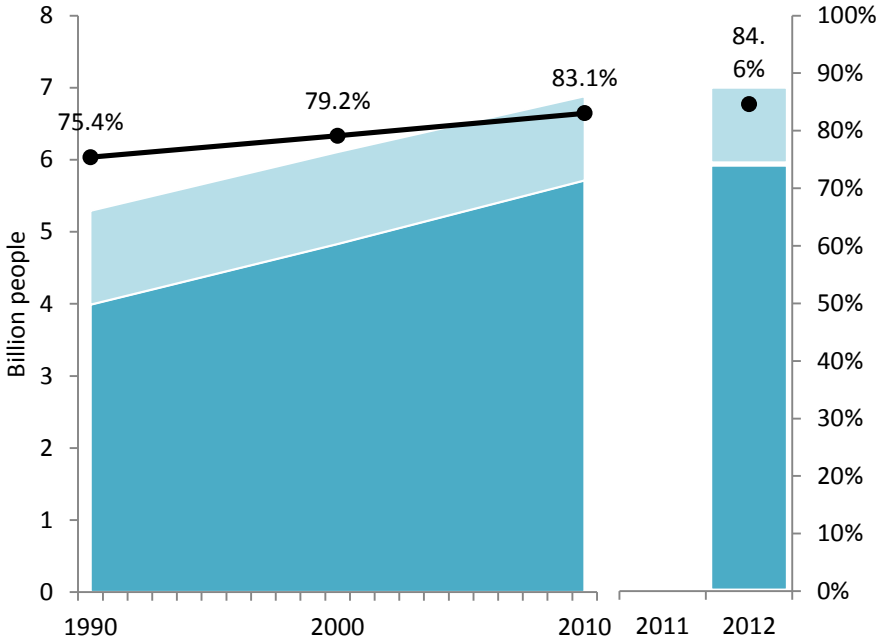


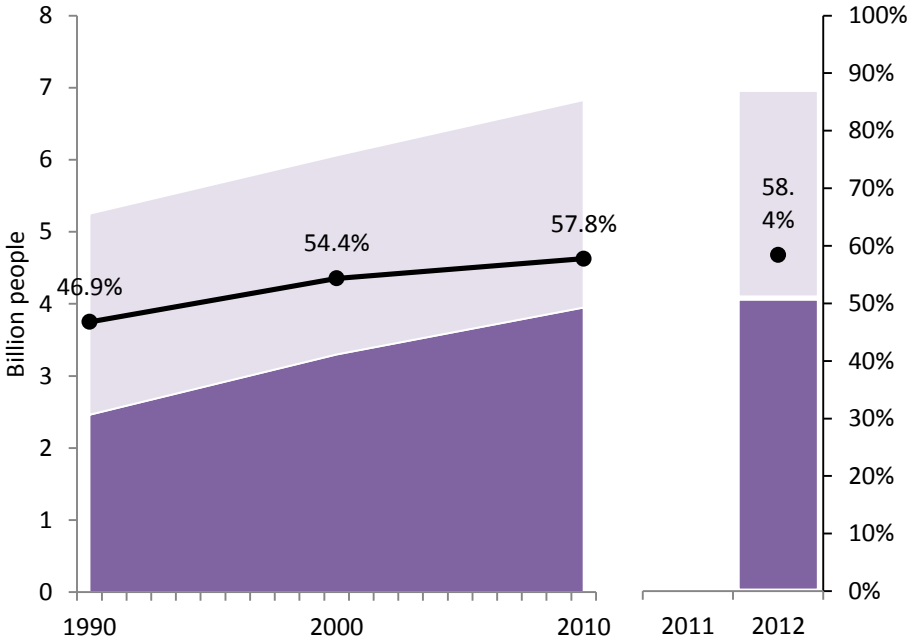
A workable solution for clean and modern cooking



Percentage of population making primary use of non-solid fuels

The global access deficit lowered for electricity and increased for non-solid fuels between 2010 and 2012





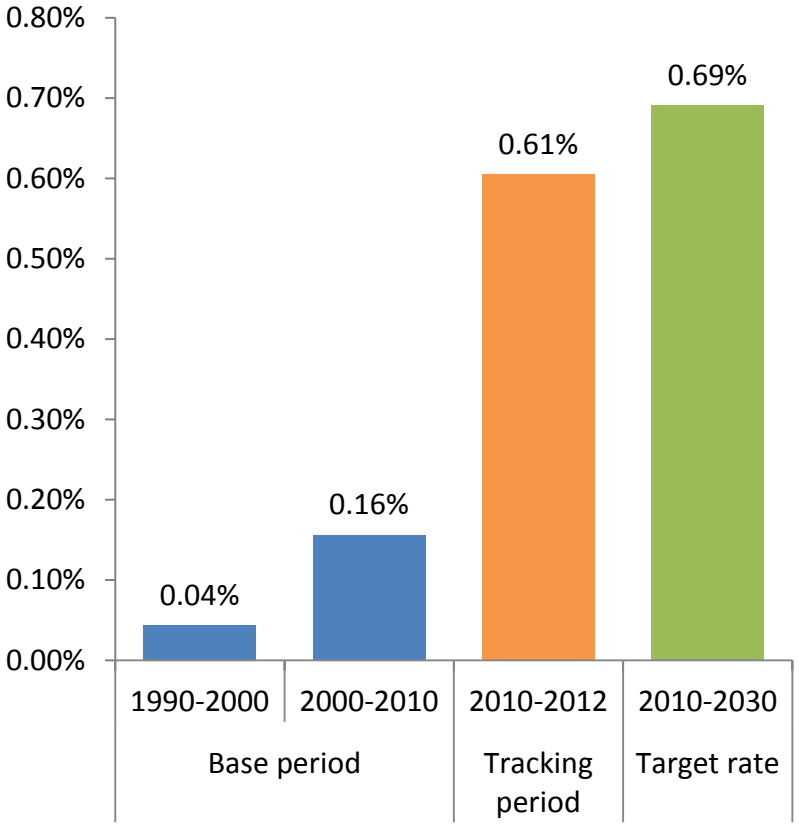
People without access to electricity
People with access to electricity
Share of population with access to electricity

People without access to non-solid fuel
People with access to non-solid fuel
Share of population with access to non-solid fuel

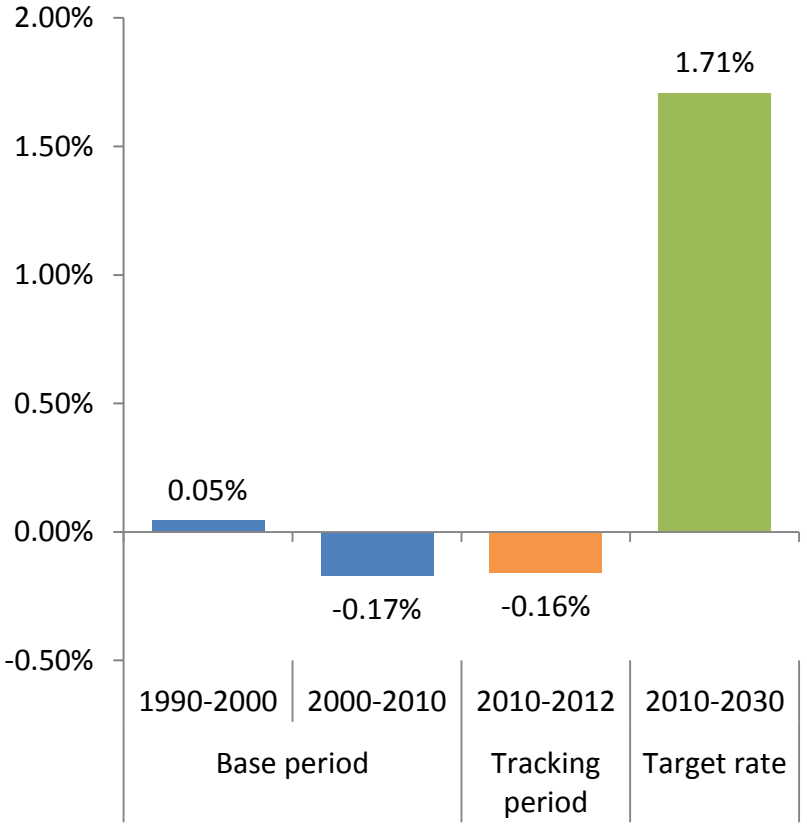
Access to electricity, 1990-2012

Access to non-solid fuels, 1990-2012

Universal access to modern energy services by 2030: on-track for electricity, off-track for non-solid fuels

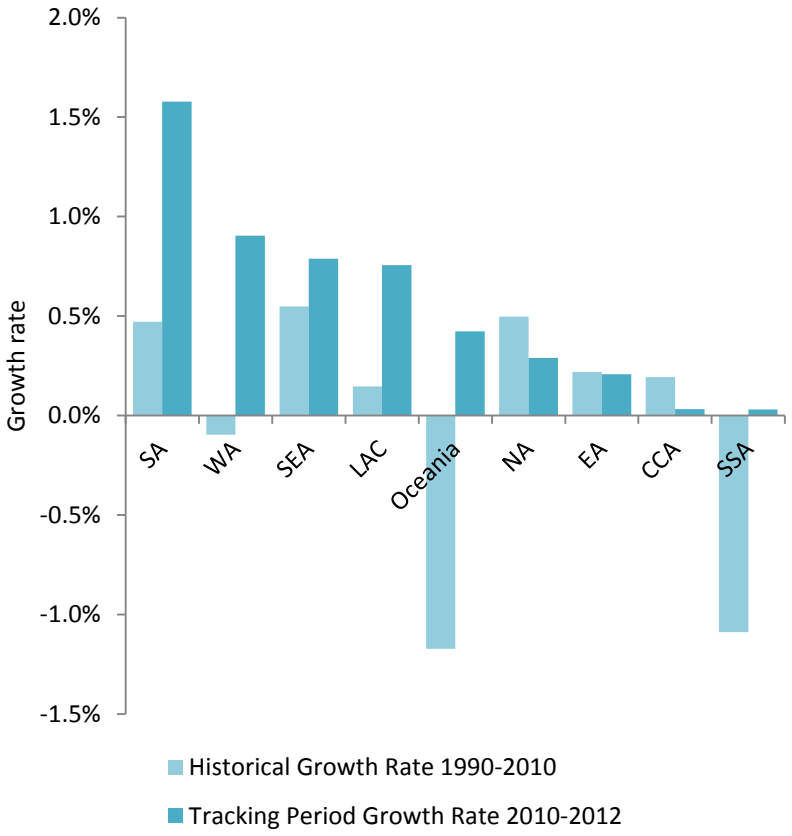


Annual growth of electricity access rate

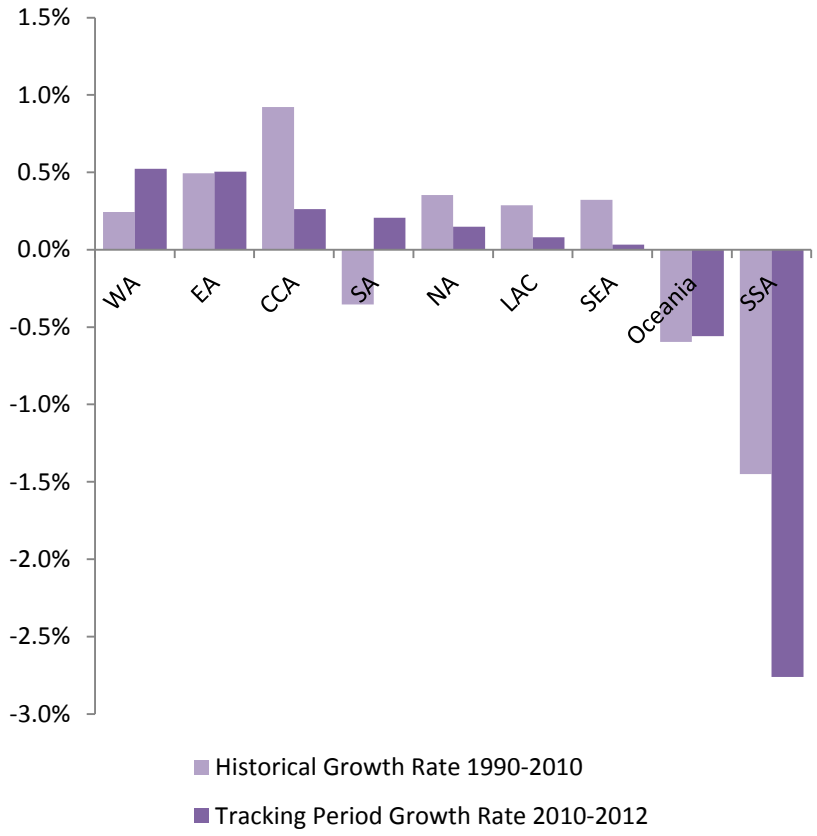


Annual growth of non-solid fuel access rate

Access growth rates in most regions accelerated for electricity and decelerated for non-solid fuels

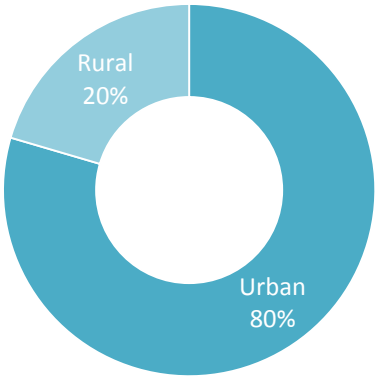


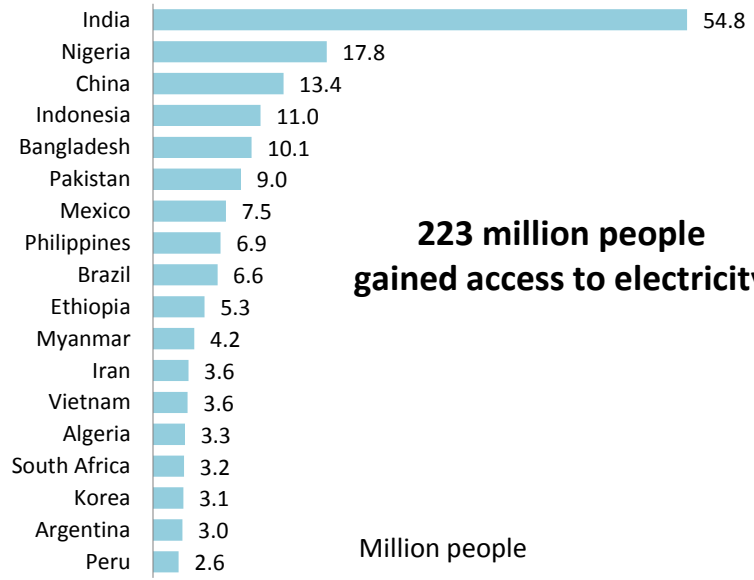
Access to electricity growth rate by region



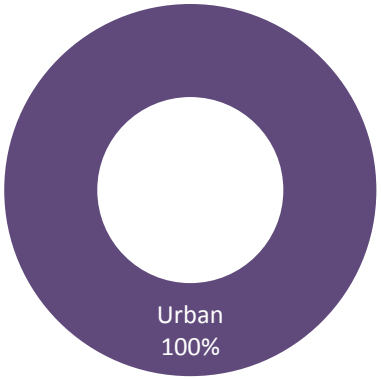
Access to non-solid fuels growth rate by region

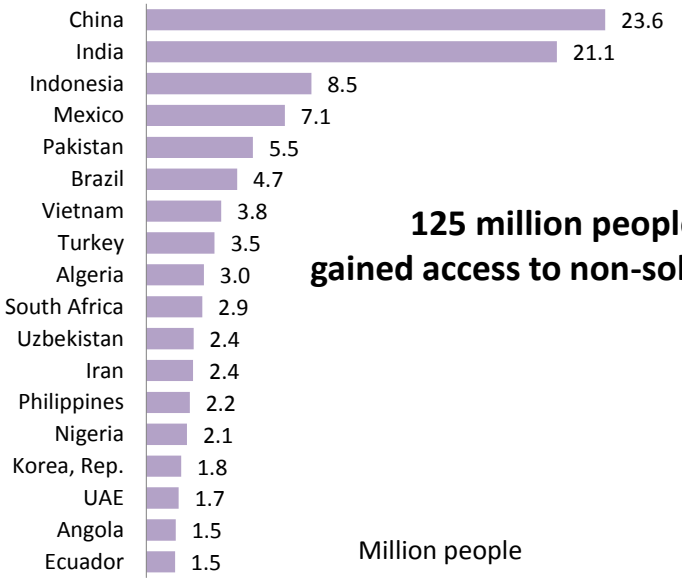
The 2010-2012 access increment was largely urban, and particularly large in India and China





