Facing the global energy trilemma: growth, climate and universal access

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Climate Finance e accesso universale all'energia
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**Le opinioni espresse non impegnano in alcun modo la Banca d'Italia*

1. we need more and more energy to sustain growth ...
2. ... but it is imperative to move towards a low-carbon energy system *in a just way*...
3. ... while providing modern energy to a fifth of the population that lacks access to electricity and to the 40% relying on traditional biomass

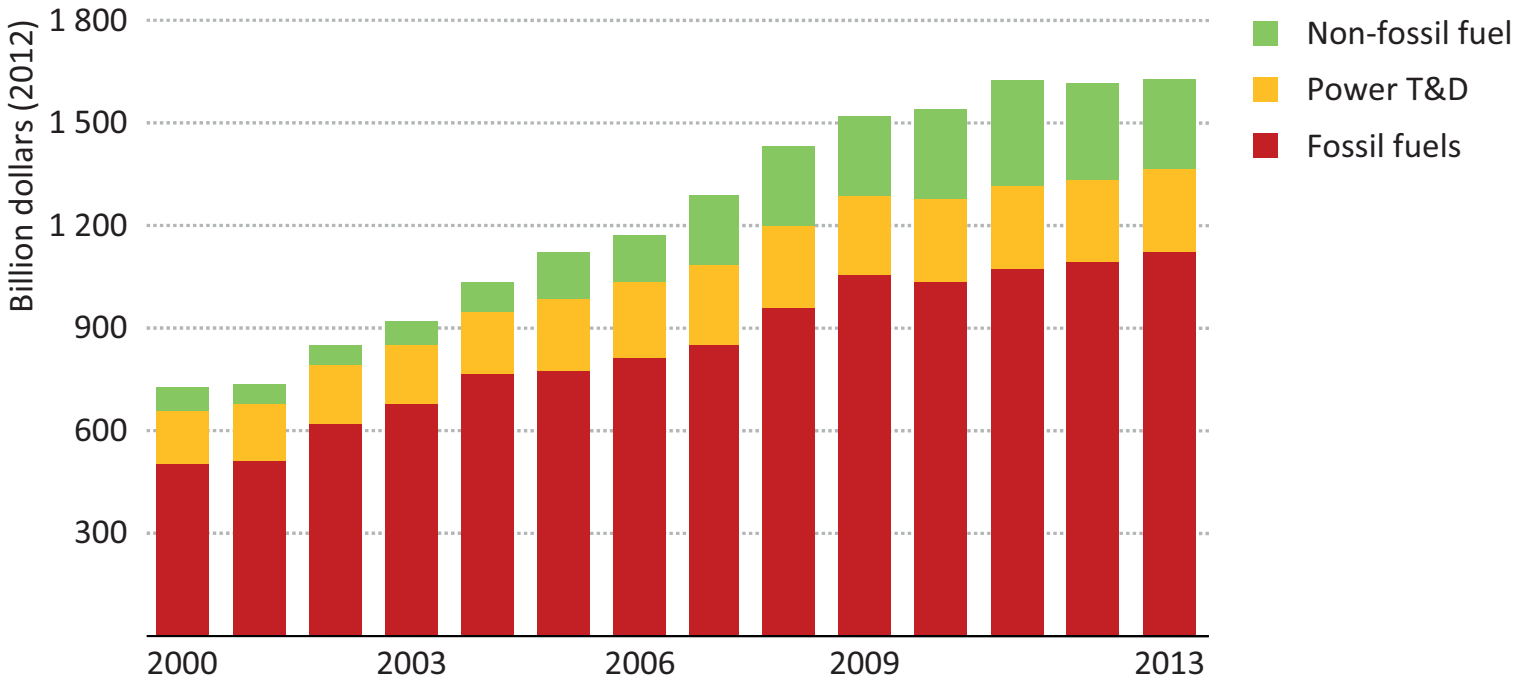
In the last two decades energy demand increased by a 1.5 factor and could further increase by 50 per cent reaching 20 Gtoe. Ample scope for a shift of the energy sector towards low-carbon fuels, but in 2040 energy needs still largely based on fossil fuels (from 80% in the BAU to 60% in the 450 ppm scenario)

World energy primary demand (Mtoe)

