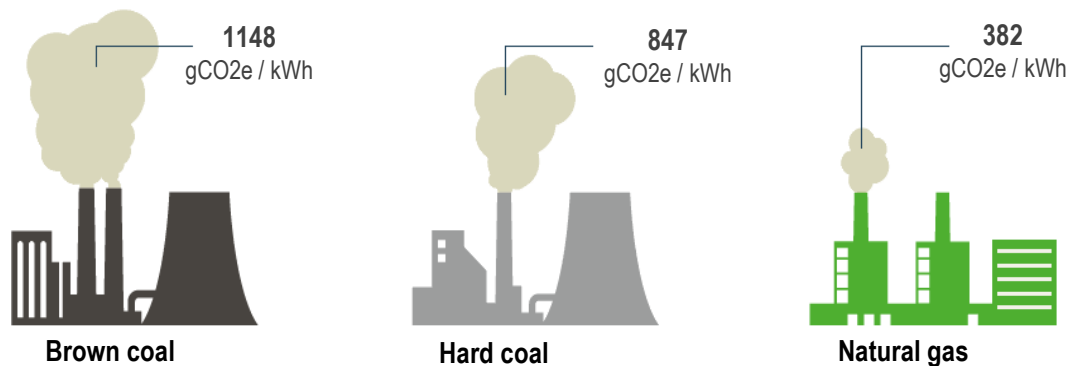


# Role of natural gas in sustainable development

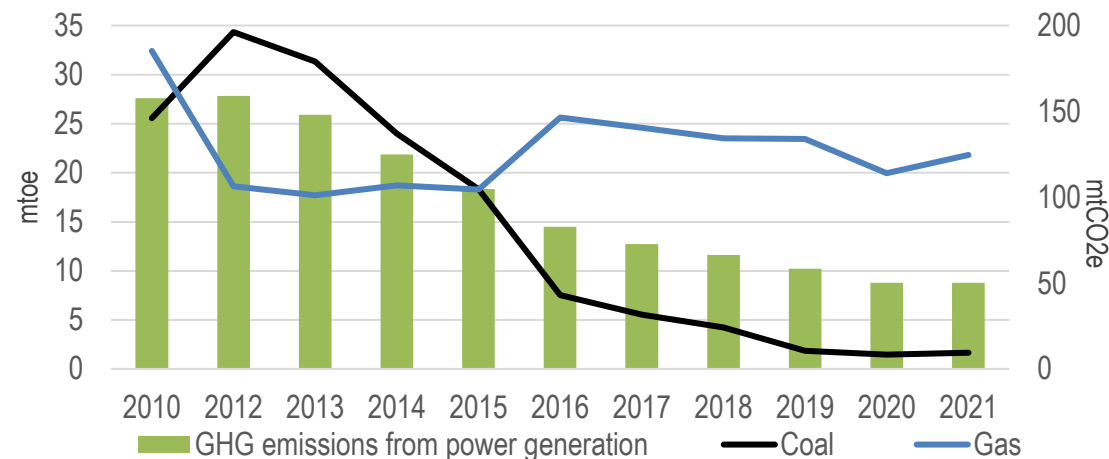
Sergey Turkin  
Gazprom PJSC

# Ecological gas advantages in power generation: key facts and cases

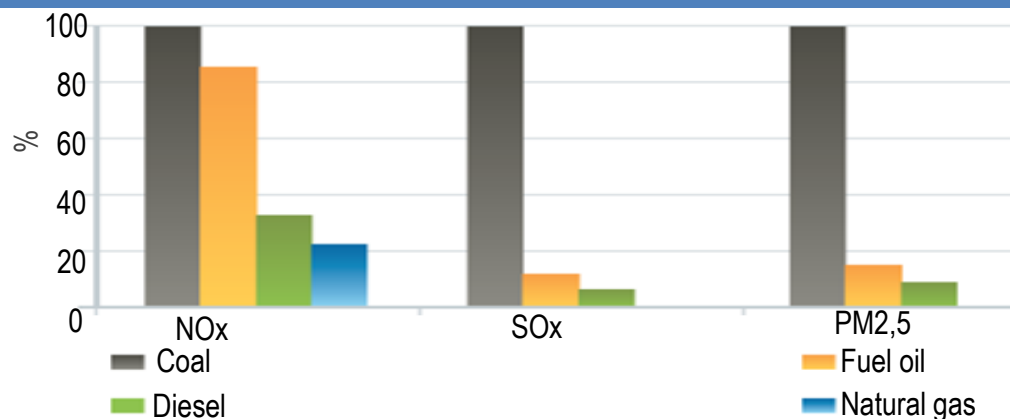
## CHG emissions of gas and coal power plants