223 million people gained access to electricity



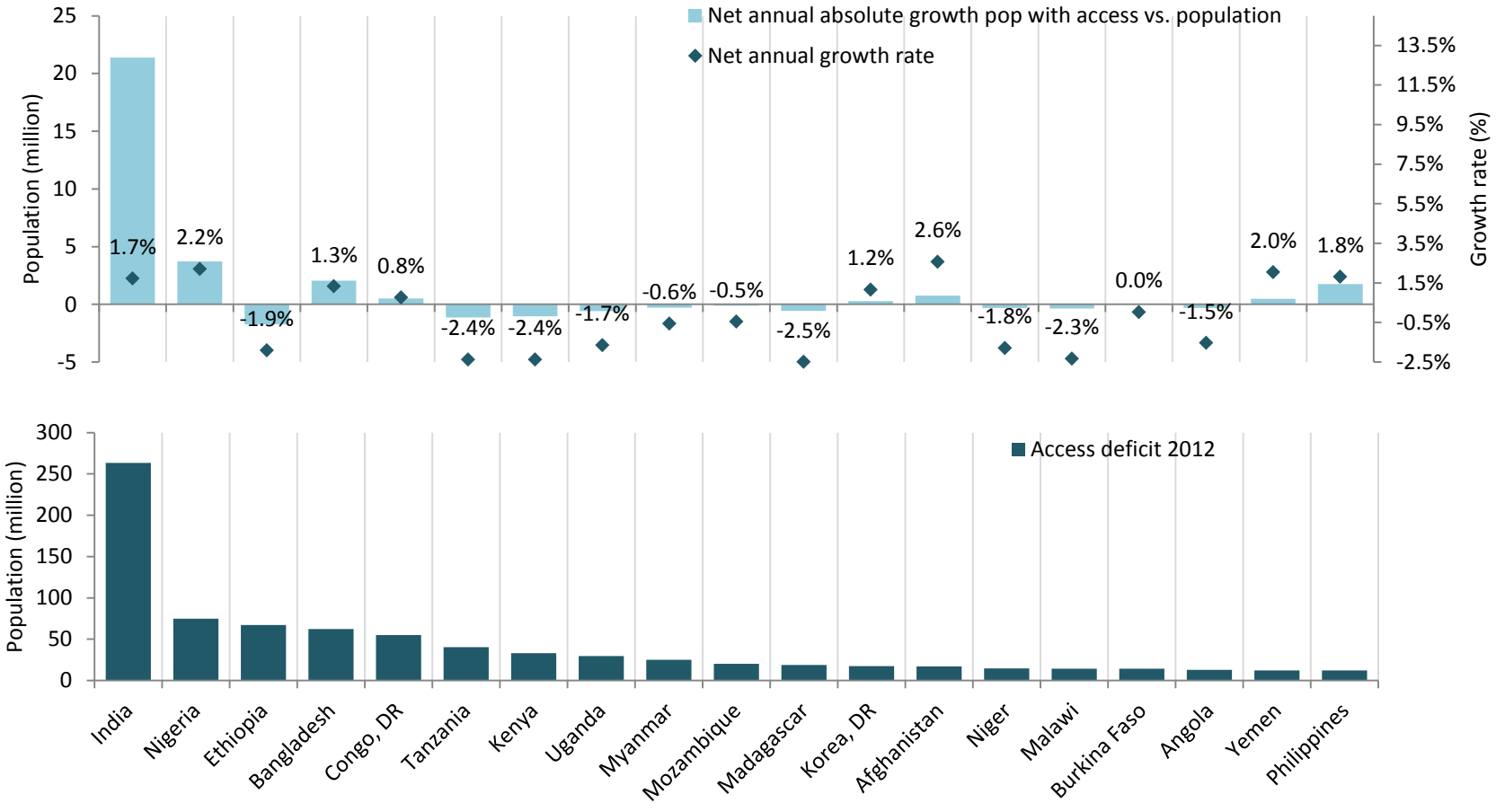


125 million people gained access to non-solid fuels

Electricity access increment, 2010-2012

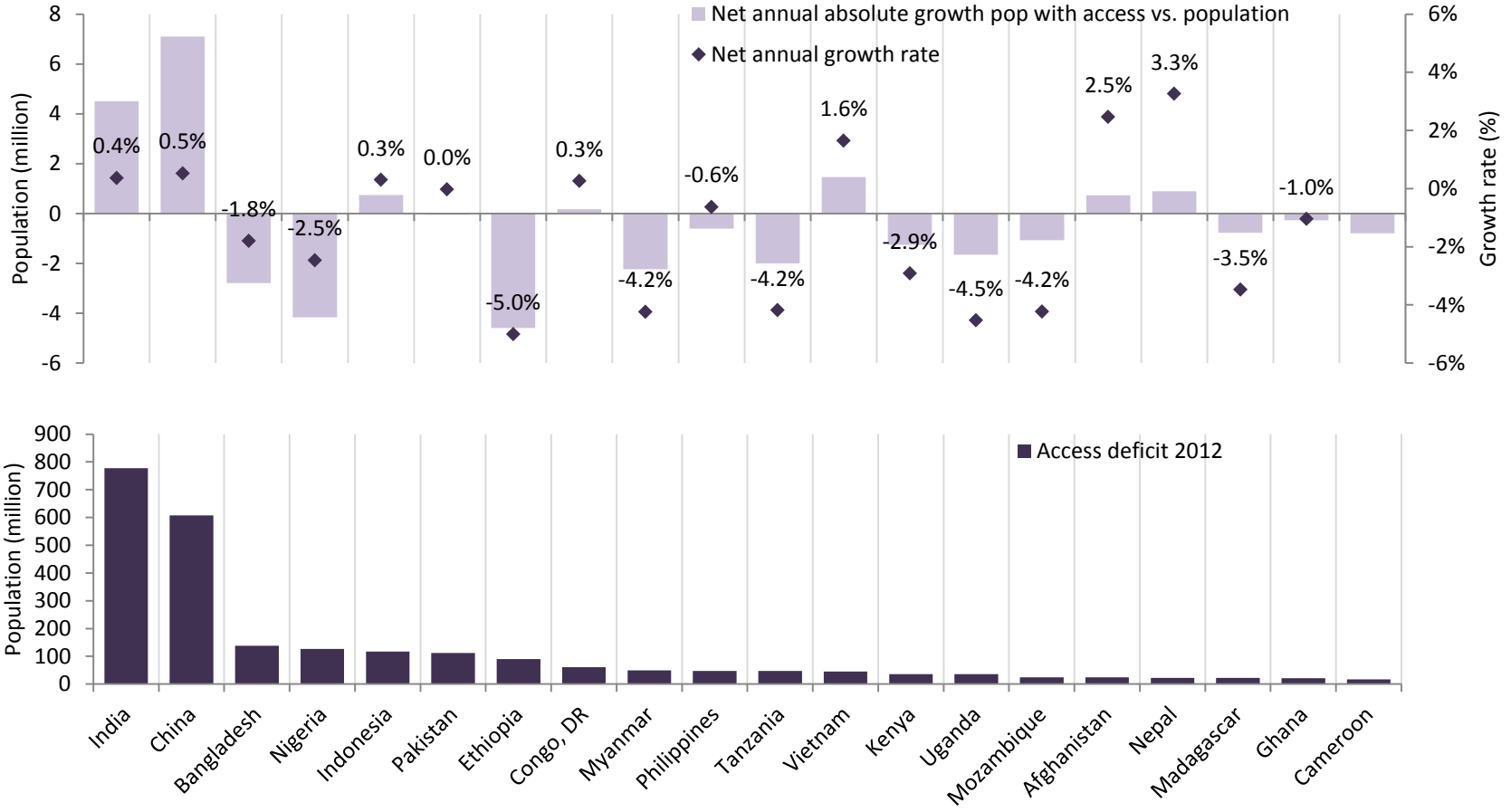
Non-solid fuel access increment, 2010-2012

For electricity, 11 out of the 20 top access deficit countries are expanding faster than population



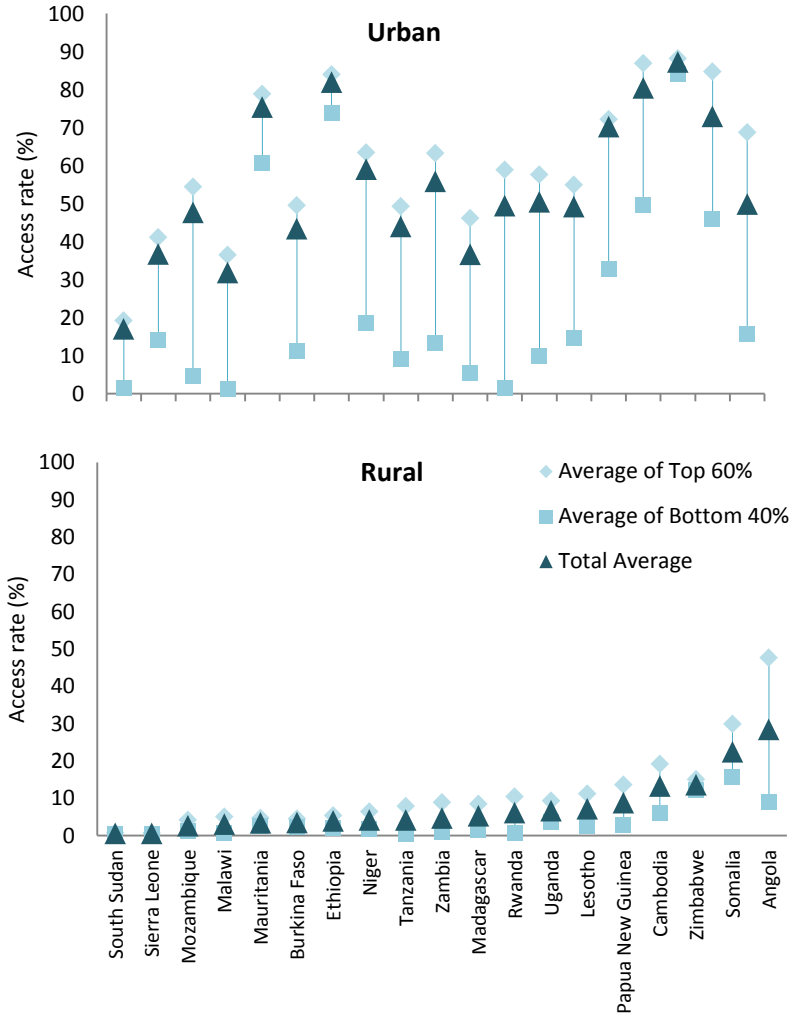
Electricity access deficit (bottom) and annual reduction of deficit, 2010-2012

For non-solid fuels, only 8 out of 20 top access deficit countries are expanding faster than population

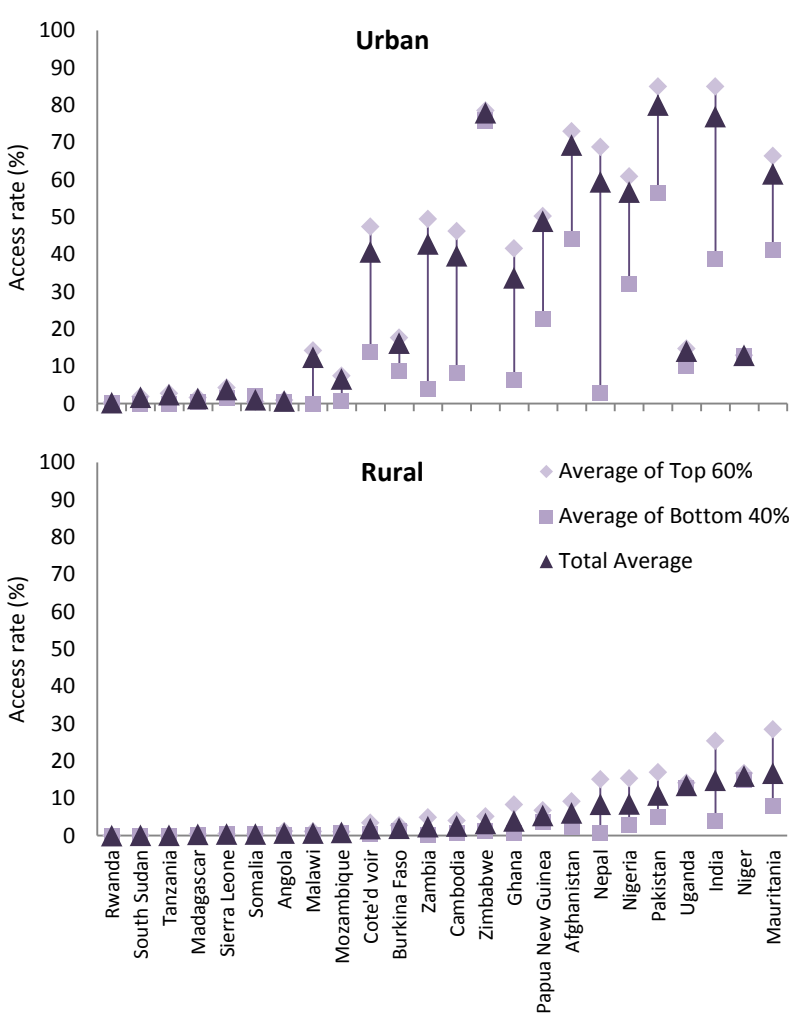


Non-solid fuel deficit (bottom) and annual reduction of deficit, 2010-2012

National urban-rural access rates mask large disparities in access across income groups



Access to electricity, 2012



Access to non-solid cooking fuels, 2012

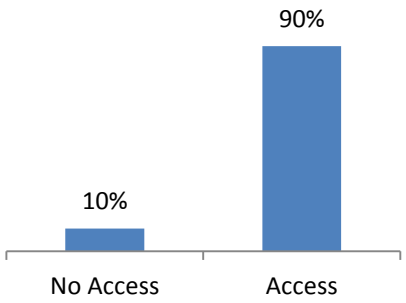
An agenda for improvement on multi-tier metrics – example of household access to electricity

			Tier-0	Tier-1	Tier-2	Tier-3	Tier-4	Tier-5
Attributes	1. Peak capacity	Power		V. Low Power Min 5 W	Low Power Min 70 W	Medium Power Min 200 W	High power Min 800 W	V.High Power Min 2 kW
		Daily capacity		Min 20 Wh	Min 270 Wh	Min 1.0 KWh	Min 3.4 KWh	Min 8.2 KWh
	2. Duration	Hours per day		Min 4 hrs		Min 8 hrs	Min 16 hrs	Min 23 hrs
		Hours per evening		Min 2 hrs		Min 2 hrs	Min 4 hrs	Min 4 hrs
	3. Reliability					Max 3 disruptions **per day**	Max 7 disruptions per week	Max 3 disruptions **per week** of total duration < 2 hours
	4. Quality					Voltage problems do not prevent the use of desired appliances		
	5. Affordability					Cost of a standard consumption package of 365 kWh per annum is less than 5% of household income		
	6. Legality					Bill is paid to the utility / pre-paid card seller / authorized representative		
	7. Health and Safety					Absence of past accidents and perception of high risk in the future		

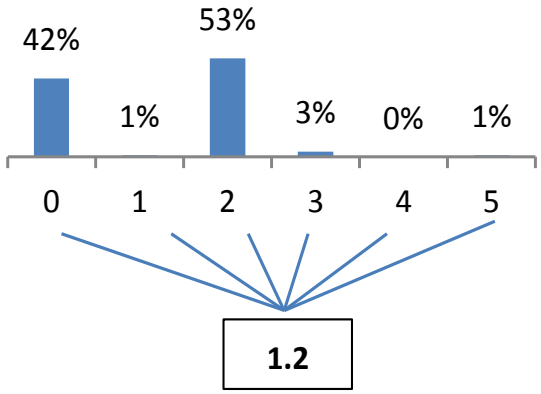
Note: Tier-rating for the household is calculated by applying the lowest of the tier-ratings across all attributes

Pilot results from survey of 2,500 households across four districts of Kinshasa, DRC

Binary Measurement

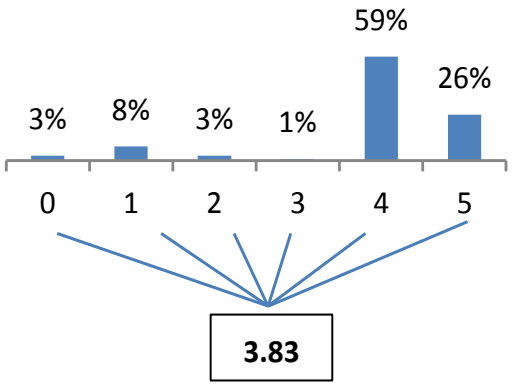


Multi-tier Measurement Of Access To Electricity Supply



Index of Electricity Access

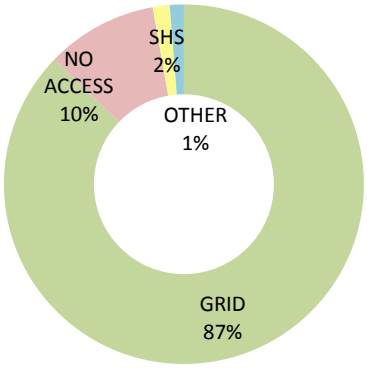
Multi-tier Measurement of Access to Electricity Appliances

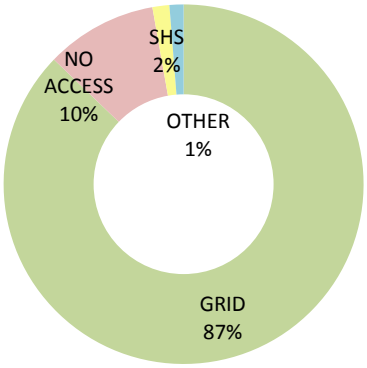


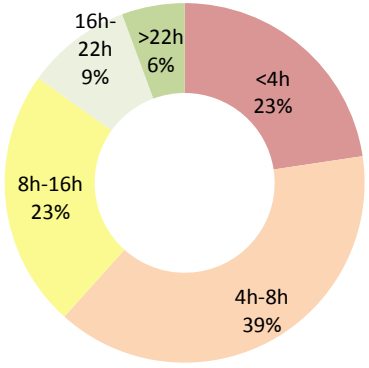
Index of Access to Appliances

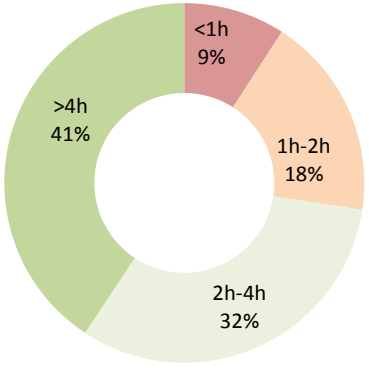
Dashboard of service attributes for Kinshasa, DRC

Electricity Source	Capacity	Duration	Duration
Source	Source	24 Hours (hours)	Evening (hours)

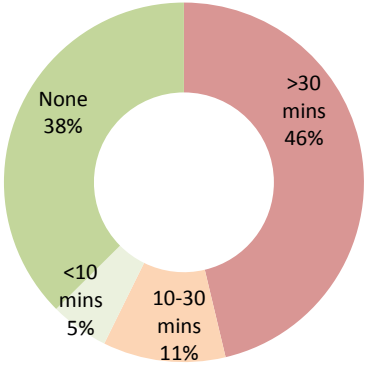


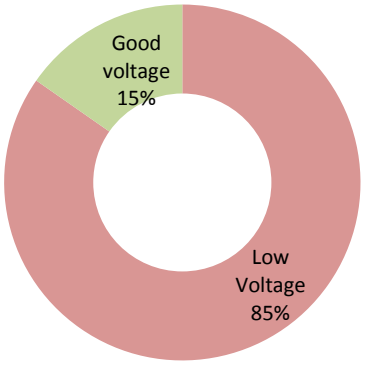


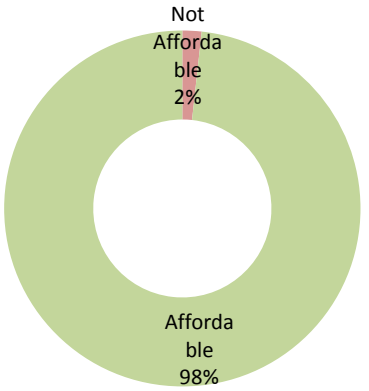


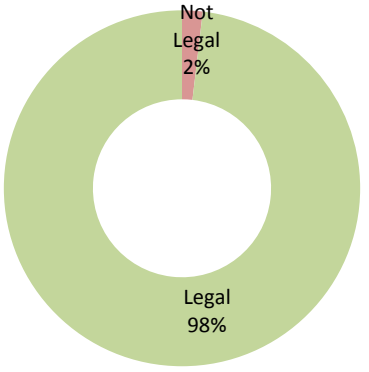


Reliability	Quality	Affordability	Legality
Duration of interruptions (mins)	Low Voltage problems	Index:	Index:







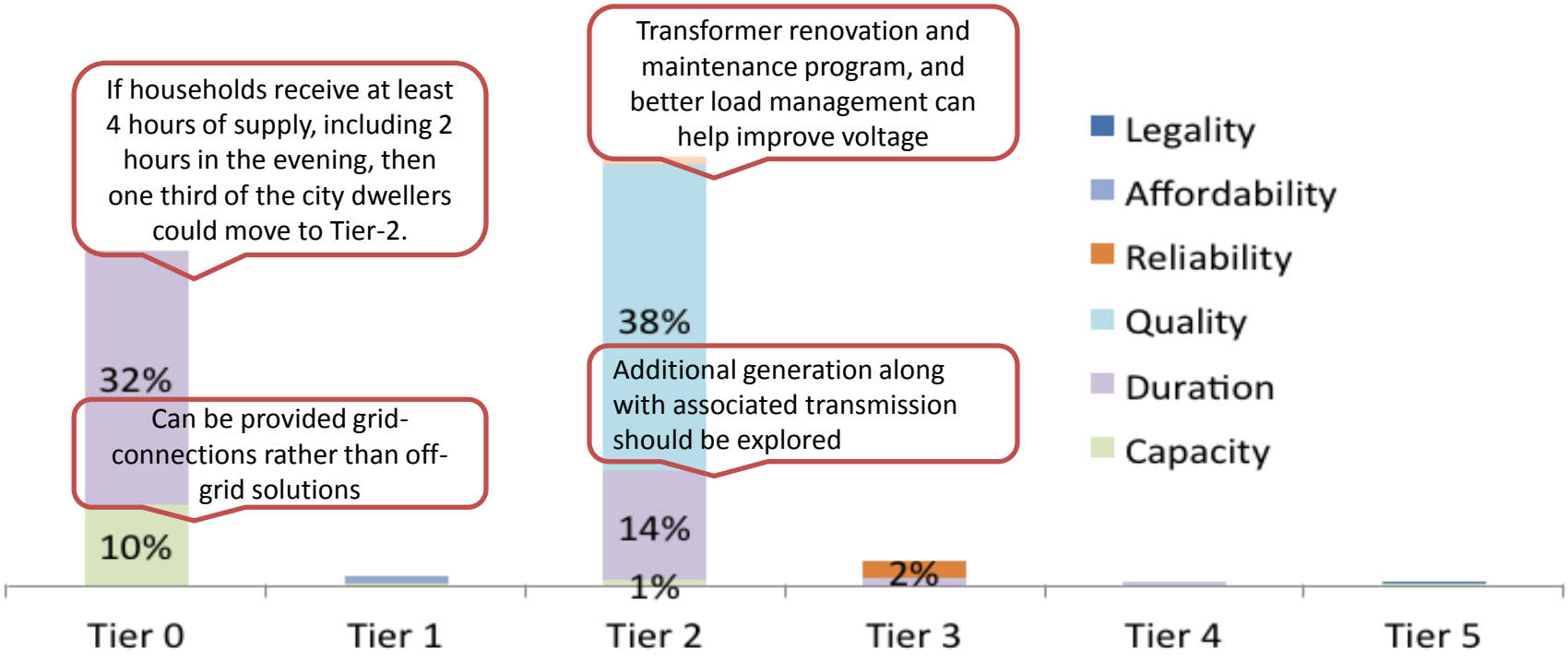


Less than 8 hours per day for 62% of the household

Unscheduled interruptions are longer than 30 minutes for more than 57% of the household

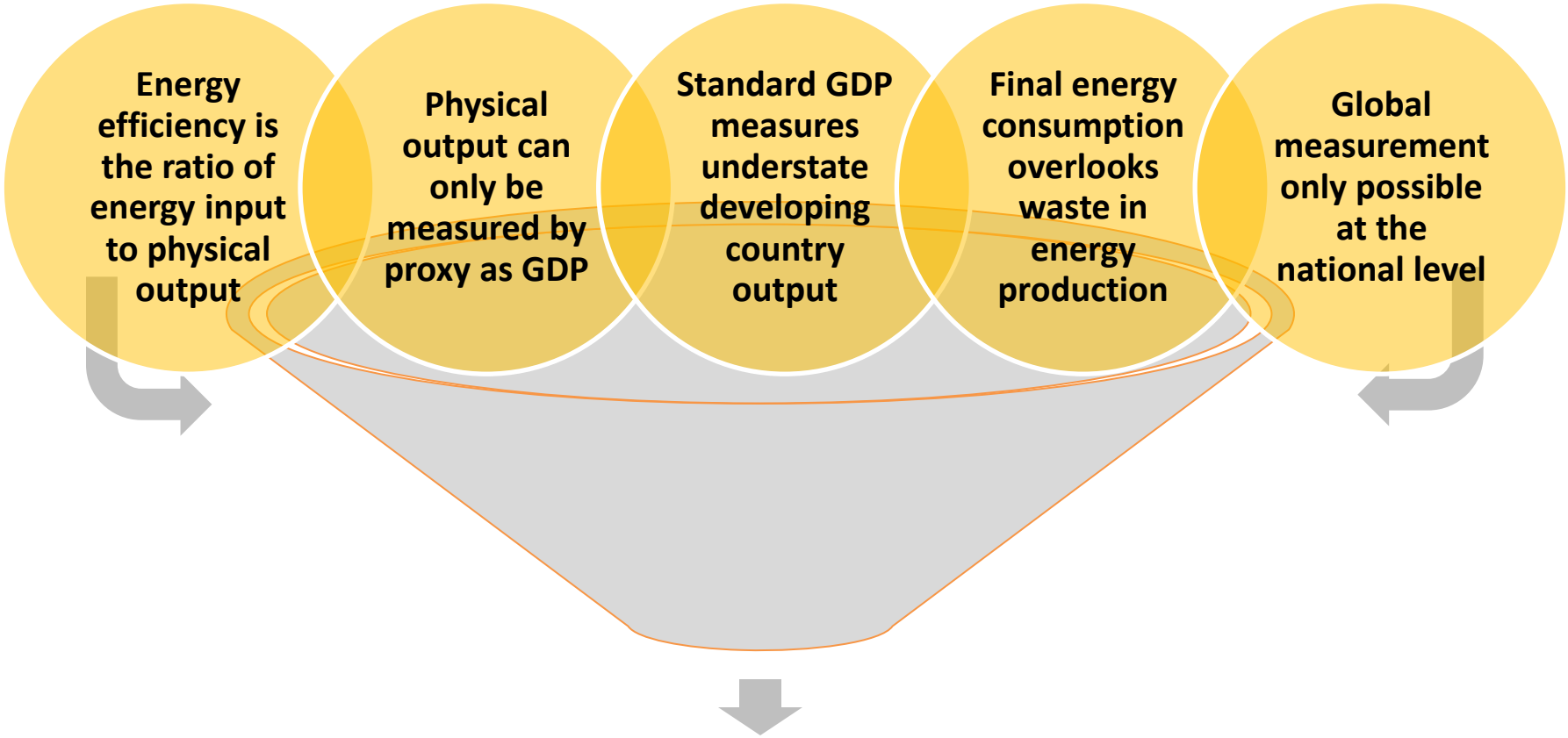
Almost 85% of the household experienced low voltage

Diagnostic of actions needed to increase access score

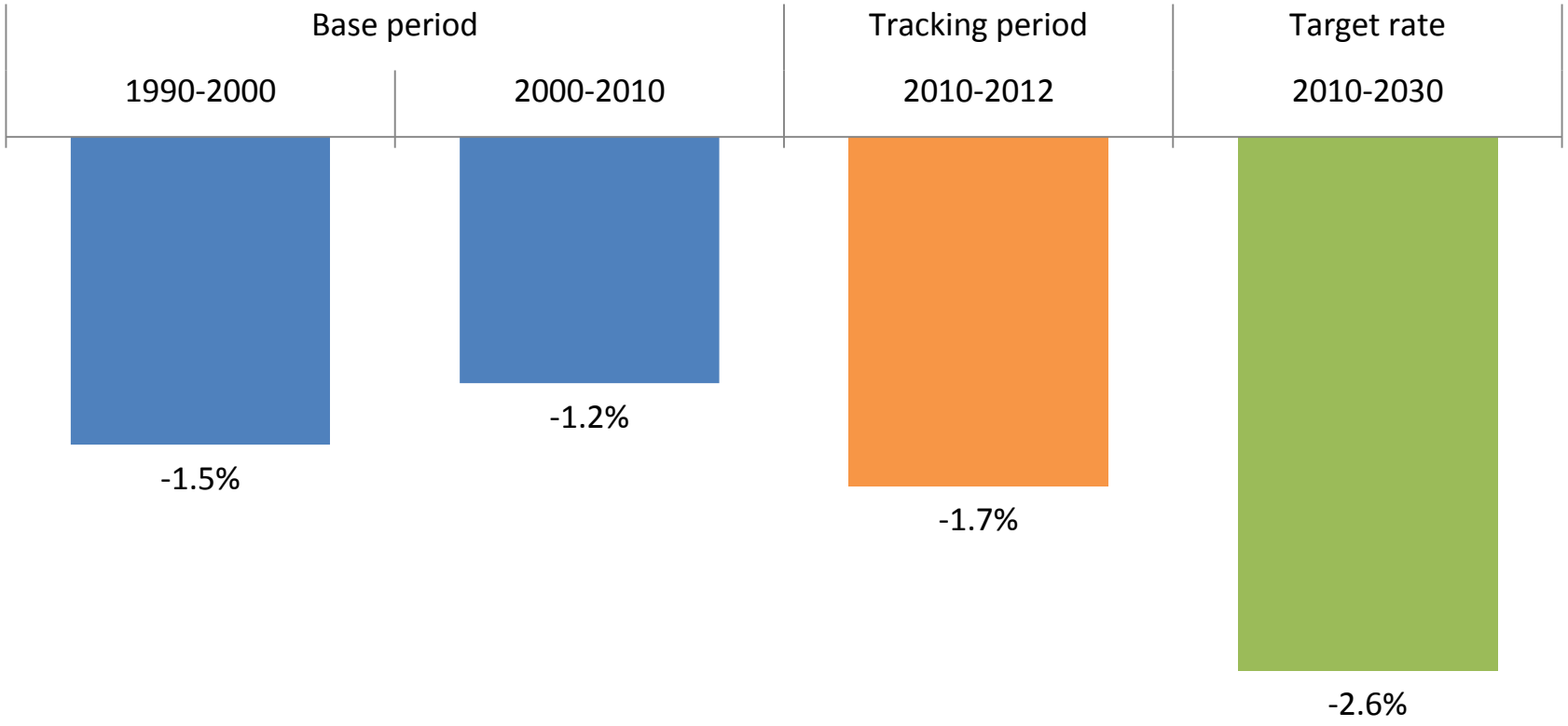


ENERGY EFFICIENCY

A workable solution for energy efficiency

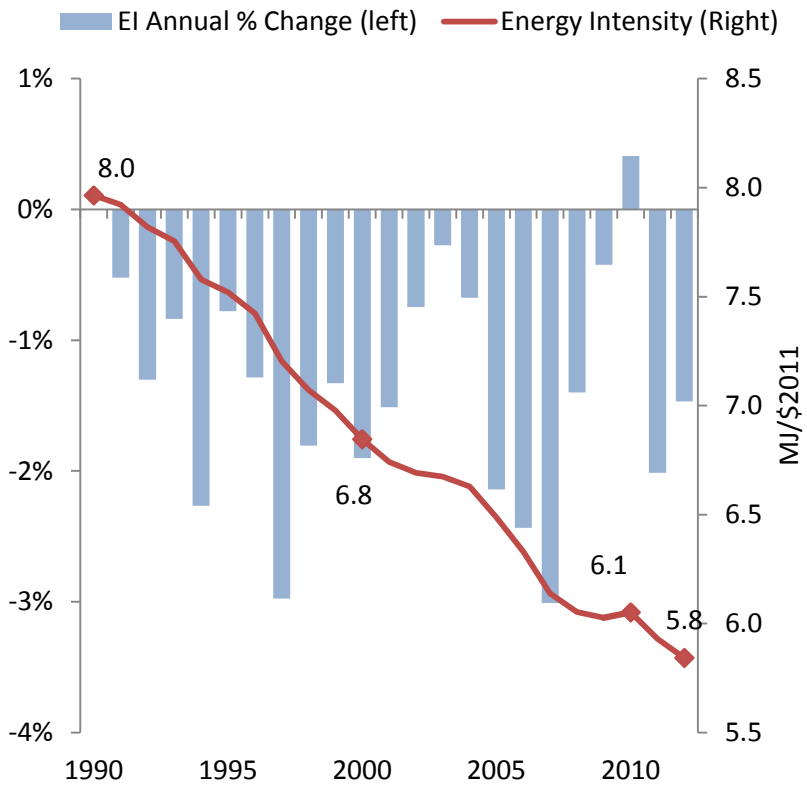


Efficiency indicator accelerates in 2010-2012, but still falls short of target rate

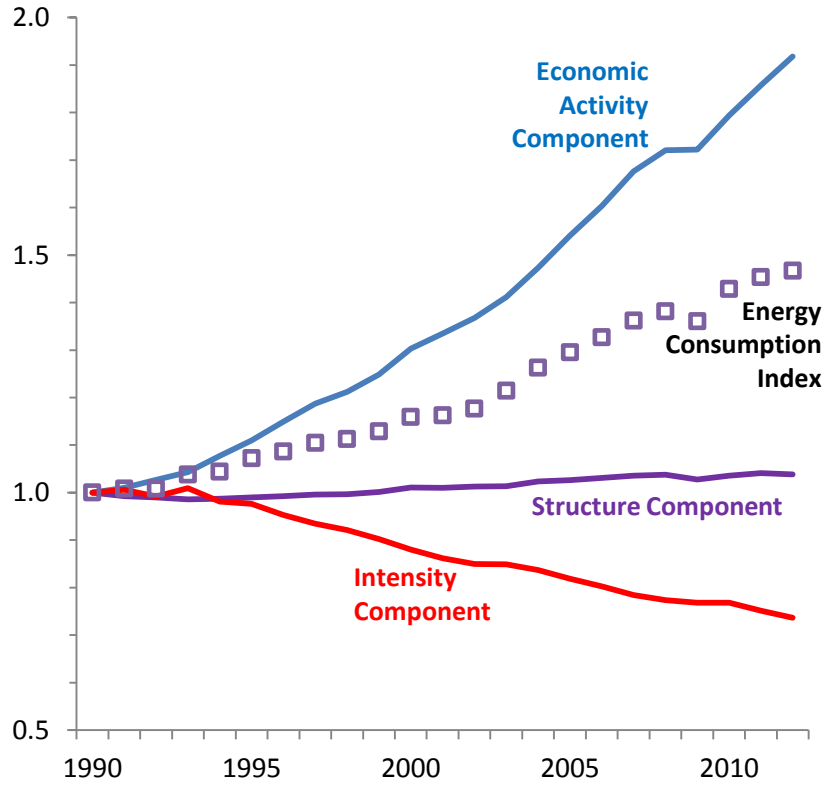


Rate of change in global primary energy intensity

Improvements in energy intensity have counterbalanced growing economic activity

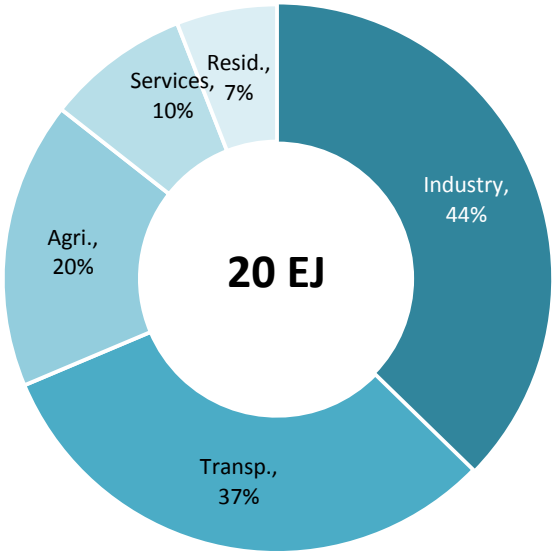


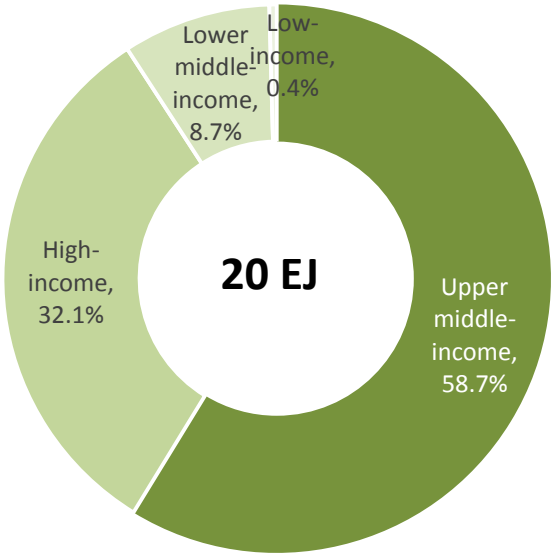
Evolution of energy intensity, 1990-2012

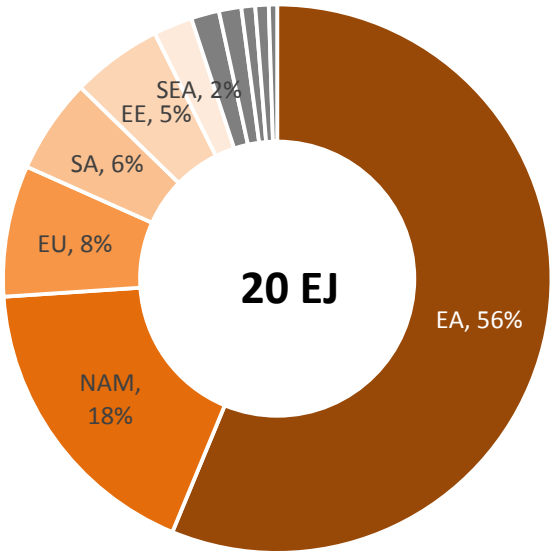


Decomposition of energy intensity, 1990-2012

Improvements in energy intensity from 2010-2012 saved as much energy as Japan consumption of 2012