	1990	2013	2040 Scenarios		
			Current Policies	New Policies	450 ppm
Coal	2,221	3,929	5,618	4,414	2,495
Oil	3,237	4,219	5,348	4,735	3,351
Gas	1,662	2,901	4,610	4,239	3,335
Nuclear	526	646	1,036	1,201	1,627
Hydro	184	326	507	531	588
Bioenergy	905	1,376	1,830	1,878	2,331
Other renewables	37	161	693	937	1,470
Total energy demand	**8,772**	**13,559**	**19,643**	**17,934**	**15,197**

Source: WEO 2015

Satisfying the increasing thirst for energy required an increasing amount of economic resources. Investments in global energy supply more than doubled since 2000 (reaching over 1.6 trillion dollars) while energy demand increased by a 1.3 factor.
In the future **annual investments will require over 2 trillion dollars** - almost half devoted to oil and gas upstream



Source: WEIO 2014

The bulk of these costs will be sustained by Emerging Countries (EC) in order satisfy an increasing energy demand and to develop their energy infrastructures; a significative chunk will also be necessary for the decarbonisation of Developed Countries

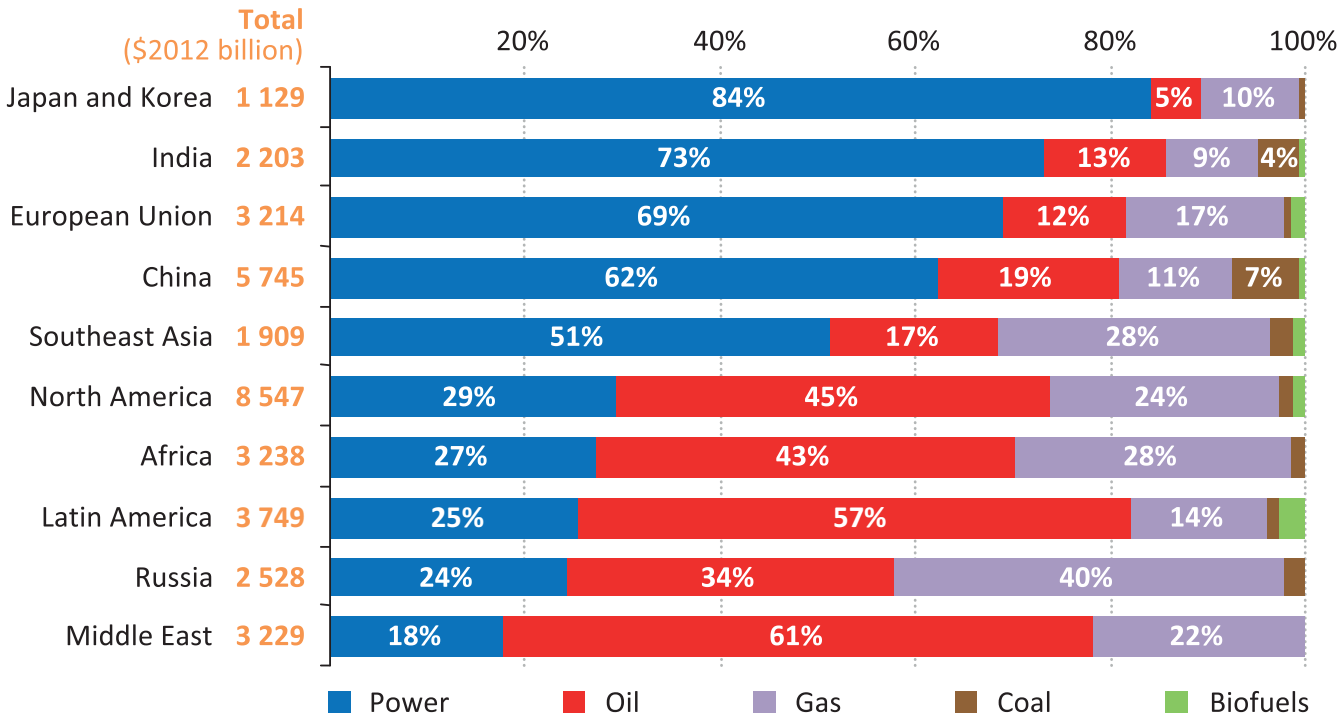
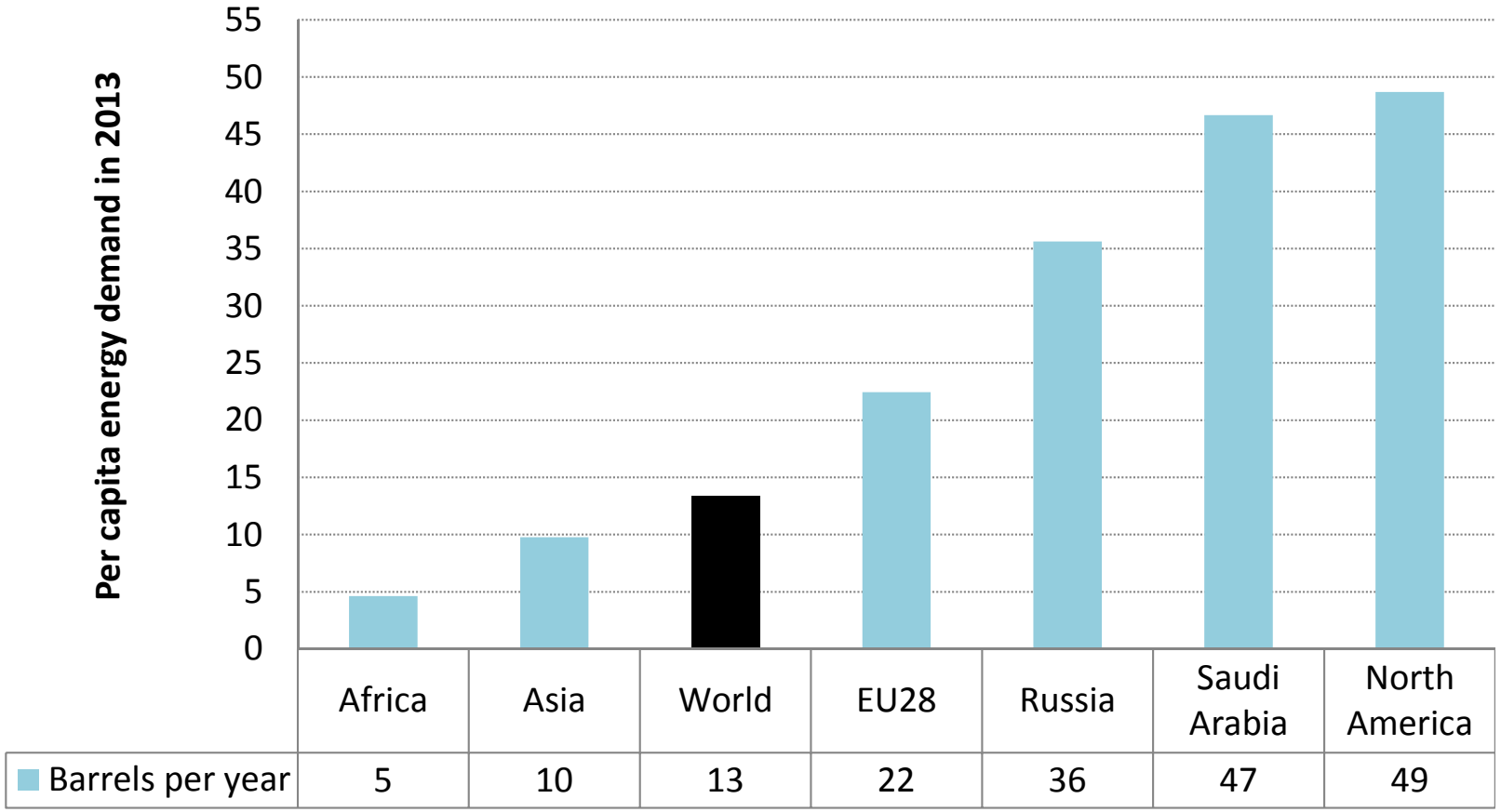
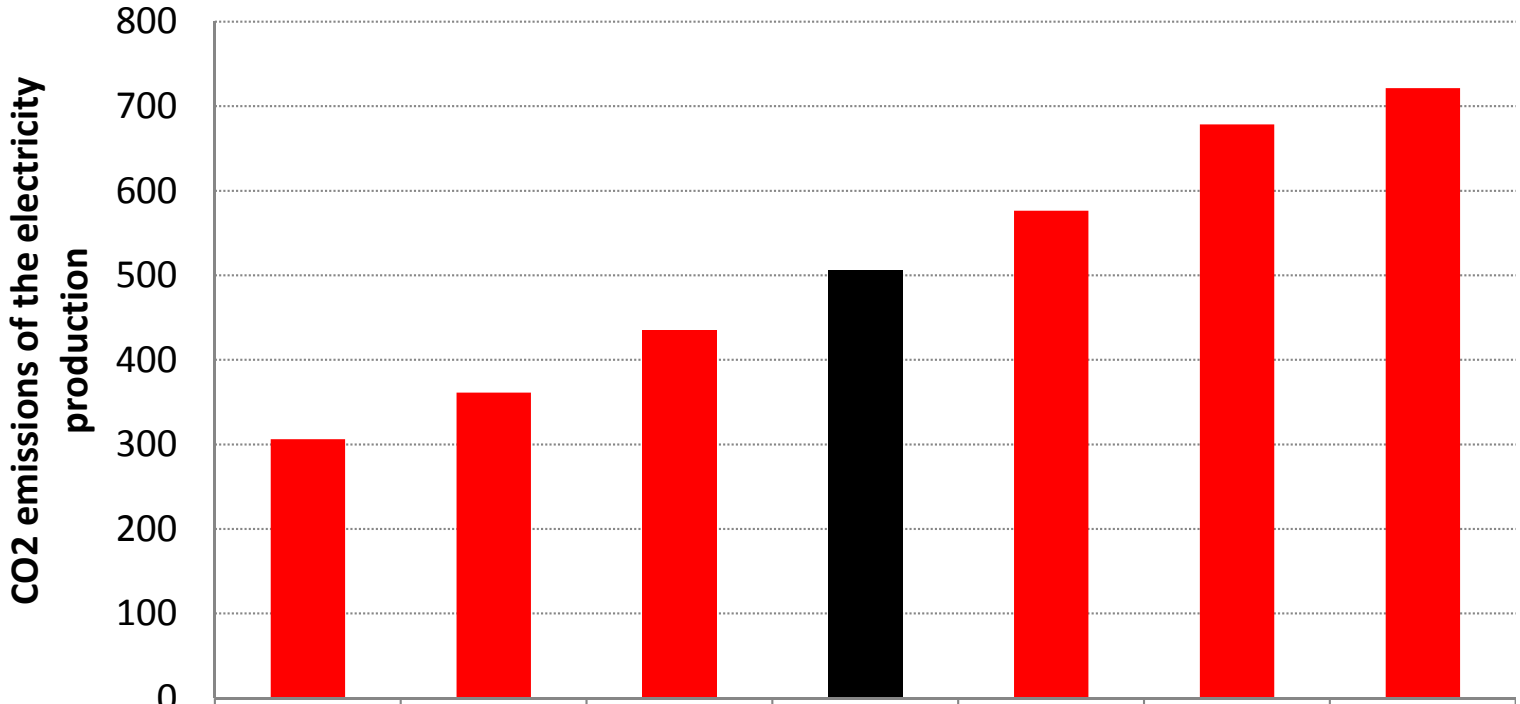