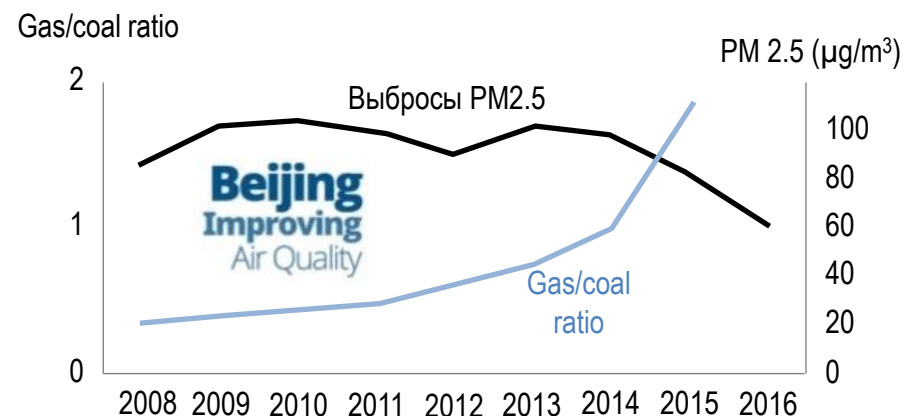
## Improvement in air quality in Beijing with natural gas



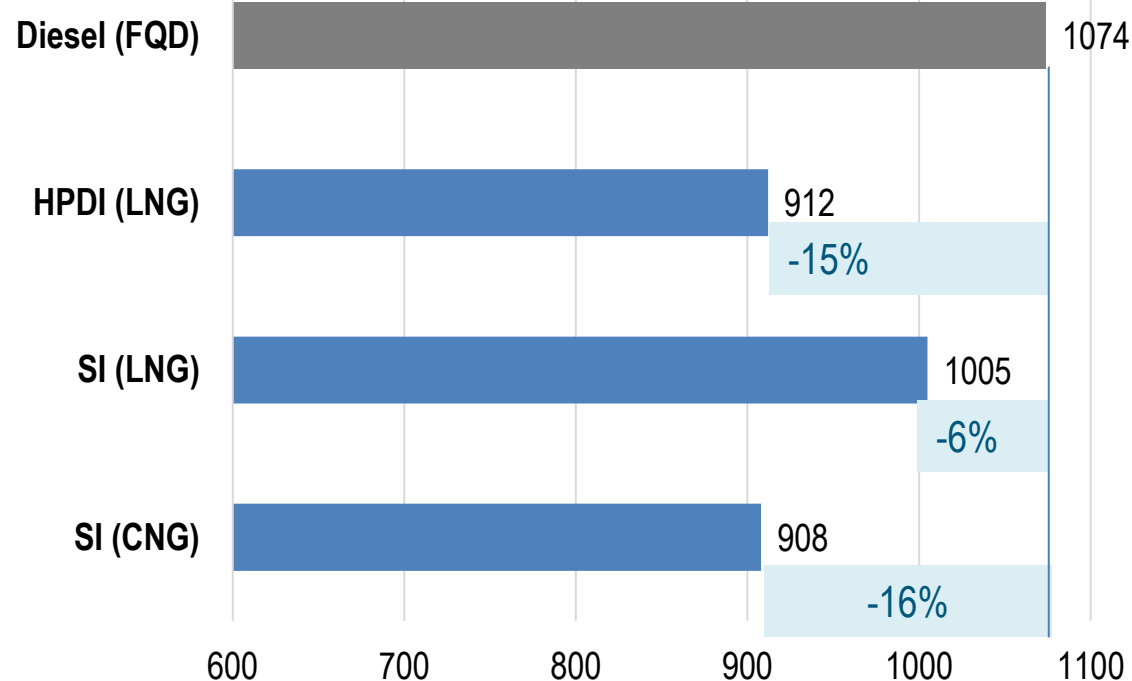
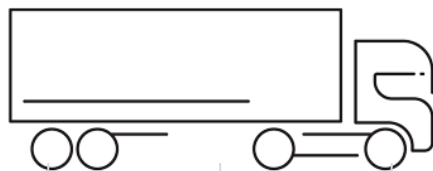
## Toxic emissions from fossil fuels