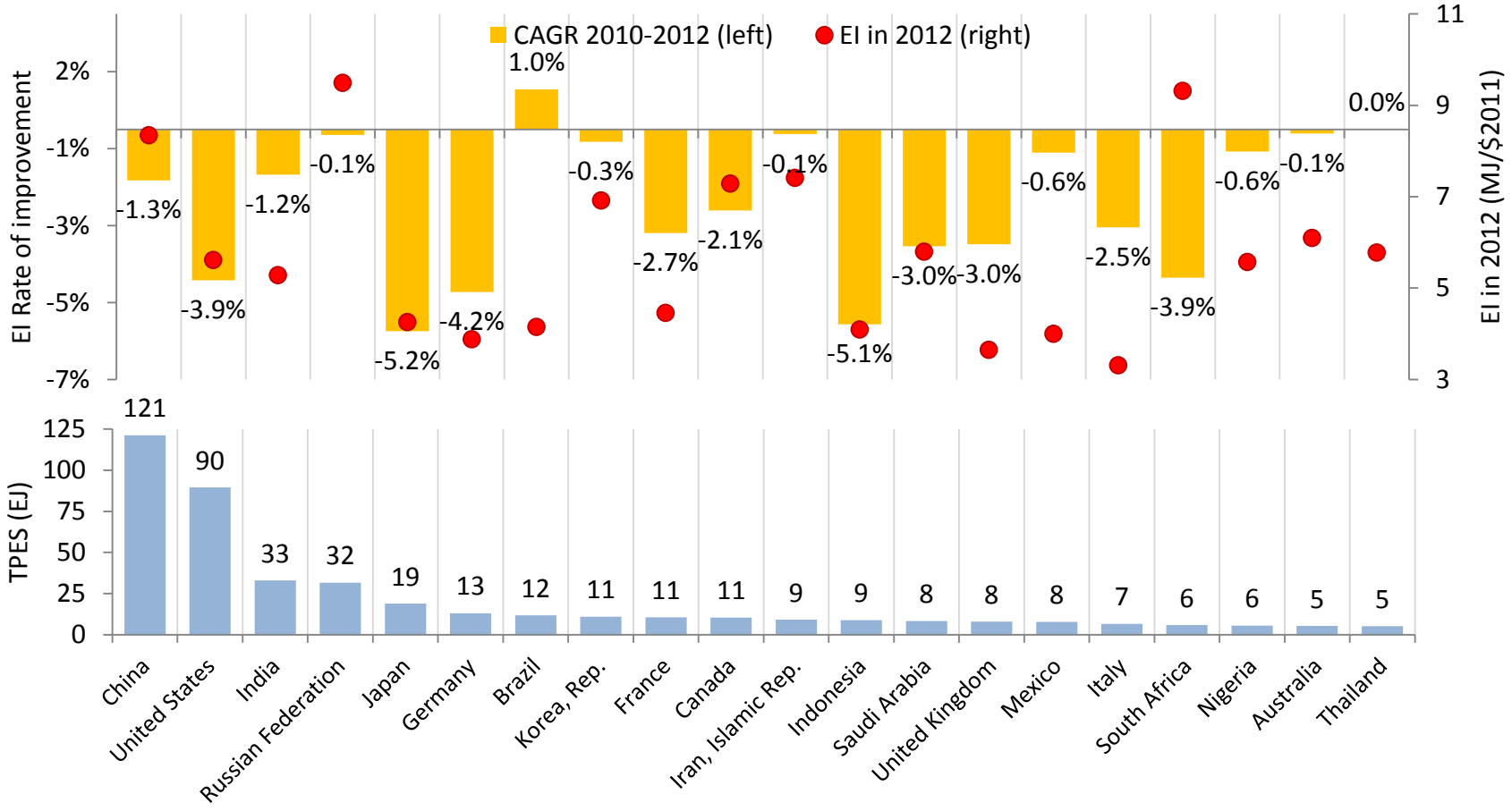


Increment by economic sector

Increment by income group

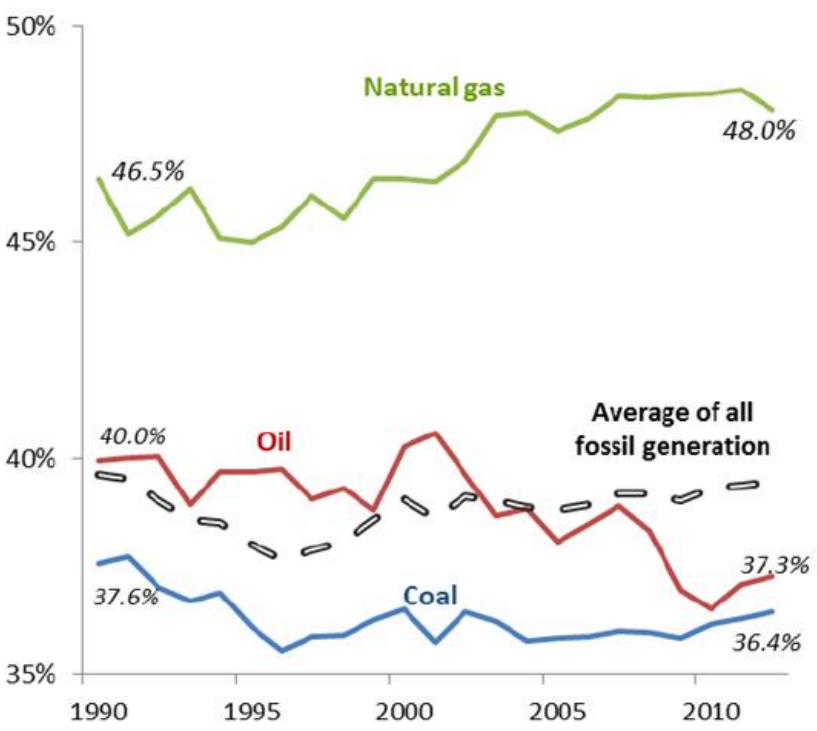
Increment by region

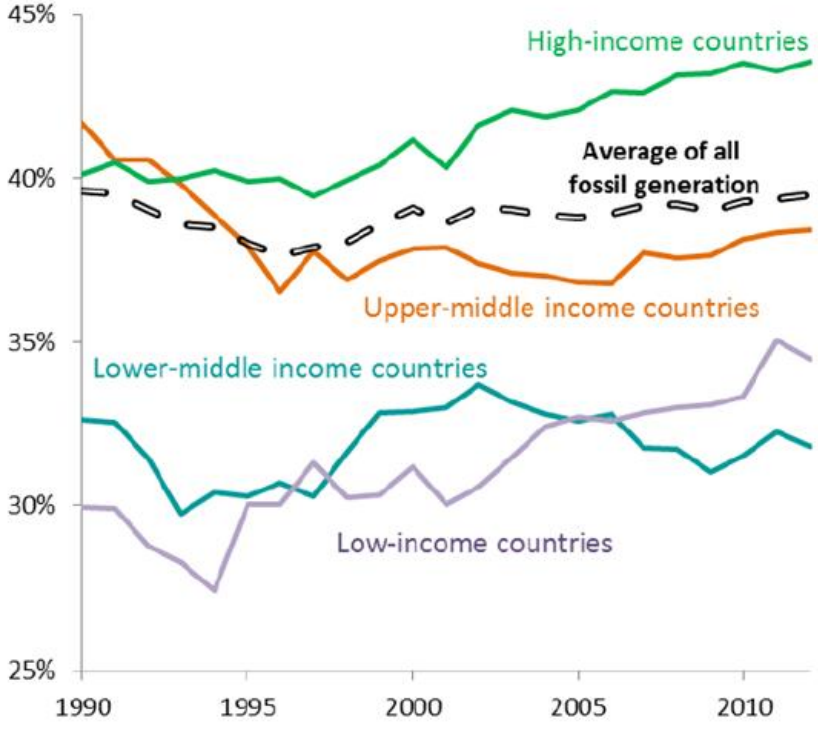
Half of top 20 energy consumers reduced energy intensity by more than 2% per year from 2010-2012



Top 20 energy users by primary energy supply in 2012 (bottom) and energy intensity CAGR 2010-2012 (top)

Continued dominance of coal has held down progress in thermal efficiency of power generation

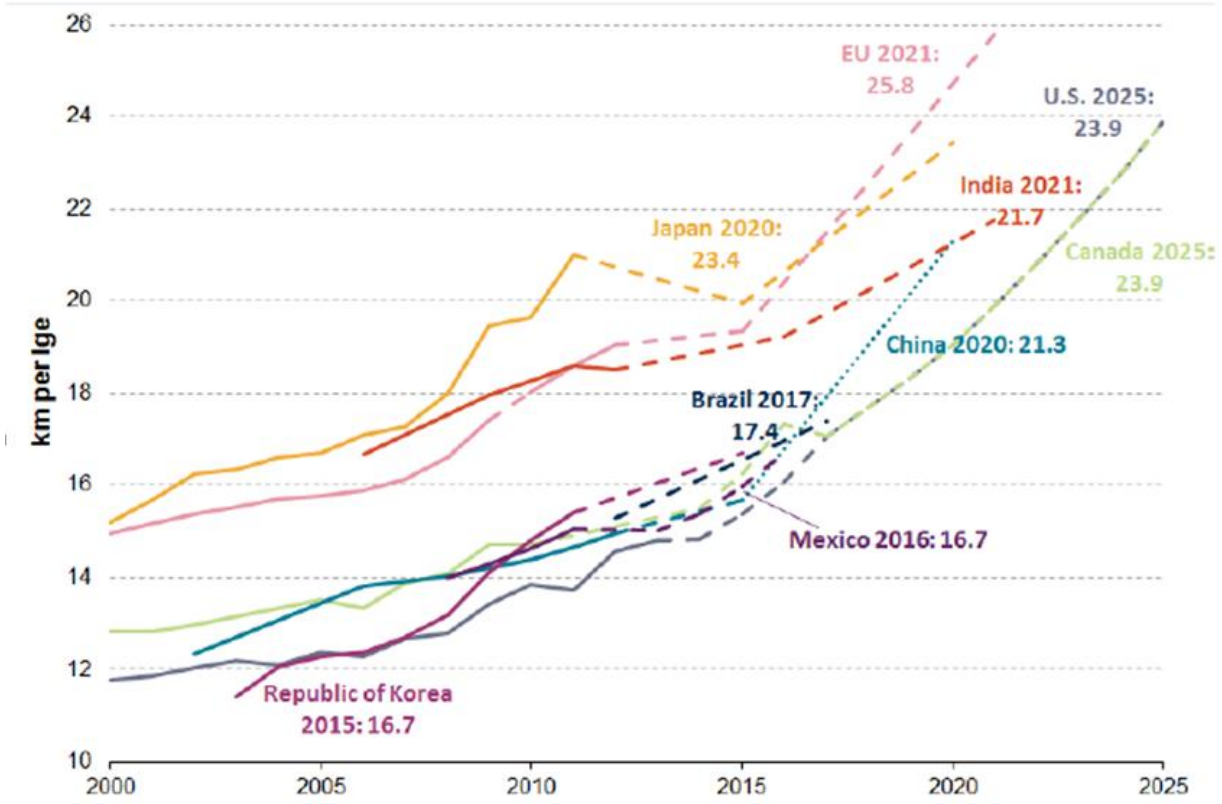




Thermal efficiency of fossil power generation by fuel and income group, 1990-2012

Source: IEA databases. Data are for main activity electricity plants

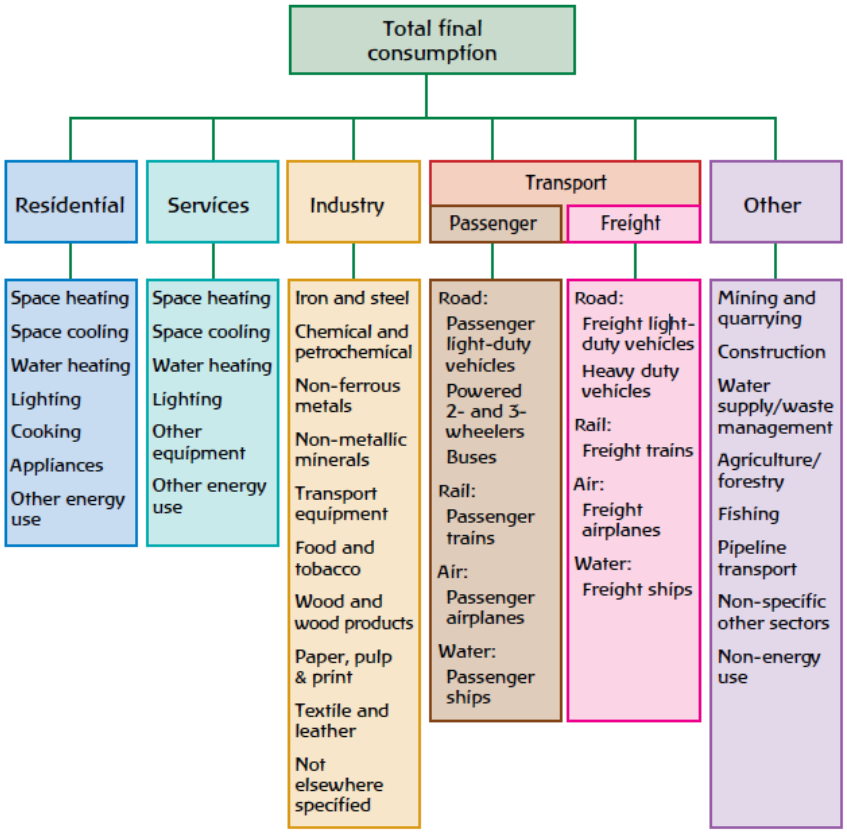
In transport, the world's largest markets have implemented fuel economy standards



Enacted light-duty vehicle fuel economy standards, 2000-2025

Source: ICCT (2014), Global Passenger Vehicle Standards, International Council on Clean Transportation; IEA

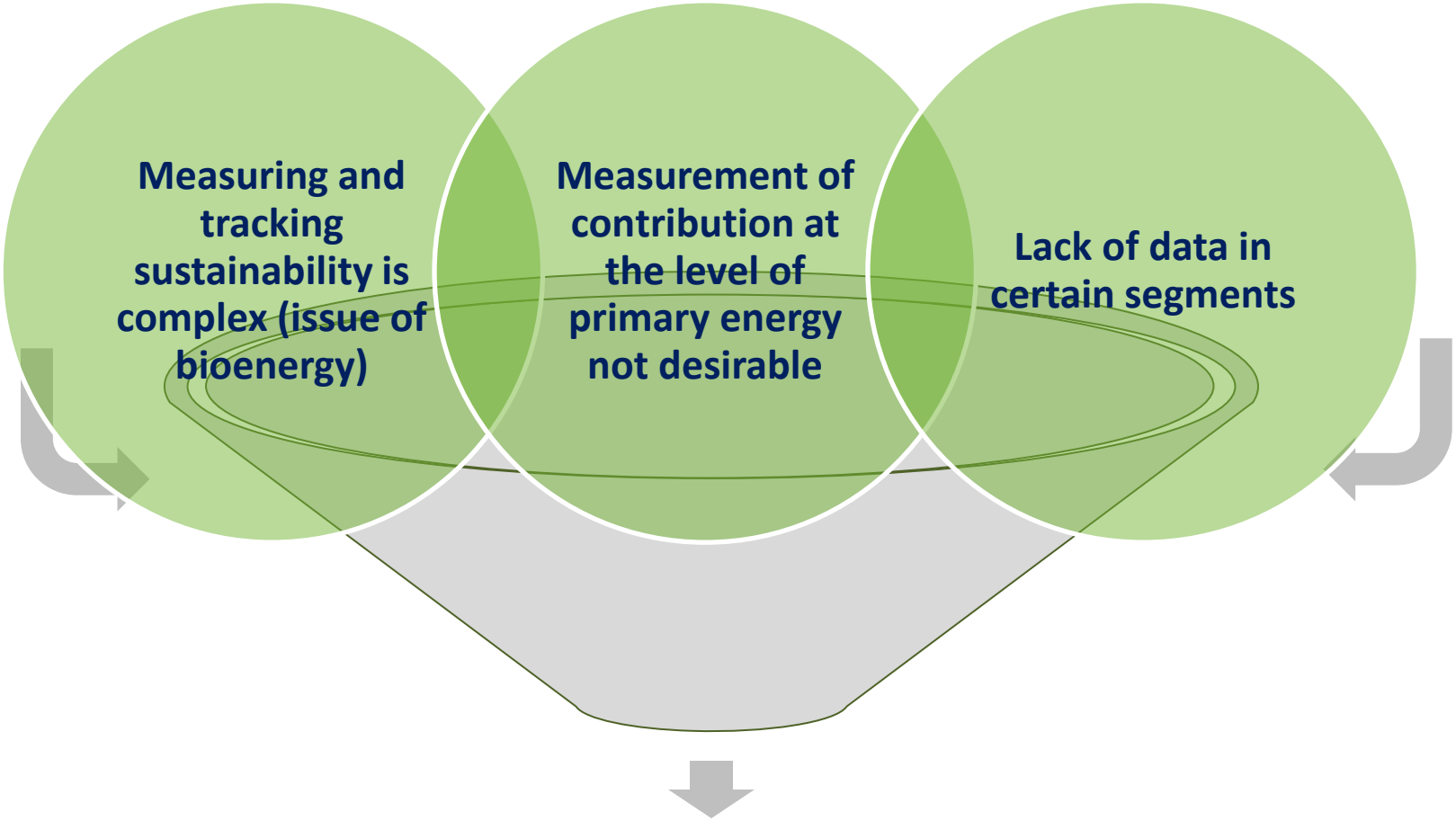
Improved tracking will entail more disaggregated data on energy input-output ratios in key economic sectors



Disaggregation of sectors, sub-sectors, and end uses in IEA energy indicators approach