Figure: Cumulative energy investment by regions and type in the New Policies Scenario, 2014-2035. Source: WEIO 2014.

Per capita energy use is unequally distributed: ECs energy demand is catching-up ...



... but they should deploy less carbon intensive energy



	EU28	Russia	North America	World	Africa	Asia	Saudi Arabia
gCO2/kWh	306	361	435	506	576	679	721

Limiting the increase in the global temperature to 2°C requires a drastic curb in fossil fuel use. Improving energy efficiency, decarbonising energy supply (e.g. increasing renewable share in power generation, phasing out coal-fired plants unless CCS-assisted) and enhancing carbon sinks

Energy-related CO_2 emissions (Gt)

			New policies			450 ppm		
	2005	2012	2020	2030	2040	2020	2030	2040
United States	5.8	5.0	5.1	4.5	4.1	4.8	3.0	1.9
European Union	4.0	3.4	3.1	2.7	2.3	3.0	2.0	1.4
Japan	1.2	1.2	1.0	0.9	0.8	1.0	0.7	0.4
China	5.4	8.2	9.5	10.2	10.0	9.0	6.3	3.6
India	1.2	2.0	2.5	3.5	4.5	2.4	2.3	2.2
World	**27.5**	**31.6**	**34.2**	**36.3**	**38.0**	**32.5**	**25.4**	**19.3**