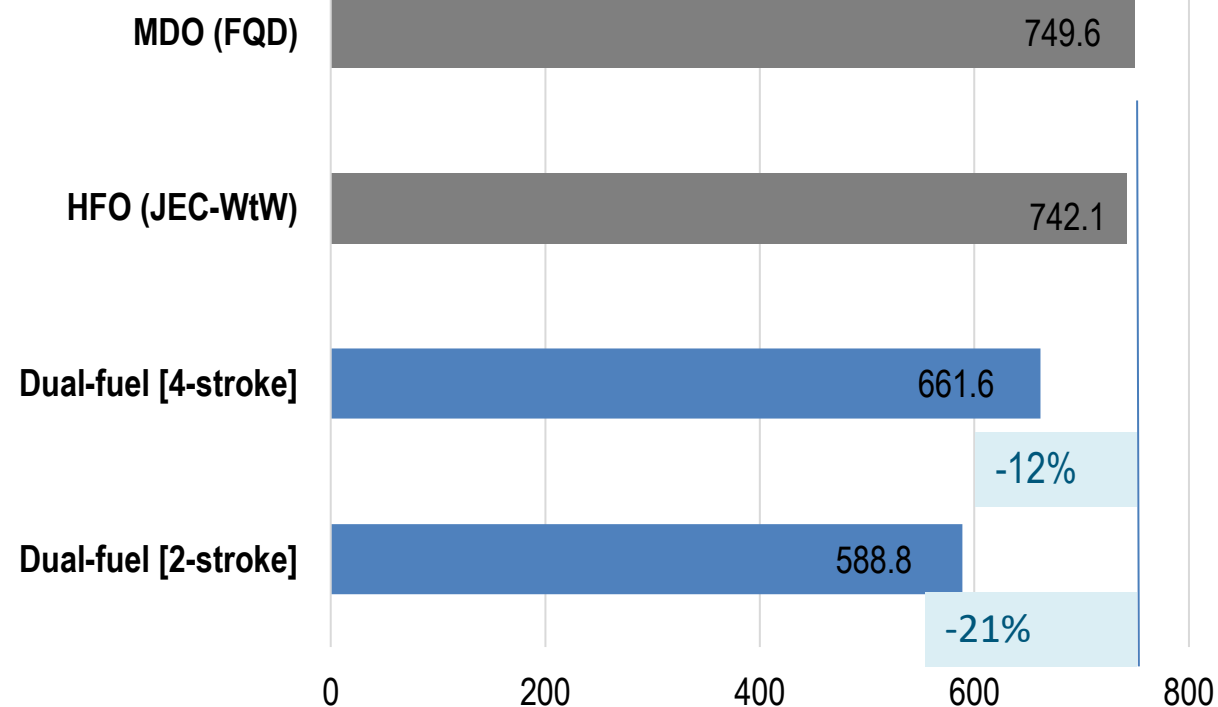
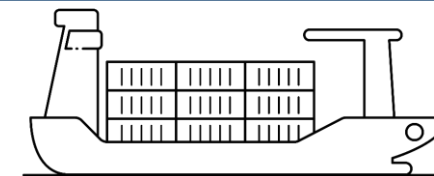
## Improvement in air quality in Beijing with natural gas



## Heavy-Duty Vehicles - GHG Intensity [g CO<sub>2</sub>-eq/km]



## Marine ships - GHG Intensity [g CO<sub>2</sub>-eq/km]



# Transfer to G4T as ecological and economic policy: Saint-Petersburg case

Transition to CNG decreases operational costs of consumers compared to gasoline (AI-92)

  
3,5 cents/km

  
10 cents/km

  
15,9 cents/km

Savings by 1000 km, USD

35

100

159

Economic effect compared to diesel:

Economy based on 1 freight truck	Methane (m <sup>3</sup> )	Diesel (liter)
Average mileage per month, km	10000	
Consumption per 100 km	43	40
Consumption per month	4300	4000
Fuel costs, USD	1310	2885