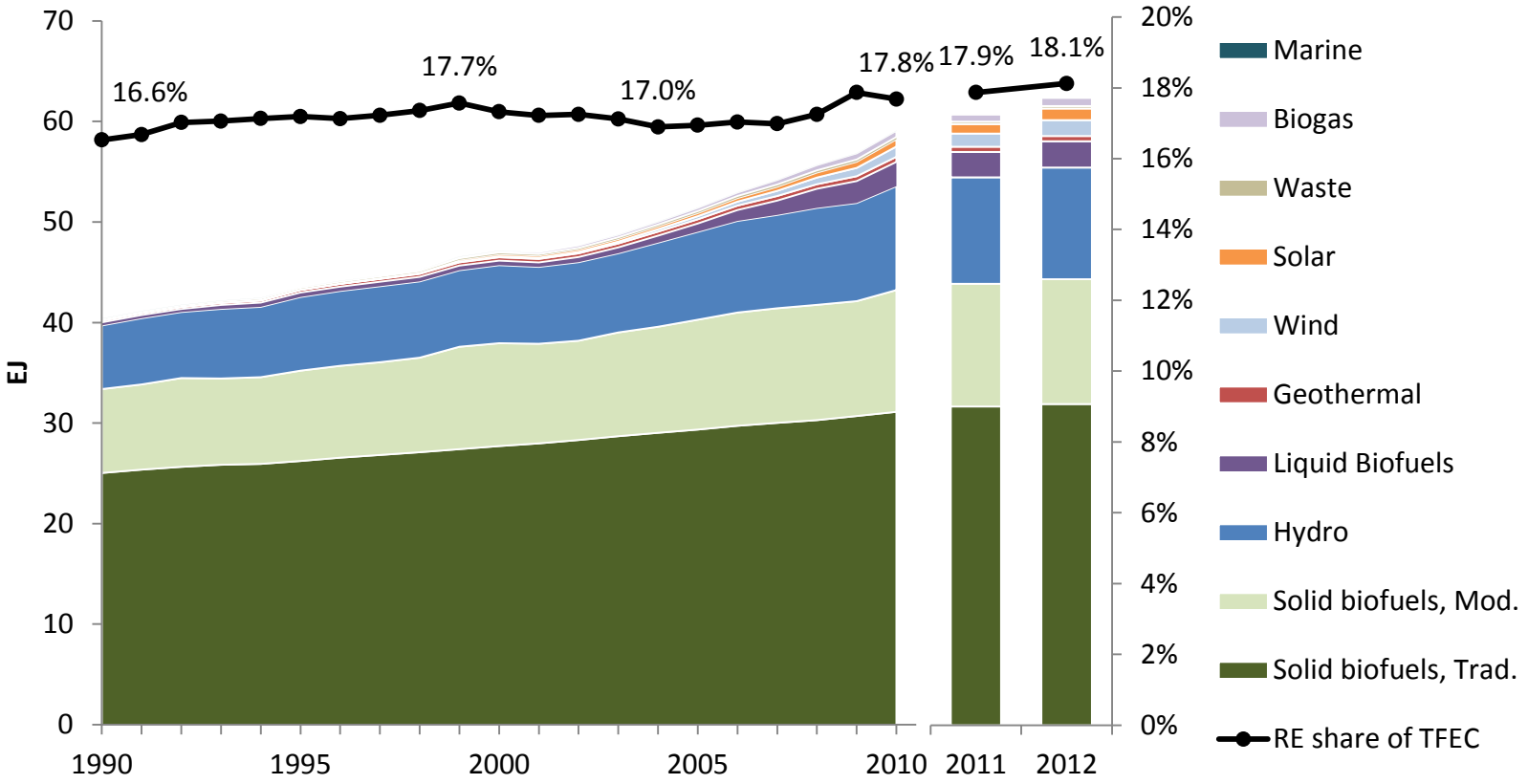
RENEWABLE ENERGY

A workable solution for renewable energy



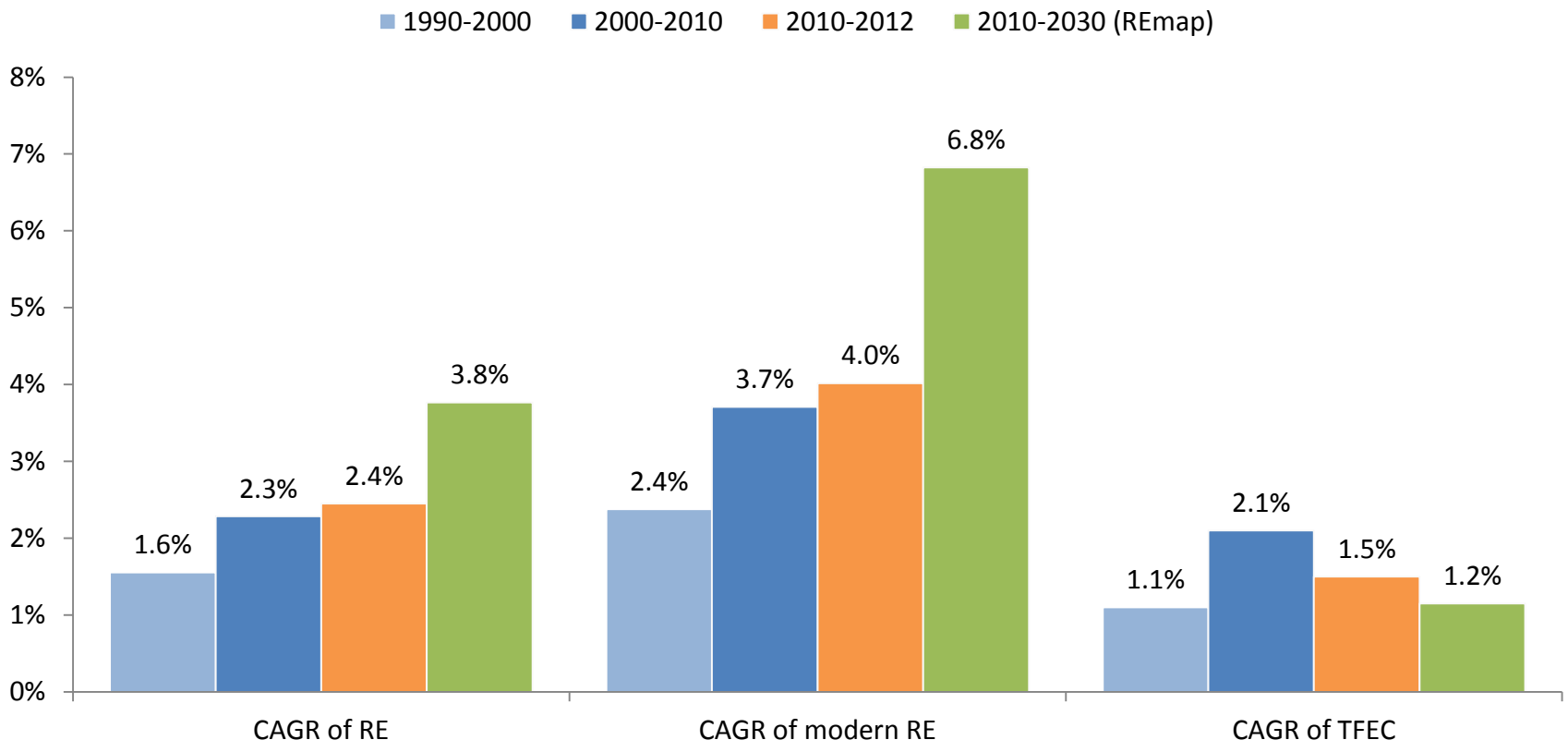
Percentage of total final energy consumption from renewable sources

The global renewable energy share increased by 0.3 percentage points from 2010-2012



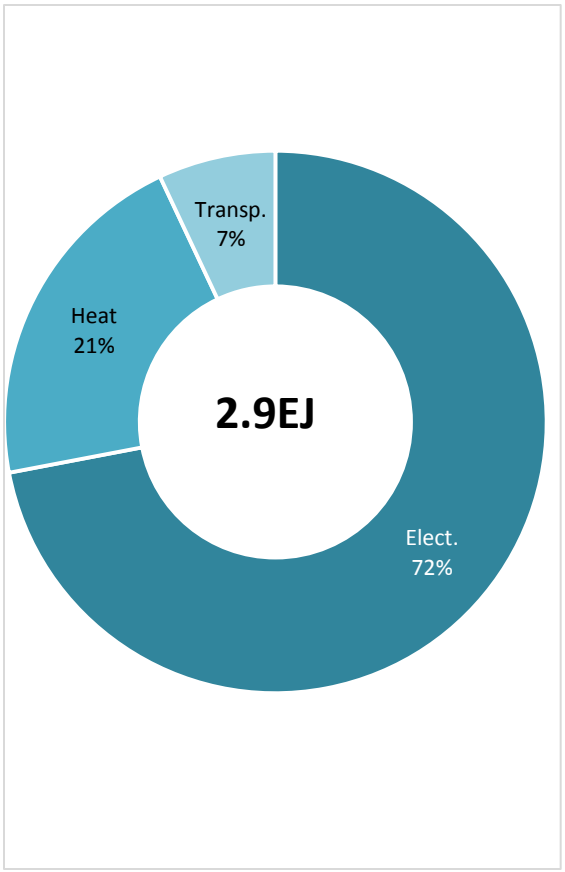
Total final consumption of renewable energy, level (left) and share of total (right)

Increase in renewable energy consumption accelerated but nowhere near the target level

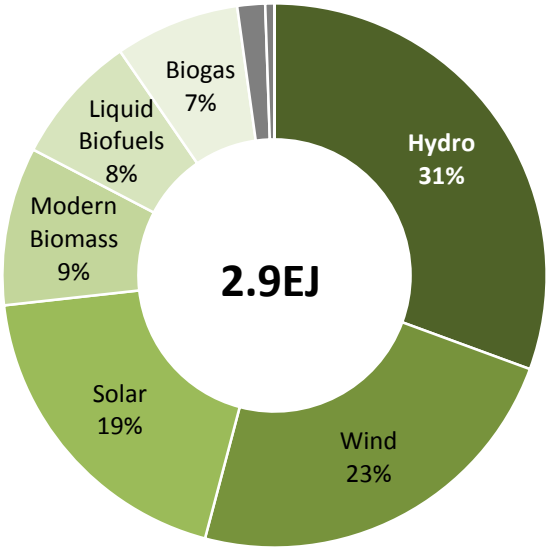


Annual percentage point increase of renewable and modern renewables share

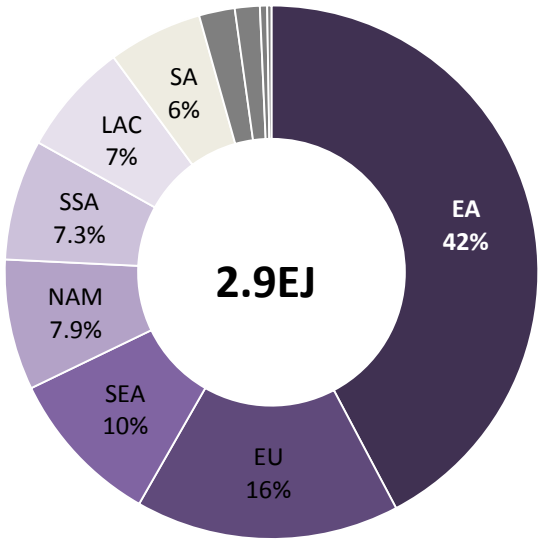
The additional renewable energy consumption 2010-2012 was equivalent to more than the energy usage of Argentina



Increment by sector

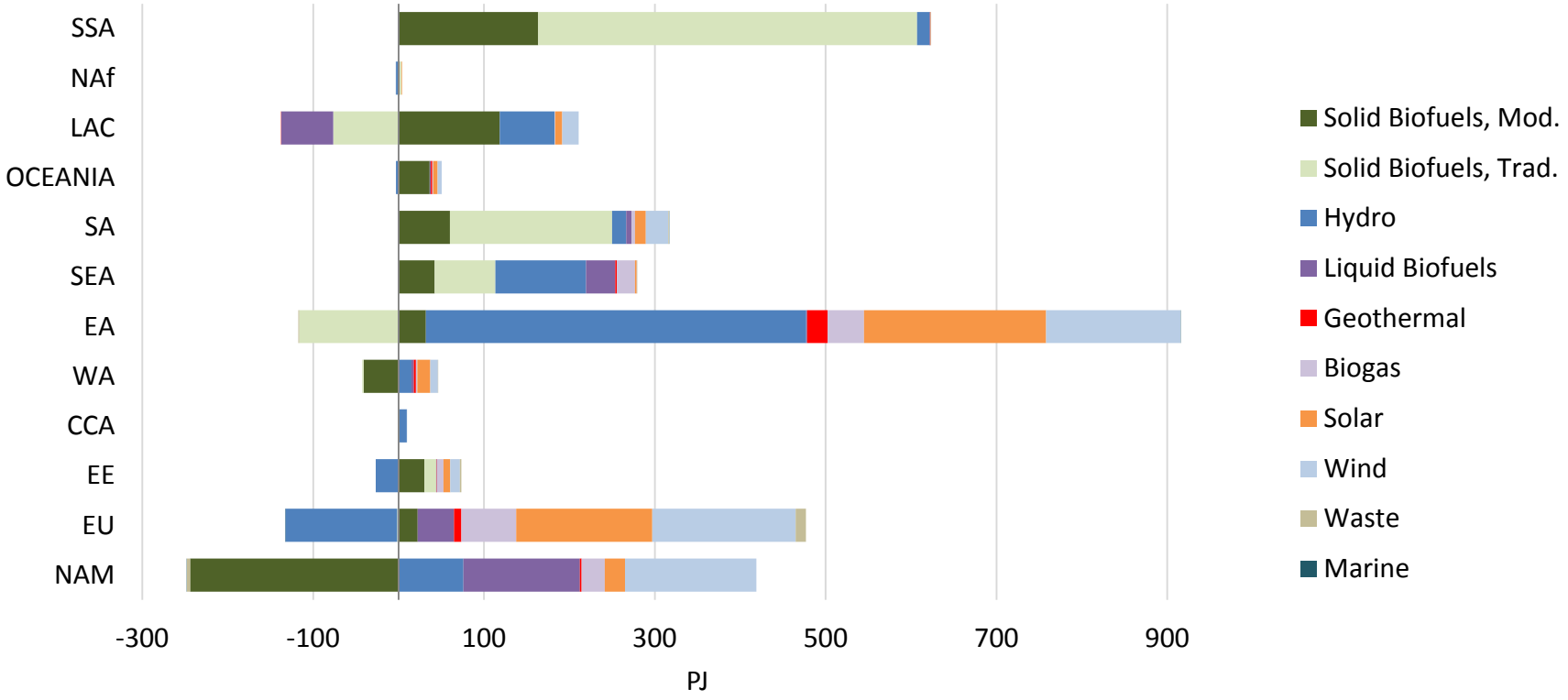


Increment by resource*



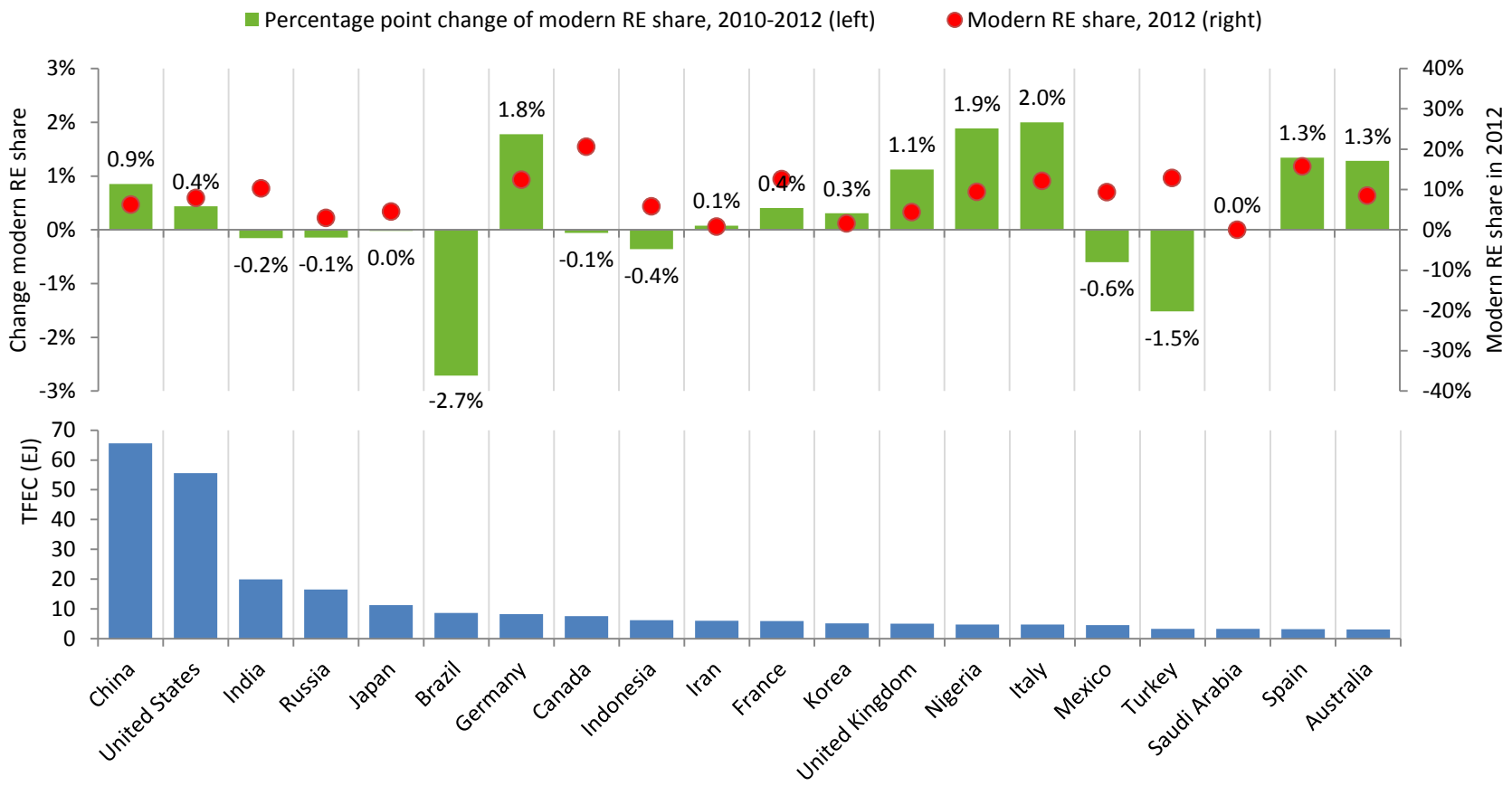
Increment by region

Wide variations across regions as to what types of renewable energy are increasing (and decreasing)