Source: IEA website and WEO 2014

Achieving the 450 ppm target by 2040 implies an amount of global resources devoted to climate change mitigation of **about 2.4 trillion dollars per year, twice as much compared with the baseline scenario** (1.2 trillion). In the 450 ppm scenario, clean energy commitments are more demanding in India, where investments in 2040 should be 18 times those in 2012 (compared with 6 in China, 5 in US and Japan and 3 in the EU)

Clean energy investment under different scenarios (G$ 2013)

		New policies			450 ppm		
	2012	2020	2030	2040	2020	2030	2040
United States	57	98	151	184	124	268	280
European Union	109	172	215	217	241	350	341
Japan	16	27	34	43	37	64	77
China	77	165	184	227	197	341	452
India	14	32	65	98	40	157	252
World	**355**	**709**	**987**	**1,238**	**881**	**1,814**	**2,411**

Source: WEO 2014

Common but differentiated responsibilities: Developed countries are responsible for 60% of historical emissions.

CO_2 Cumulative Emissions (1850-2011) compared with annual emissions in 2014

	Gt	Percentage of world total	(annual shares in 2014)
United States	361.3	28	(17)
European Union	325.5	25	(10)
Japan	49.9	4	(4)
China	140.9	11	(28)
India	35.6	3	(6)
World	**1,304.7**	**100**	**(100.0)**

Source: CAIT 2.0

Climate Finance: developed countries transfers financial resources to the less-developed nations with the purpose of mitigating greenhouse gas emissions and of increasing the resilience of local communities in order to adapt to climate-induced events

- In 2009 the Copenhagen Accord attempted to extend to developing nations mitigation actions in order to slow the growth in their emissions
- As a compensation, the Copenhagen Accord requested that both public and private resources were collected in order to satisfy the needs of ECs for mitigation and adaptation.

Climate Finance resources should amount to 100 G$ per year by 2020; more then 100 G$ after 2025 (one of the achievement of the recent Paris Agreement)

- According to the OECD and the Climate Policy Initiative, developed countries collectively mobilized 52.2 G$ in 2013 and 61.8 in 2014.
- The needed private resources for mitigation can be collected only reducing the uncertainty on future energy prices, regulation and policies (IFIs/MDBs assistance can help in providing de-risking facility).
- We need to establish a **universal system of carbon pricing** (carbon tax, cap-and-trade, fossil fuels subsidies phasing-out).

Climate Finance: where the developed countries will find the needed resources?

- In order to regularly collect public resources to finance climate initiatives transparent and stable source of financing should be linked to the climate policies adopted in the country of origin (e.g., EU ETS, carbon tax).
- It is strategic to connect the discussion on Climate finance with the initiatives aimed at improving energy access (one of the 17 sustainable development goal). In this case also the flows of funds devoted to relieve energy poverty should be accounted as Climate financing.

Achieving universal access requires a substantial addition to current spending (45 G$ per year until 2030 compared with about 5 G$ in 2013)