  
➔ **54,6%**  
decrease  
in costs

Annual «portion» of toxic pollutants per one inhabitant pf Saint-Petersburg, kg



Before transfer of 50% of  
auto transport to CNG

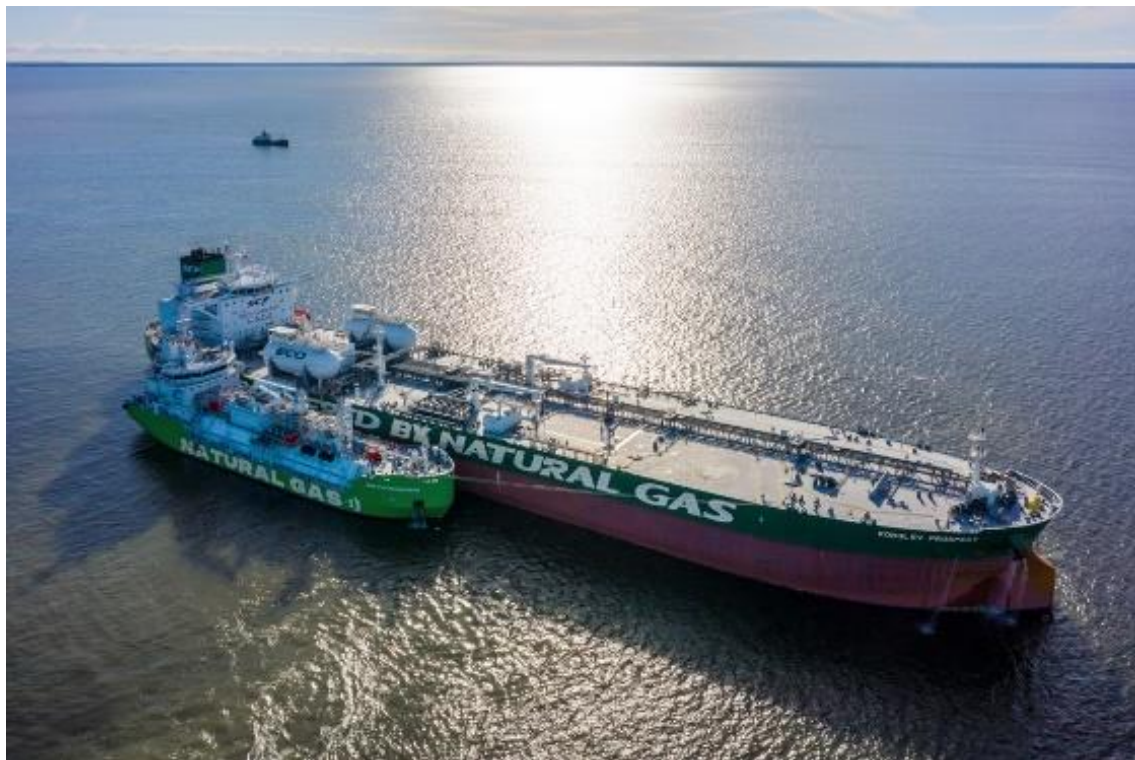


After transfer of 50% of  
auto transport to CNG



# Marine bunkering – recent developments in Gazprom

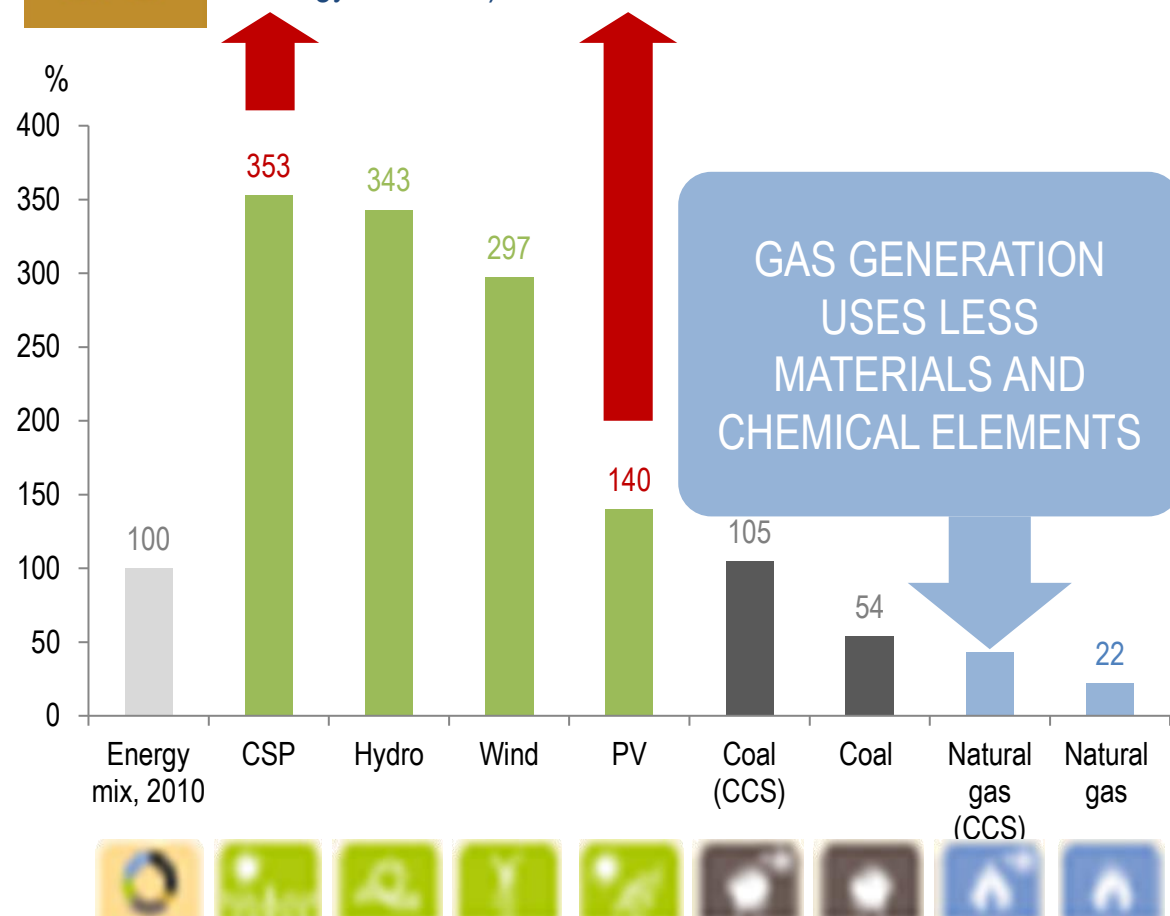
- Starting from March 2022 Gazprom started LNG bunkering of marine ships in the ports of the Baltic sea.
  - “Dmitry Mendeleev” – is the 1<sup>st</sup> LNG bunker vessel in Russia with the capacity of 5800 cubic meters
    - The 1<sup>st</sup> consumers of the bunker LNG are Russian companies, i.e. 2 car-rail ferries “Marshal Rokossovsky” and “General Chernyakhovsky”