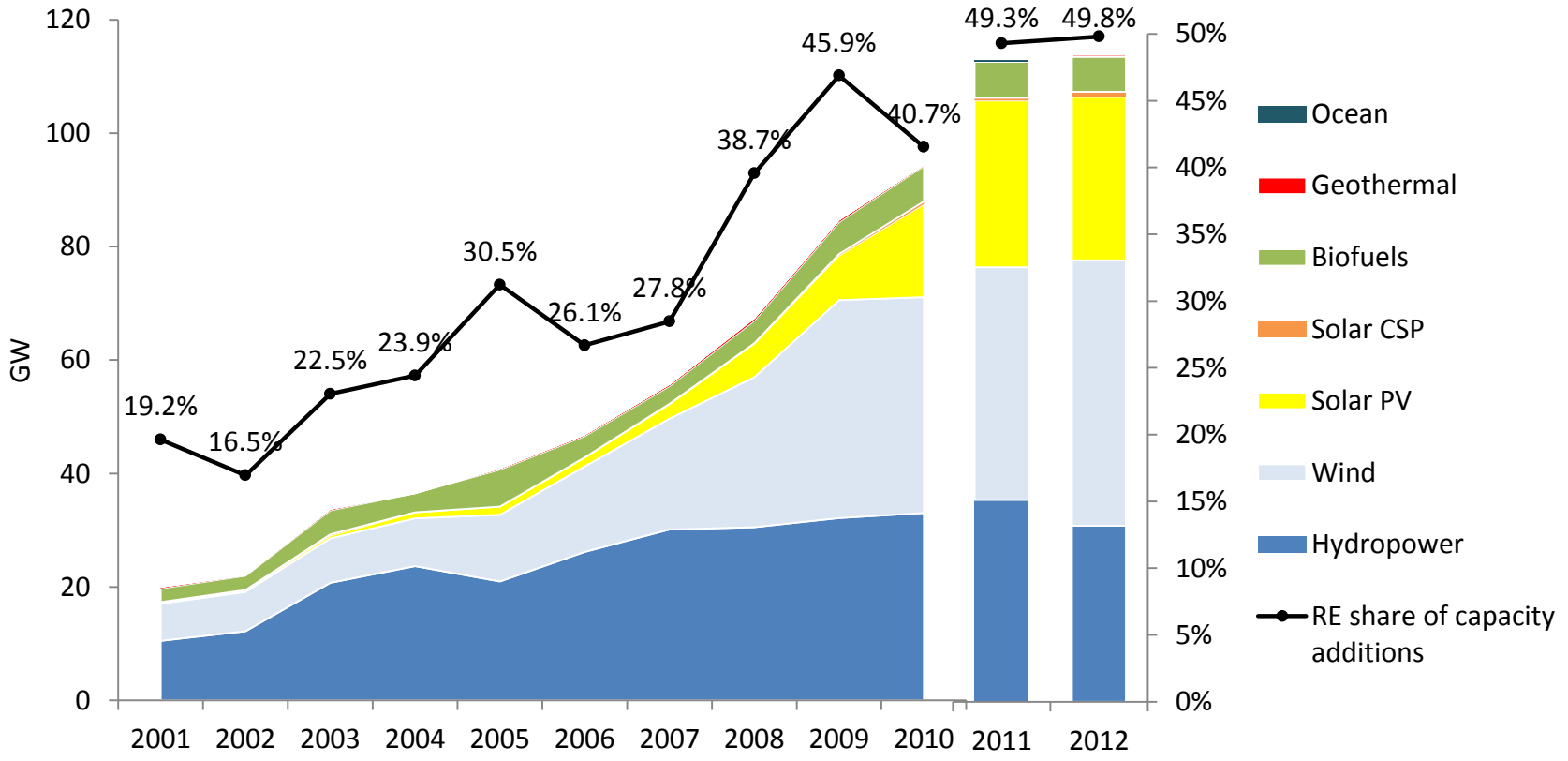
Renewable energy increment by region and resource, 2010-2012

Half of top 20 energy consumers expanded their renewable energy share from 2010-2012



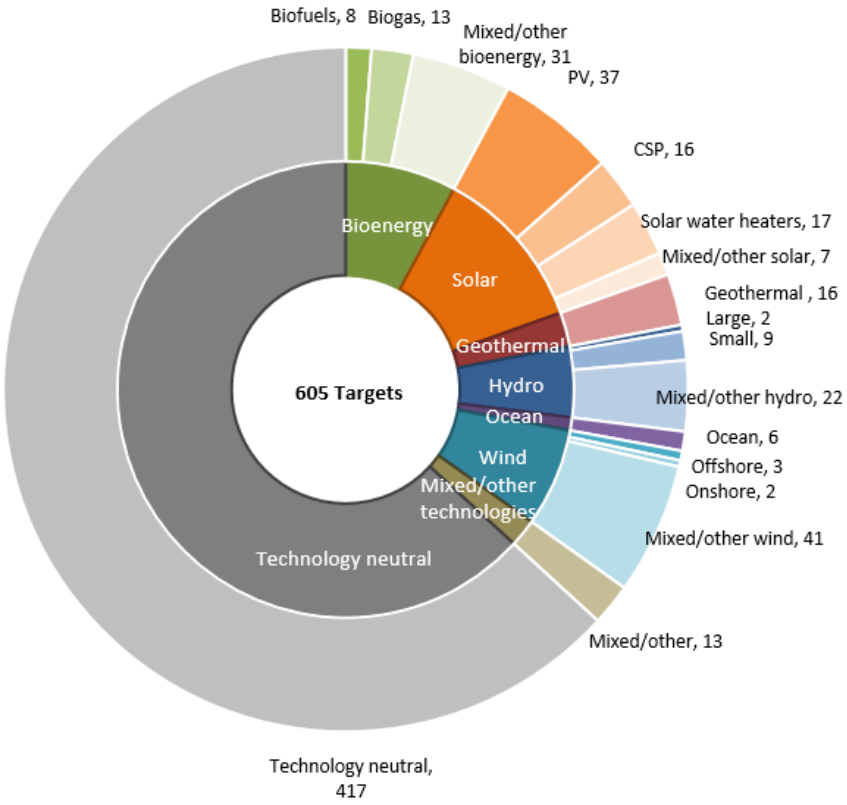
Top 20 energy consuming economies: change of modern renewables share, 2010-2012

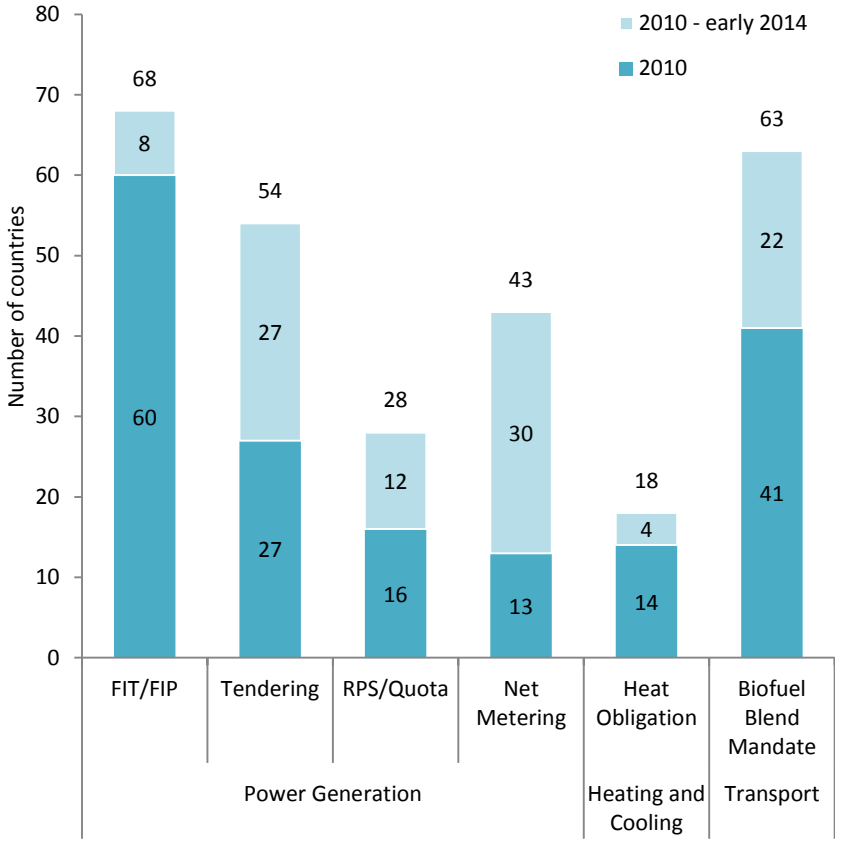
Renewable energy accounted for almost half of electricity generation capacity additions, 2010-2012



Capacity added (left) and renewables share of added capacity (right), 2001-2012

Continued strong growth in countries adopting renewable energy targets and incentives

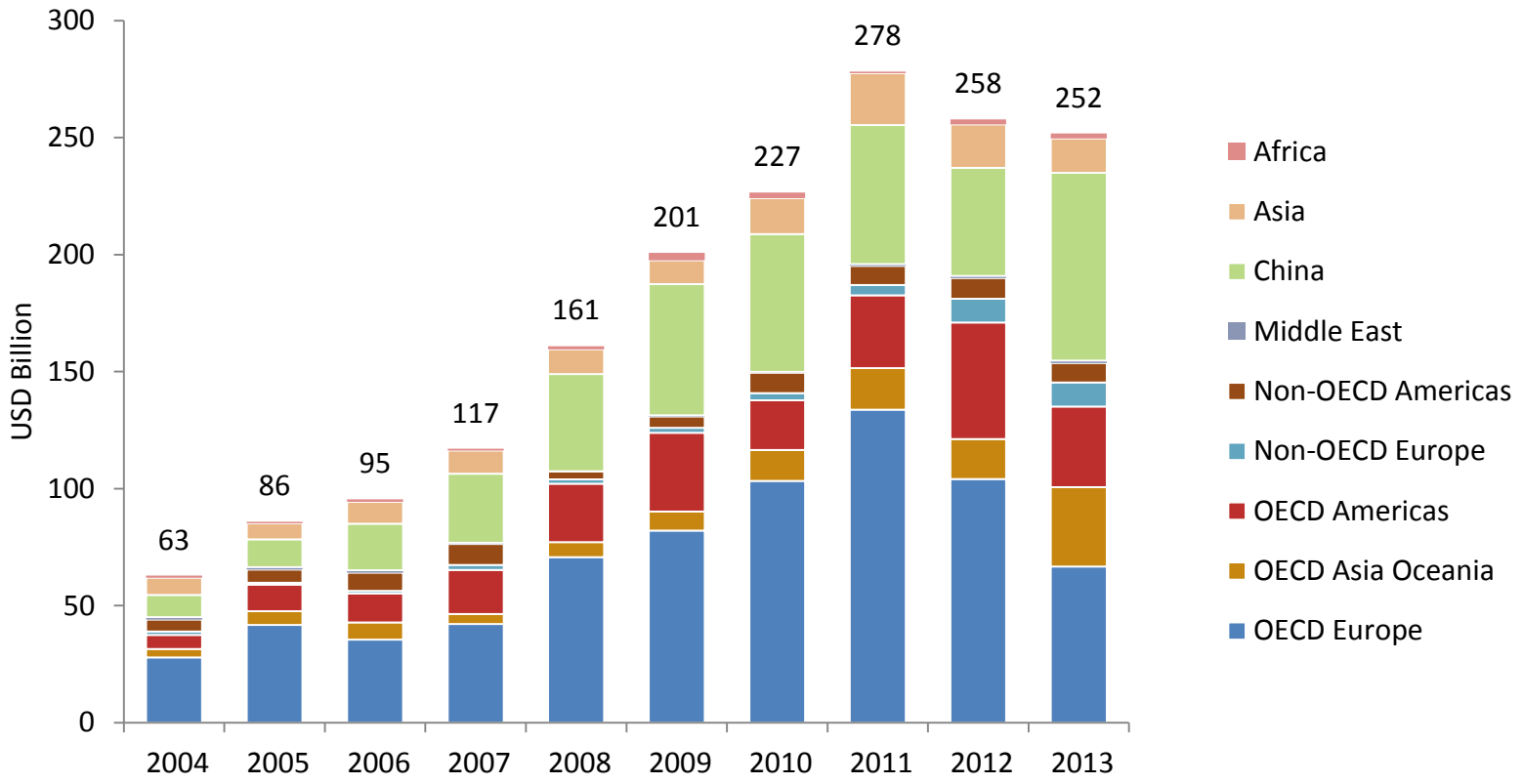




Renewable energy targets, 2014

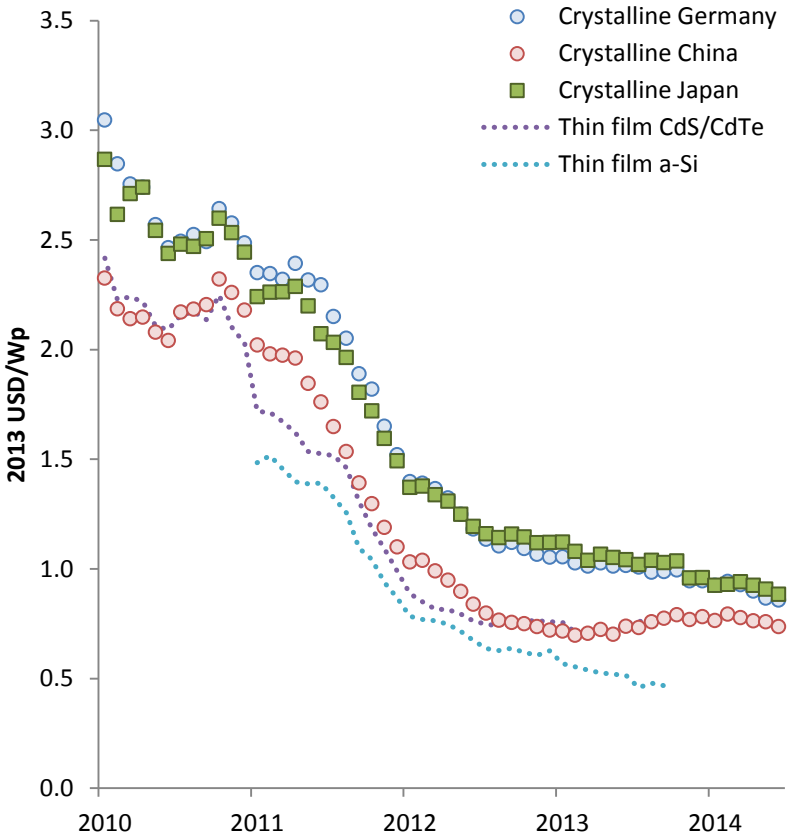
Regulatory support policies, 2010-2014

Global investment in renewable energy peaked in 2011 at USD 278 billion and has declined in recent years



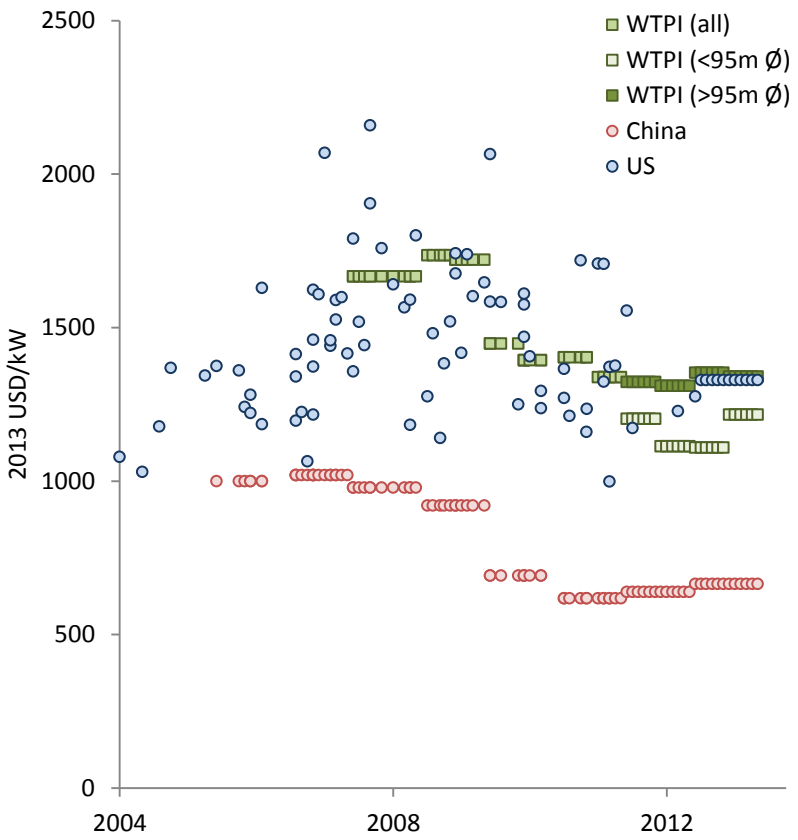
Global annual investment in renewable energy, 2004-2013

Cost reductions in wind and particularly solar PV have also lowered investment requirements



Solar PV module prices, 2010-2014

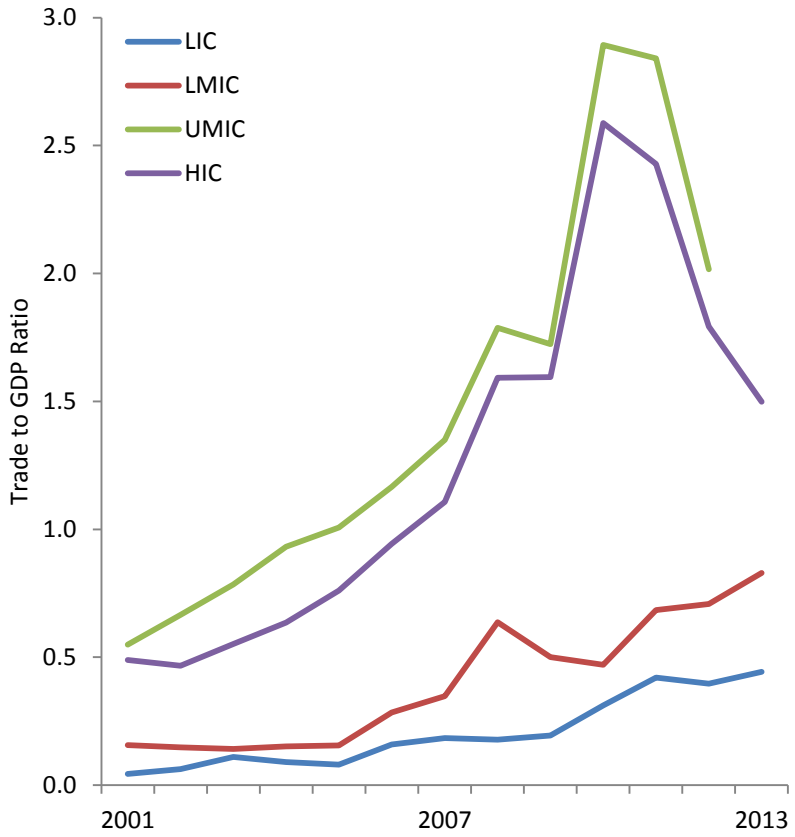
Source: pvXchange (2014) and GlobalData (2014)



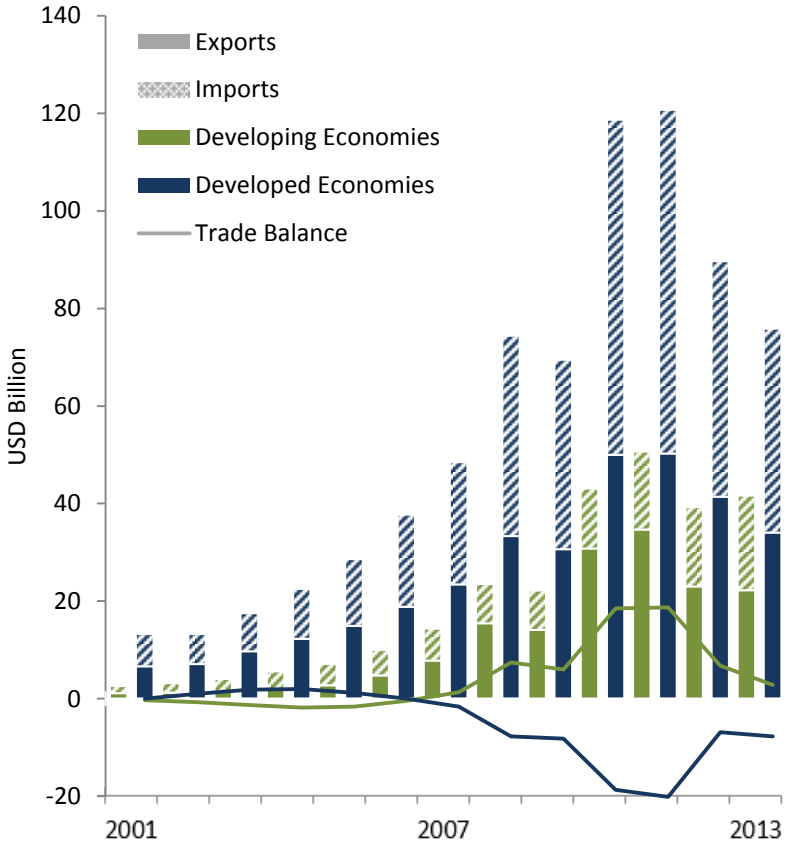
Wind turbine prices, 2004-2014

Note: WTPI: Bloomberg New Energy Finance Wind Turbine Price Index.
Source: IRENA Renewable Cost Database; BNEF, 2014; CWEA, 2013, LBNL, 2014, and GlobalData, 2014.