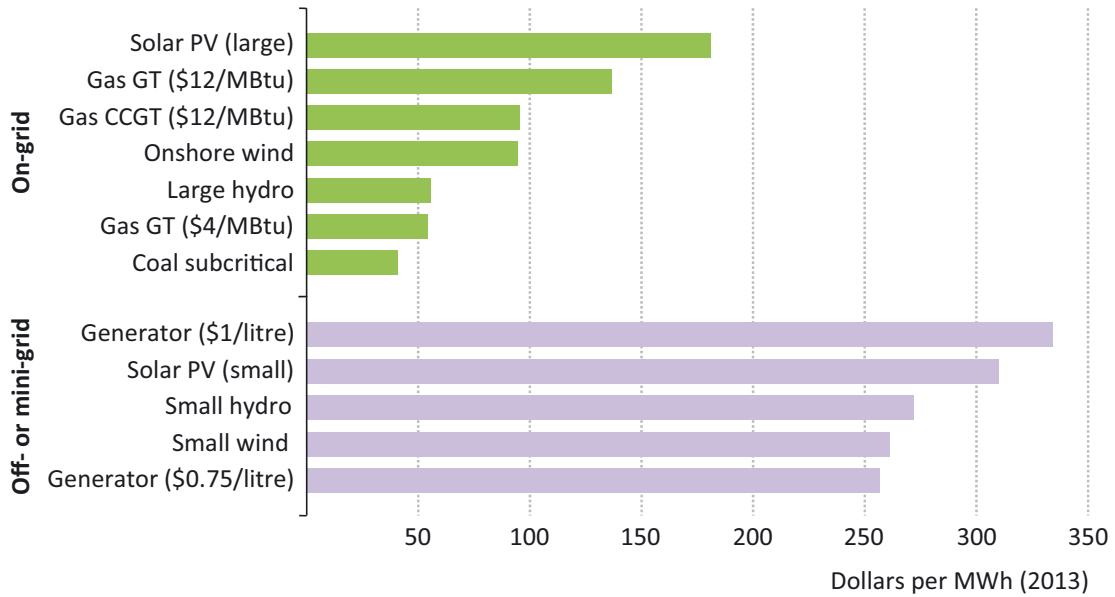
Electricity access Population relying on traditional use of biomass for cooking in 2013

Region	Population without electricity (millions)	Electrification rate (%)	Urban electrification rate (%)	Rural electrification rate (%)	Population relying on traditional use of biomass (millions)	Percentage of population relying on traditional use of biomass (%)
Developing countries	**1.200**	**78%**	**92%**	**67%**	**2.722**	**50%**
Africa	635	43%	68%	26%	754	68%
North Africa	*1*	*99%*	*100%*	*99%*	*1*	*0%*
Sub-Saharan Africa	*634*	*32%*	*59%*	*17%*	*753*	*80%*
Developing Asia	526	86%	96%	78%	1.895	51%
China	*1*	*100%*	*100%*	*100%*	*450*	*33%*
India	*237*	*81%*	*96%*	*74%*	*841*	*67%*
Latin America	22	95%	98%	85%	65	14%
Middle East	17	92%	98%	79%	*8*	*4%*
Transition economies & OECD	**1**	**100%**	**100%**	**100%**	8	4%
WORLD	**1.201**	**83%**	**95%**	**70%**	**2.722**	**38%**

Source: http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase

Because the majority of the energy poor lives in rural areas,traditional power infrastructure can be more expensive (low consumer density). This cannot be grasped looking at the levelised costs of electricity: with low users' density extending the grid becomes more expensive and off-grid economics kicks-in

Levelised costs of electricity for on-grid and off-grid technologies in sub-Saharan Africa, 2012



Notes: Costs are indicative and figures for specific projects could vary significantly, depending on their detailed design. GT = gas turbine; CCGT = combined-cycle gas turbine; MBtu = million British thermal units.

Climate financial should be conditional on Fossil Fuel Subsidies (FFS) removal: based on the IEA's latest survey, the value of fossil-fuel subsidies worldwide is estimated at 493 G$ in 2014. These are most of the time regressive.
As an example in India in 2014 annual subsidies for oil products only amounted to 30 G$, roughly a third of the investments required in order to provide Universal Energy Access in the country.

		2012	2013	2014
Total	**All Products**	**548**	**532**	**493**
Oil	Oil	285	285	267
Electricity	Electricity	131	127	117
Gas	Natural Gas	128	117	107
Coal	Coal	4	3	2

Country	Product	2012	2013	2014
India	Oil	39,4	37,2	29,7
India	Electricity	3,2	5,5	3,7
India	Gas	2,7	4,4	4,8
India	Coal	-	-	-
India	Total	45,3	47,2	38,2

Source: http://www.worldenergyoutlook.org/media/weowebsite/2015/Subsidies20122014.xlsx

- Achieving the most ambitious climate targets will take more than 2.5 trillion dollars of investments...we need a global system penalising carbon emissions.
- It is essential to connect the discussion on Climate finance with the initiatives aimed at improving energy access (one of the 17 sustainable development goal). Investments for energy access will amount to 45 G$ per year compared to 1,600 G$ for energy supply and 100 G$ for Climate finance.
- In many of the energy-poor countries a mini-/off-grid hybrid solution can serve both the scope of providing energy access and limiting the impact on GHG emissions.
- FFS phasing-out in ECs should be a precondition to access Climate Finance.