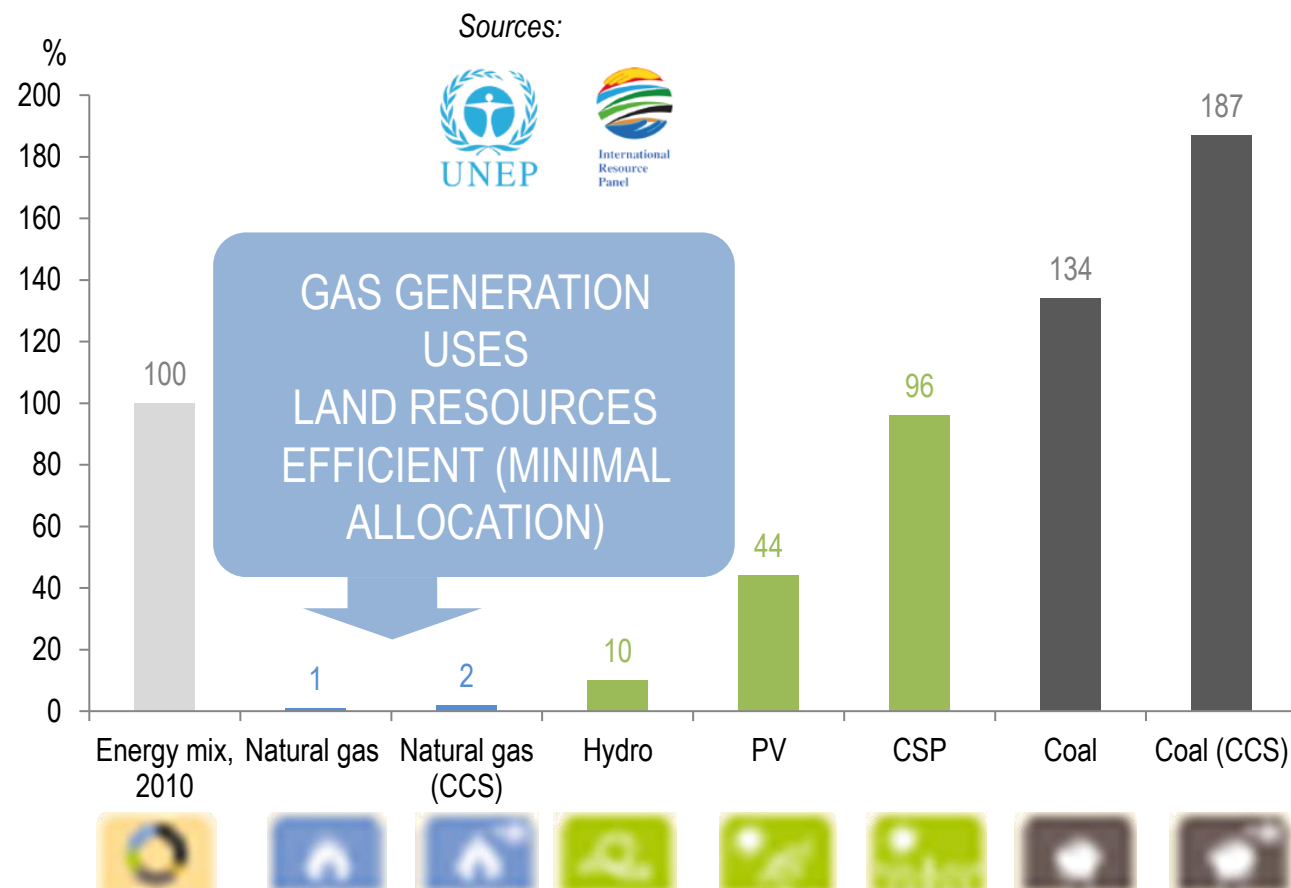
# Backup slides



## VARIOUS ELECTRICITY SOURCES CONTRIBUTION TO THE USE OF MATERIALS (with respect to the Global Energy Mix 2010)



## VARIOUS ELECTRICITY SOURCES CONTRIBUTION TO LAND USE (with respect to the Global Energy Mix 2010)

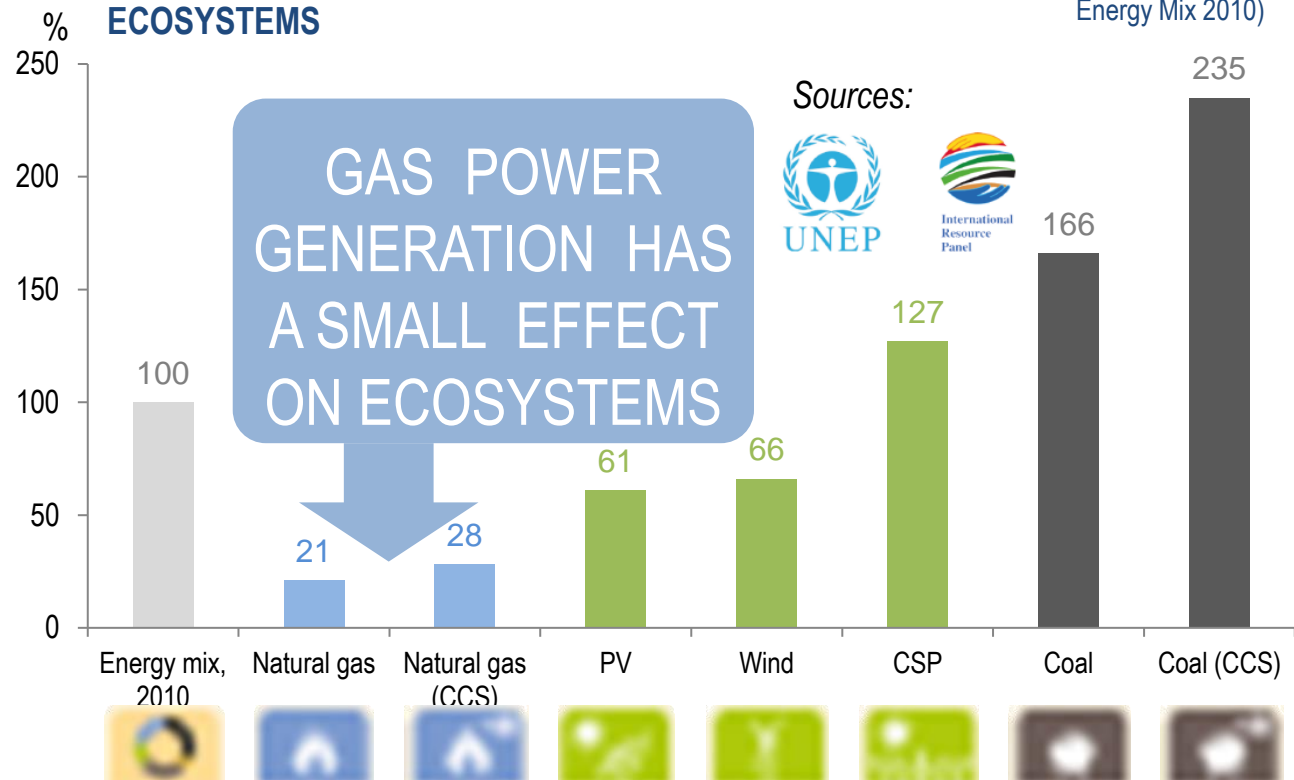






Trends in land fertility decline, loss of biodiversity and forests are of great concern. Around 1.6 billion people depend on forests for their livelihood

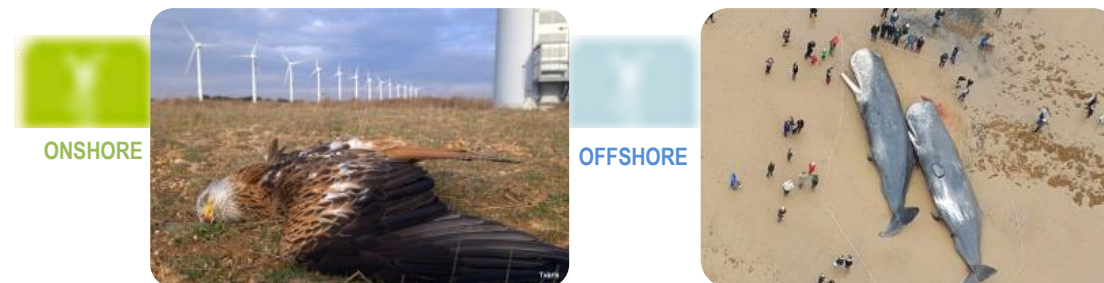
## IMPACT OF VARIOUS ENERGY SOURCES ON ECOSYSTEMS



Over three billion people depend on marine and coastal biodiversity for their livelihoods. 16 per cent of ecosystems are in the “high” or “highest” risk categories for coastal eutrophication



## THE ADVERSE IMPACT OF WIND ENERGY ON WILDLIFE



Wind turbines emit low frequency noise, including dangerous infrasound. In the sea, these vibrations are transmitted to a distance of 50 km

"Blinding", disorientation of animals and birds

According to expert estimates, a wind farm project that was to be built off the coast of Cape Cod in Massachusetts (USA) would have killed up to 6 600 seabirds every year

Thoughtless, based only on political considerations pursuing the aim to expand the share of renewable energy in the energy balance can lead to severe consequences for nature, and then along the chain – for the economy as a whole



6 CLEAN WATER AND SANITATION