Developing countries increasingly engaged in clean energy trade



Evolution of clean energy trade to GDP ratio (wind turbines, solar PV/LEDs), 2001-2013



Balance of clean energy trade (wind turbines, solar PV/LEDs), 2001-2013

Towards a better understanding of solid biofuels for traditional energy uses

- Traditional solid biofuels accounted for 53% of global renewable energy consumption in 2012 (modern solid biofuels for about 18%, so together 70%)

- To answer whether traditional solid biofuel consumption is sustainable we must first define sustainability itself

- Sustainability has environmental, economic and social dimensions, a full tracking of which is not possible

- Yet **semi-quantitative indicators** (e.g. coverage of certification schemes) and **qualitative indicators** (e.g. those developed by the Global Bioenergy Partnership) exist which, when tracked over time, can help distinguish progress towards sustainable use of solid biofuels.

THE WAY FORWARD

SE4ALL Finance Committee highlights financing needs

	Actual (USD mln. p.a.)	Required (USD mln. p.a.)	Scale-Up
Energy Access	9	45	500%
Energy Efficiency	225	393 (615 WEO-450)	175%
Renewable Energy	244	320 (442 WEO-450)	131%
SE4ALL Total	478	758 – 1,102	158%

GTF goals and indicators closely match proposed post-2015 Sustainable Development Goals

Goal to be achieved by 2030		Indicator	1990	2010	2030
Access	Universal access to affordable, reliable and modern energy services	Percentage of population with electricity access	76	83	100
		Percentage of population with primary reliance on non-solid fuels modern cooking solutions	47	59	100
		Share of household income spent on fuel and electricity (affordability)			
		Number of hours or days per year without electrical or gas services due to unscheduled outages (reliability)			
Efficiency	Double the global rate of improvement in energy efficiency	Rate of improvement of energy intensity measured in primary energy terms and GDP at purchasing power parity		–1.3	–2.6
Renewables	Significantly increase the share of renewable energy in the global energy mix	Renewable energy share of total final energy consumption	16.6	18	36

Next steps

- SE4ALL Global Tracking Framework 2015 Update on track for publication in the spring
- Global Tracking Framework consortium interacting closely with UN Technical Teams working on SDG indicators
- Plans for a Global Energy Access Survey to be launched in 2015 applying multitier framework to all major access deficit countries
- Plans for a global rollout of RISE (Readiness for Investment in Sustainable Energy)
- Consortium committed to next update of Global Tracking Framework in 2017

SUSTAINABLE ENERGY FOR ALL

ENERGY NEXUS

Energy and Water

- Water and energy resources are inextricably linked. In the energy sector, water is used for generating hydropower, cooling thermal power plants, extracting, processing and transporting energy resources, and growing energy crops. Conversely the water sector needs energy to extract, treat and transport water, as well as for irrigation and desalination

- SE4ALL
  - Water is necessary for reaching universal access to energy
  - Water use varies by renewable energy technology
  - Increasing energy efficiency can contribute to improving water efficiency

- Indicators
  - Reliable and comprehensive data on the energy-water nexus is scarce.
  - Indicators must track water withdrawal, consumption and discharge, over time and space (at the power plant level)

Energy and Water, possible indicators

Water and energy nexus	Indicator	Source
Water requirements of the energy sector by energy source	Global water use for energy production by scenario	WWDR 2014
	Water footprint of energy generation by fuel	WWDR 2014
	Water use for electricity generation by cooling technology ISO certification	WWDR 2014
	Yields and water requirements for major biofuel crops	WWDR 2014
	Number of energy companies disclosing their water use (withdrawal, consumption, discharge)	New indicator
	Water intensity (m^3/GJ) by energy technology by regional climate	New indicator - collected from plants
	Water withdrawn and discharged by the energy sector	New indicator - collected from plants
	Use of alternative water sources (such as saline water and wastewater)	New
Energy requirement in the water sector	Energy requirements to deliver 1m^3 of water safe for human consumption from various water sources	WWDR 2014
	Energy requirements and cost implications of desalination by technology	WWDR 2014
	Power consumption trends in seawater reverse osmosis desalination	WWDR 2014
Water risks for energy companies	Level of water risk to business operations	CDP
	Water-related business impacts in the past five years	CDP
Environmental impacts of the energy sector on water resources	Quality of discharged water	New indicator
	Time, place, and quality of water abstraction and releases	New indicator
Policy and planning	Perceived change over the past 20 years in the importance of water for energy	WWDR 2014
	National energy policy/strategy/plan with water resources management component	WWDR 2014
	Water considered at planning stage or during project development	New indicator

Energy and Food Security

- Energy has a key enabling role in achieving food security which "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

- SE4ALL
  - Access to modern energy services in the agriculture sector contributes to increasing food production and food availability, while often improving farm income.
  - The uptake of renewable energy in agri-food systems helps decoupling the agricultural production from the fossil fuels market.
  - Energy efficiency in agriculture and agri-food systems usually has a positive effect on economic returns of food production in the long run through savings on energy costs.

- Indicators
  - Data already exists on inputs to "behind the farm gate" operations, use of traditional fuels and the effect of bioenergy development on food supply and prices.
  - Complementary indicators would include energy used to manufacture agri-food chain inputs, energy use beyond the farm gate, and renewable energy produced along agri-food chains.

Energy and Food Security, possible indicators

Food and energy nexus	Indicator	Source
Energy use for food production	Direct use of fossil fuel energy in agriculture per hectare of arable land (by agricultural product)) (J/ha)	FAOSTAT
	Direct use of fossil fuel energy in agriculture per unit of value of output (J/ USD)	FAOSTAT
	Direct use of fossil fuel energy in agriculture per unit of calorie of food produced (J/cal)	FAOSTAT
	Fossil fuel energy inputs in agri-food chains (beyond farm gate)	New indicator
	Renewable energy inputs in agri-food chains (beyond farm gate)	New indicator
	Energy intensity in agri-food systems per economic value of production	New indicator
Energy use for cooking	Share of people using traditional fuels vs modern fuels (i.e. gas and electricity) for cooking vs no cooking facility	FAOSTAT
Energy produced by the agri-food sector	Energy outputs in agri-food chains (beyond farm gate) by type of energy	New indicator

Energy and Gender

- Energy interventions are likely to impact women and men differently

- SE4ALL
  - Access to affordable modern energy services can reduce both time and effort spent in reproductive and productive labor, improve women's mobility and maternal health care
  - Women can, together with men, play a significant role as energy providers, expanding energy access to the poor and 'hard to reach' customers
  - Women and men respond differently to energy efficiency incentives and energy use alternatives

- Indicators
  - Existing surveys and databases shed light on the relationships between gender and energy, providing information on time poverty, women's economic empowerment, mortality and morbidity rates
  - However a quantitative assessment of differential impacts of energy on the lives of women, men, girls and boys is limited.

Energy and Gender, possible indicators

Gender and energy nexus	Indicator	Source
Access to modern energy services	Percentage of households with access to electricity, by sex of household head	UN Women
	Proportion of households with access to mass media (radio, TV, Internet), by sex of household head	UNSC
	Use of electrical appliances, by sex of household member	New indicator
	Percentage of households using solid cooking fuels, by sex of household head	UN Women
	Percentage of households using efficient cookstoves, by sex of household head	New indicator
	Percentage of micro and small business with access to electricity, by sex of owner	New indicator
Time poverty	Average weekly time spent on fuelwood collection, by sex and age of household member	UN Women
	Average weekly time spent in water collection (including waiting time at public supply points), by sex and age of household member	UN Women
	Average weekly hours spent on unpaid domestic and care work, by sex and age of household member	UNSC, UN Women
	Average weekly time spent in hand processing grain/tubers by sex and age of household member	New indicator
Women's empowerment	Gender gap in wages	UNSC
	Percentage of firms owned by women, by size	UNSC
	Proportion of energy entrepreneurs, by sex	New indicator
Health	Proportion of births supported by electricity	New indicator
	Mortality and morbidity rates due to indoor air pollution, by sex	WHO [confirm]
	Mortality and morbidity rates due to outdoor air pollution, by sex	WHO [confirm]

Energy and Health

- Energy is both an essential pre-requisite of good health, as well as a source of many serious health risks – most notably air pollution.

- SE4ALL
  - Access to reliable and affordable modern energy services can significantly reduce the burden of disease related to household (indoor) air pollution and plays a critical role in health care provision
  - Wider uptake of renewable energy, particularly for electricity, hot water heating and space heating of homes and health facilities, also have the potential to reduce indoor air pollution and enhance health care provision.
  - Energy efficiency improvements in power generation, transport and buildings can yield a range of health benefits, including reduction of urban air pollution

- Indicators
  - Existing indicators approximate exposure and burden of disease from indoor and outdoor air pollution. Measurement of electricity access in health care facilities is also being developed.
  - Ongoing efforts to improve energy-health nexus indicators, including development of safety standards for cooking solutions, exposure rates to indoor air pollution from heating and lighting

Energy and Health, possible indicators

Health and energy nexus	Indicator	Source
Household air pollution	Type of primary cooking fuel used in households	WHO
	Household air pollution indicators	WHO
	Estimated indoor air pollution exposure	WHO
	Estimated burden of disease	WHO
	Type of primary cookstove used in households	New indicator
	Type of secondary and beyond cooking fuel/devices used in households	New indicator
	Type of lighting and heating fuels used in households	New indicator
	Type of lighting and heating devices used in households	
	Mortality and morbidity attributed to household air pollution from all cooking, heating and lighting activities	New indicator
Outdoor air pollution	Air quality measures in urban areas	WHO
	Outdoor air pollution burden of disease	WHO
	Expanded and validated data on urban air pollution exposures for use in estimating urban burden of disease from air pollution exposures	New indicator
	Outdoor air pollution concentrations and exposures: contributions by sectors (e.g. transport-related emissions, housing-related emissions, etc.)	New indicator
	Proportion of safe active urban transport	New indicator
	Proportion of urban trips via walking/cycling	New indicator
	Proportion of urban trips via walking/cycling/ (typical range 1%-40%) in association with either: a) % pedestrians and cyclist fatalities in total traffic fatalities (typical range 10-40%) or; b) pedestrian/cycle fatalities per billion kilometres of annual pedestrian/cycle travel.	
	Multi-tier energy access in health facilities	New indicator
Energy access in health facilities		

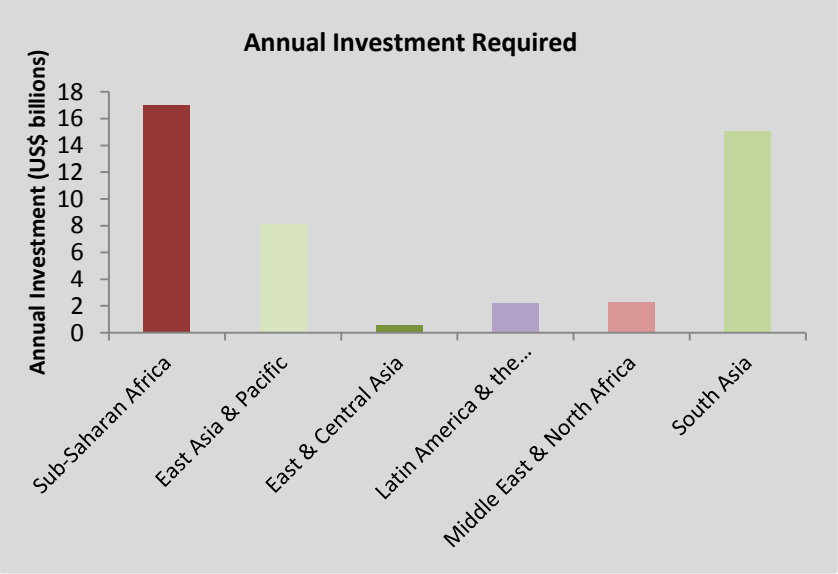
ANNEX 2: FINANCE

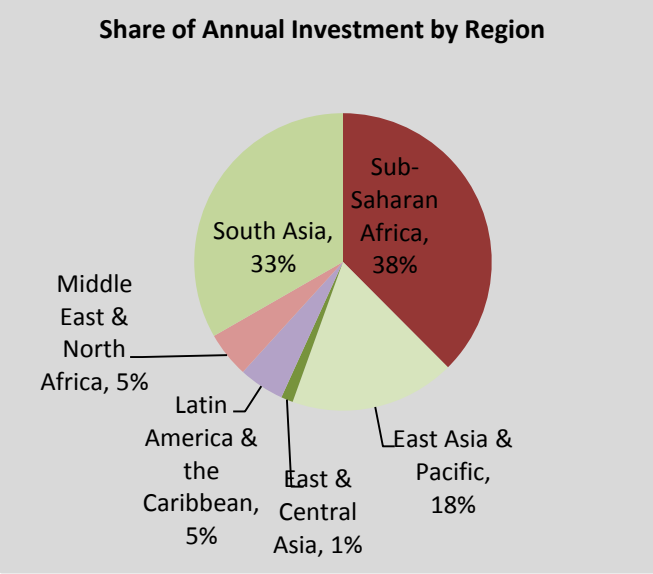
Significant investment needed to reach SE4ALL goals

		Energy Access	Renewable Energy	Energy Efficiency
As-Is	Target to achieve	**Universal access by 2030**	**Reach 30% of the global energy mix**	**Double global rate of improvement to -2.6% for 2010-2030**
	Technical Context	83% electricity access in 2010 (up from 73% in 1990)	18% renewable energy share in global energy mix	energy intensity decreased at -1.3% CAGR 1990 – 2010
	Financial Context	$9 billion	$214 billion *(BNEF)*	$300 billion *(IEA)*
Process	Key Actors	National/Regional governments Utilities/Electrification agencies Private developers		
	Key Influencers	SE4All, MDBs, ….		
	Key technologies	Rural and urban grid, rural mini-grids	Hydro and Wind	Transport and buildings
	High-Impact areas	India, Nigeria, Bangladesh	Central Asia, North America, Western Europe	North America, Central Asia, Former Soviet Union
Target	Annual investment criteria for success	**$45 billion**	**$320 billion**	**$296 billion**
Risks	Barriers to success	Poor implementation Lack of proper incentives	Large/quick ramp up in Wind and hydro needed Emerging economies need capacity to burden 60% of spend	
	Exclusions	Not considering access to non-solid fuels/cooking		
	Sources	IIASA – GEA, IEA – WEO, BNEF, WDI, World Bank data and analysis		

Ten countries represent 50% of investment need

Annual Investment of US$45b* required to reach SE4All electricity access goal

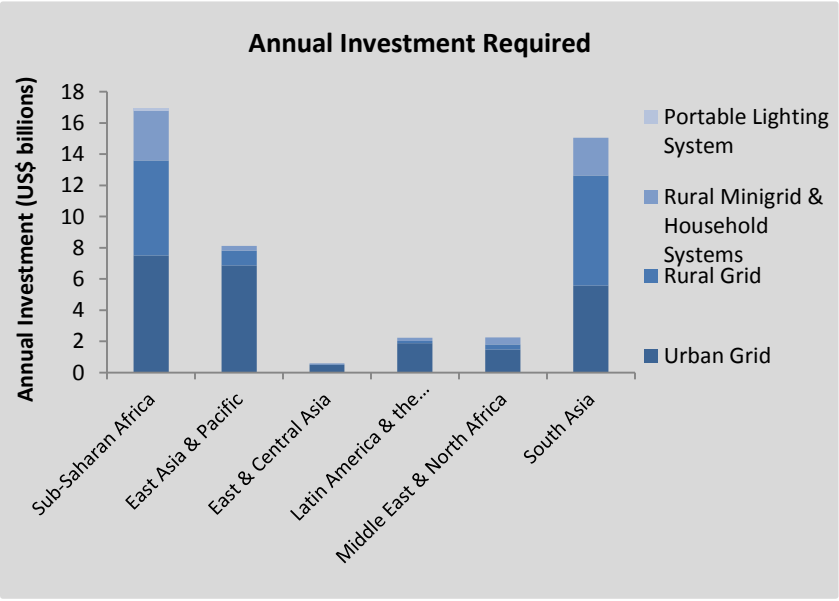


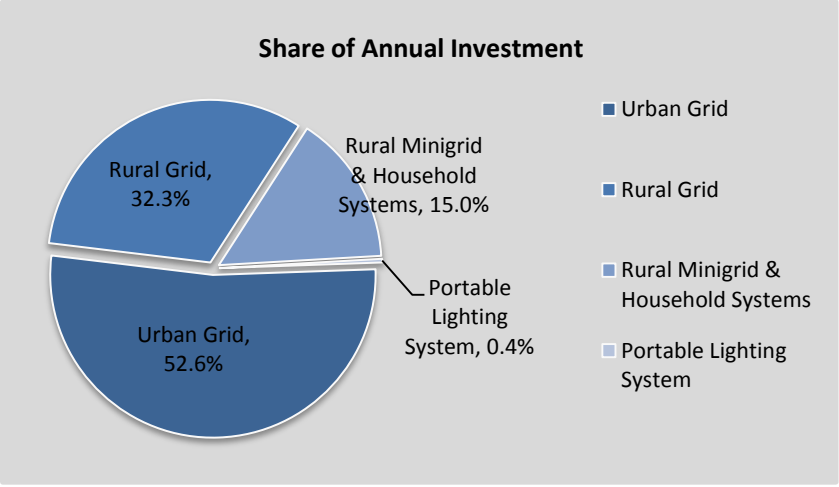


- Annual Investments of $45 billion are needed for universal access, a four-fold increase in 2010 spending of $9 billion
- Sub-Saharan Africa, South Asia and East Asia & Pacific have largest access deficit
- Much of the investment opportunity lies in rural areas
- Ten countries represent roughly 65% of access deficit and provide an opportunity of roughly 50% of annual investment needed

Source: World Bank

Grid based electrification represents 80% of need





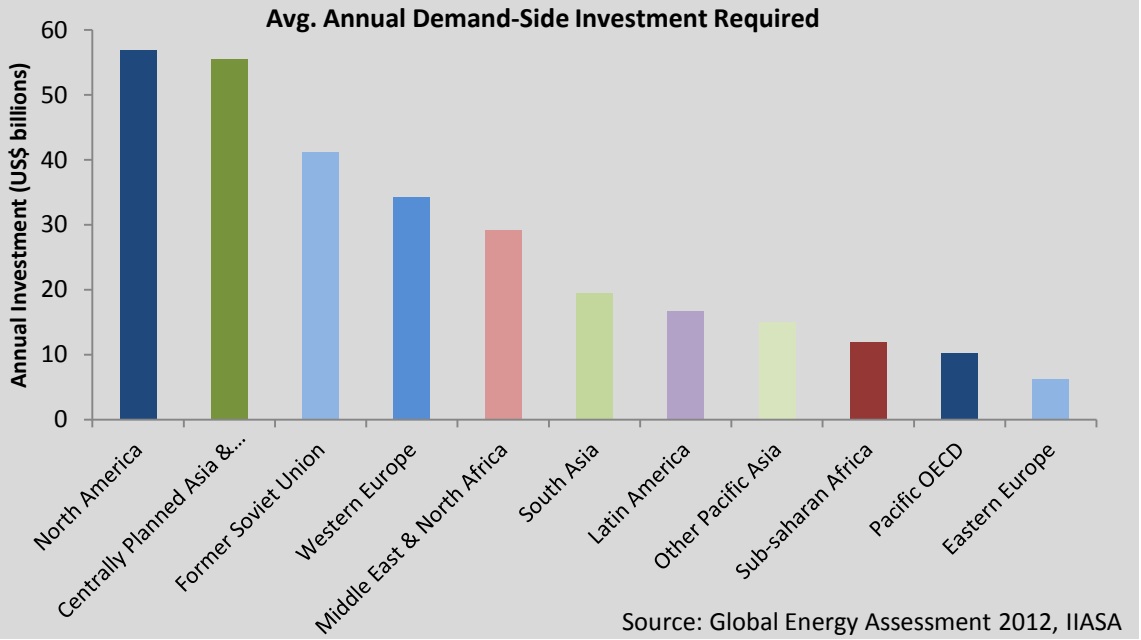
- Financing needs vary depending on many factors, including: type of investment, size, and type of service providers
  - **Grid** extension requires financing for large generation and transmission & distribution projects. Grants are also needed to incentivize household connections and make tariffs more affordable
  - **Micro-grids** face upfront costs, which are off-set by lower operation costs; therefore they typically need access to long-term credit
  - Smaller PV & biomass-powered village micro-grids or fee-for-service/lease-to-own **solar home systems** have a shorter-time repayment period & often need capital to expand scale; therefore equity/venture capital is most needed
  - **Portable lighting products** distributors need working capital and trade finance. User-finance is also critical
  - Grants may also be needed to make off-grid solutions more affordable and to support a rapid scale-up

NOTE: the share between rural grid and off-grid is indicative. It will depend on the utilities' ability to expand the grid in the required time-frame, and the extent of mobilization of private sector investments in off-grid solutions

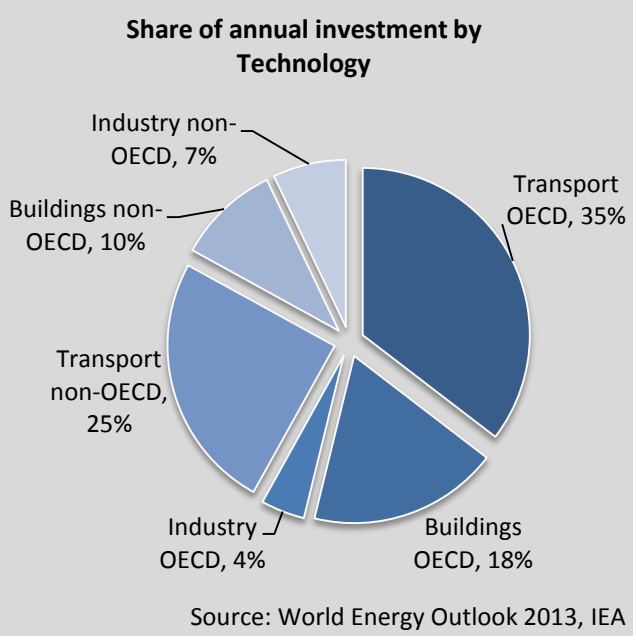
Source: World Bank

Energy efficiency investment needs 30% increase

Annual Investment of US$296b required to reach SE4All goal



Source: Global Energy Assessment 2012, IIASA



Source: World Energy Outlook 2013, IEA

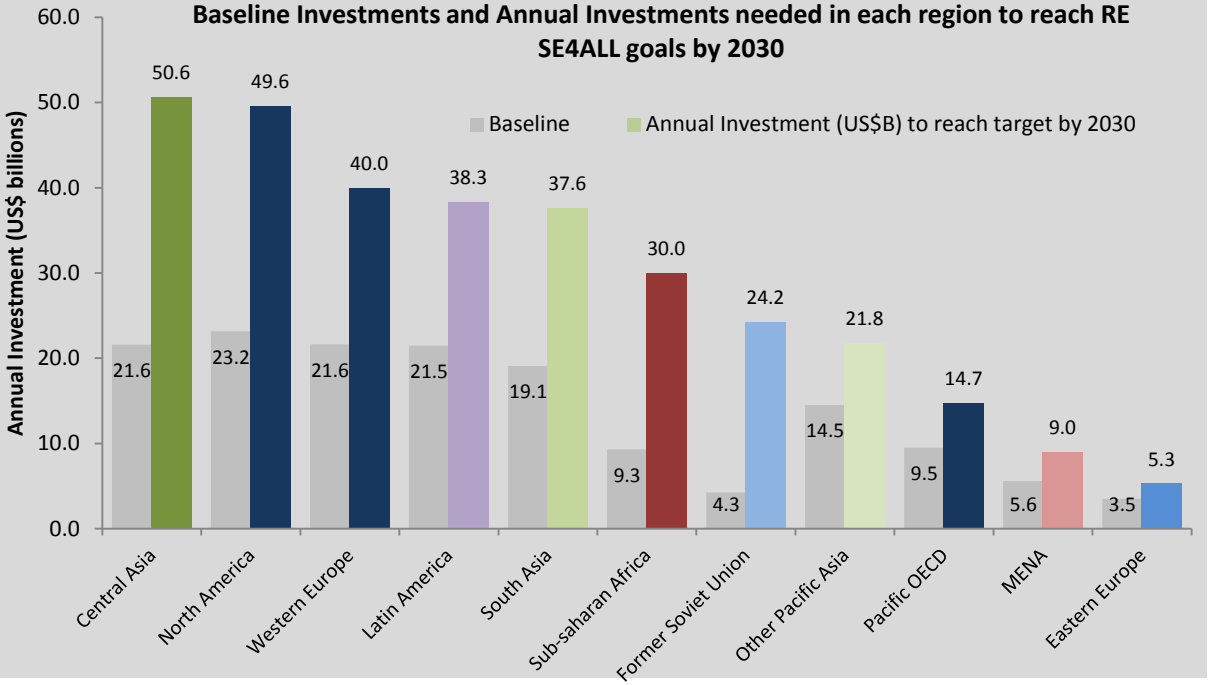
- GEA estimates that $259 to 366 billion (296 on average) is required
- IEA estimates that investment in key energy efficiency markets worldwide totaled up to $147 to 300 billion (225 on average) in 2011
- The recent trend of investment in energy efficiency must be sustained over the long-term to achieve this goal

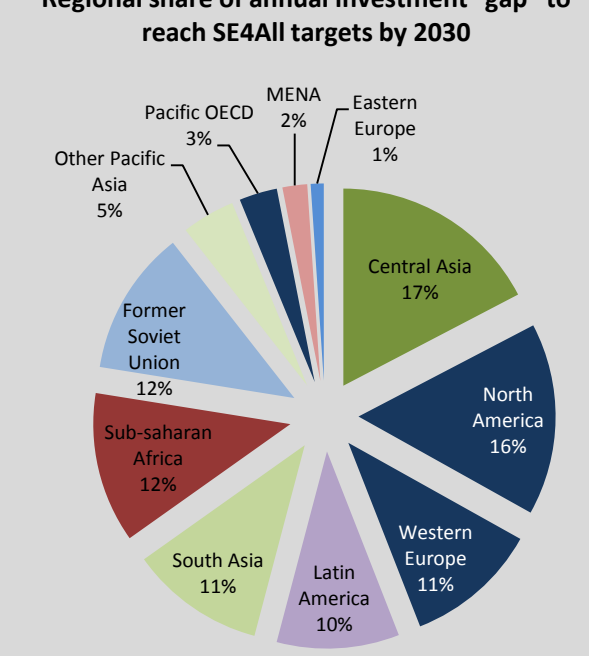
Source: Global Energy Assessment 2012, IIASA; World Energy Outlook 2013, IEA

60% of needed renewable investment in emerging economies

SUSTAINABLE ENERGY FOR ALL

Annual Investment of US$321b required from a current baseline of US$154b to reach SE4All goal

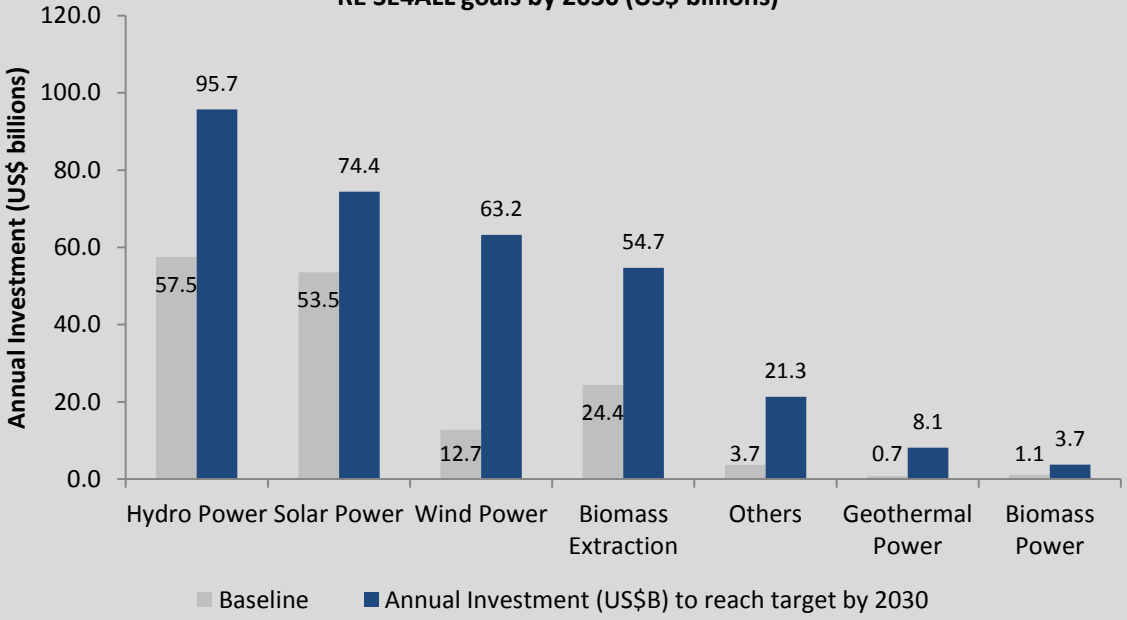


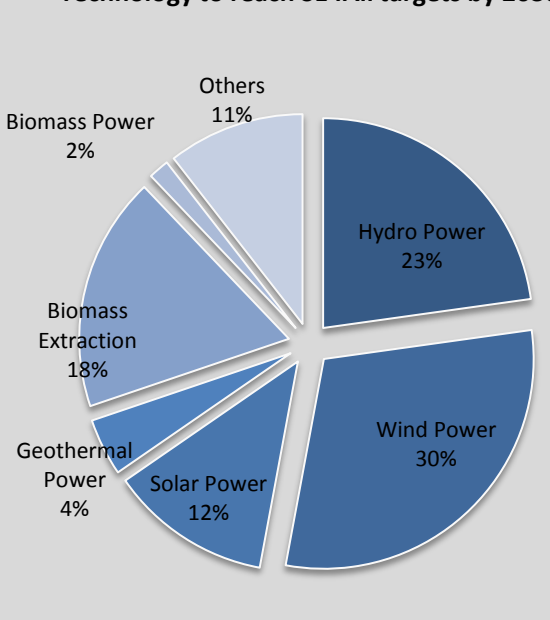


- Former Soviet Union (driven by Russia) and sub-Saharan African countries need to increase investment 4x and 2x respectively to meet targets
- Largest annual funding gaps in absolute terms exist in Central Asia (driven by China), North America (driven by USA) and Western Europe

Source: Global Energy Assessment 2012 by IIASA; Bloomberg New Energy Finance 2013; World Bank

Hydro and wind make up majority of renewable funding gap



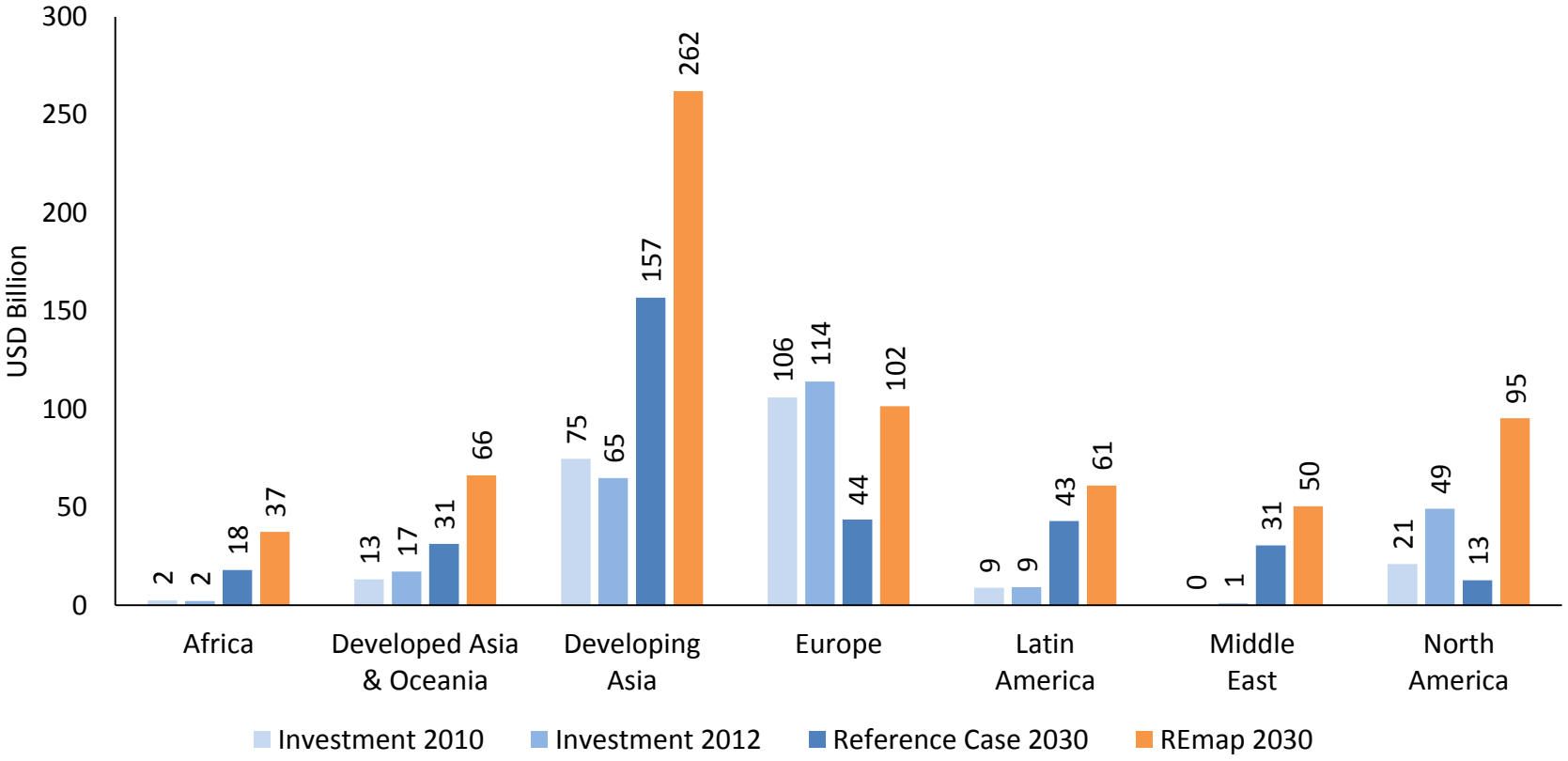


"Others" includes synthetic fuels, hydrogen and hydrogen fuel cells from renewables

- 10x investment in Geothermal and 4x investment in Wind needed per year to reach SE4ALL targets
- Wind and Hydro also have the largest investment gap in absolute terms per year to reach SE4ALL targets

Source: Global Energy Assessment 2012 by IIASA; Bloomberg New Energy Finance 2013; World Bank

Still, most regions require significant scale up of renewable energy investment to meet target



Past, projected and required annual renewable energy investment $bln