Water scarcity affects more than 40 per cent of the global population. 783 million people do not have access to clean water. More than 80 per cent of the liquid waste generated from human activities is discharged into rivers or seas without any treatment. Freshwater is only 3 per cent of the world's total water supply. **It is a finite natural resource that must be managed wisely**

GAS GENERATION HAS A MINIMUM CLEAN WATER CONSUMPTION (0.2 quart / oeq)



## Natural gas

One oil-equivalent quart of natural gas requires anywhere from a tablespoon to a cup of water. Unconventional or "fracked" natural gas is at the higher end of the range.



## Petroleum

One quart of petroleum requires from one to two-and-a-half quarts of water. (Extraction itself requires less than a cup — most of the water goes toward cooling in the refinery.)



## Electric power from coal

One oil-equivalent quart of electric power from coal requires anywhere from 11 to 18 quarts of water for cooling. (Gas-fired turbines also require cooling water, but are a bit more efficient and require less water than coal-fired plants.)



## Ethanol

One oil-equivalent quart of ethanol requires from six quarts to as much as 1,176 quarts of water (depending on irrigation). This is typical of most biofuels.



## Hydroelectric power

One oil-equivalent quart of hydroelectric power requires from 15 quarts to as much as 5,040 quarts of water because of evaporation and subsurface seepage from reservoirs.

Source: ExxonMobil