



Société Géographique
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Planning for the low carbon transition: where climate policy meets geography.

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“The struggle for existence is the struggle for available energy”

Ludwig Boltzmann

- Human history is characterised by energy transitions.
- The drivers for these transitions range from technological innovations and socio-economic developments, to political events.
- Society and technology co-evolved, but as energy use increased, supply chains became longer and more complex



Hunting sperm whales in the
Southern Ocean,
Late 1700s to mid 1800s
(to make candles – for light)

*How the discovery of 'rock oil'
made lighting super cheap,
leading to a collapse in whale
Hunting (for a while anyway)*



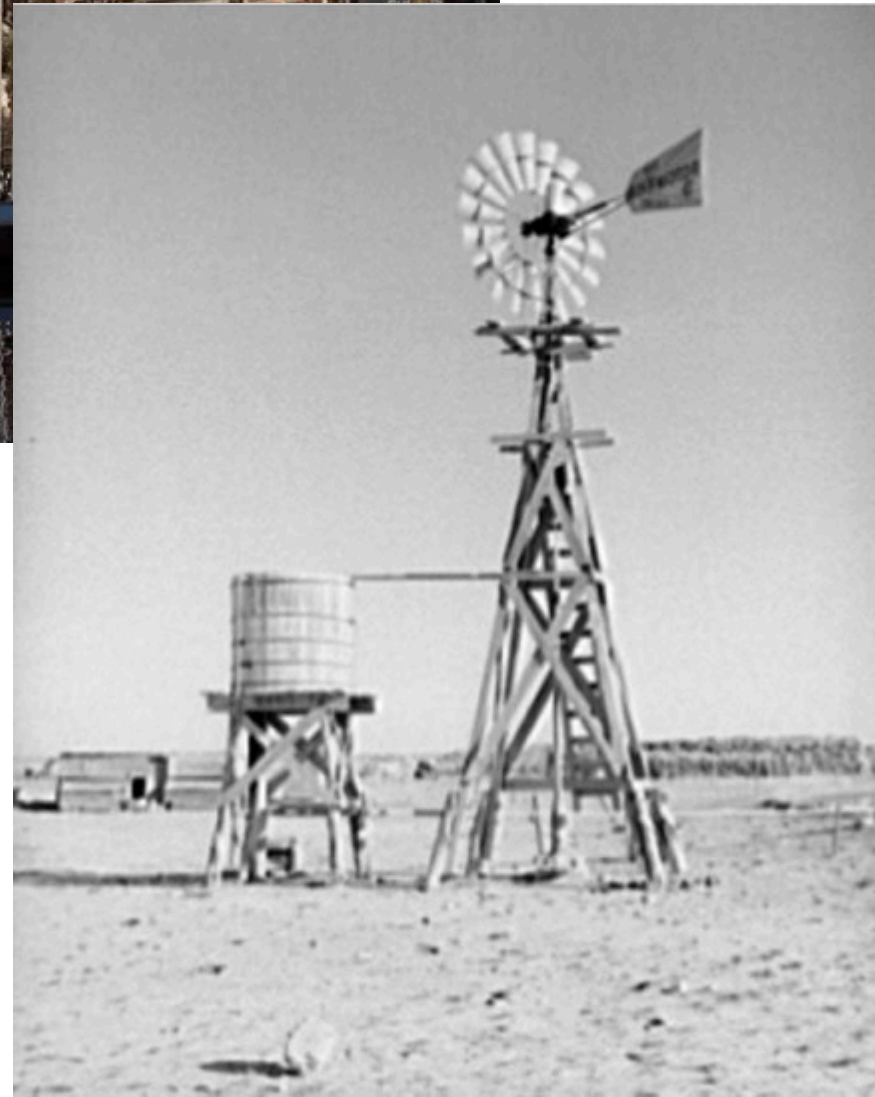
Titusville,
Pennsylvania,
1859; Oil!



Renewable energy & Resource frontiers:

Spatial expansion – e.g. expansion of agriculture in arid areas through wind-driven water pumps (picture); expansion of ‘wind-mining’ & the grid through off-shore wind farms.

Spatial in-filling – e.g. (retro)fitting wind mills (picture) or PV panels in crowded urban spaces;



‘old’ energy system

- Electricity grid (small number of huge, centralised power stations)
- Fossil fuel supply chains, with specialist functions:
 - Petrol & diesel supplies (for road transport)
 - Coal supplies (for electricity generation; industrial processes [iron smelting])
 - Gas pipe network (for heat demand in buildings [space, water, cooking]; industrial processes)

The role of geography in energy transitions

- On the supply-side, longer supply chains means that social and environmental externalities grow: (geographical distance -> less transparency & engagement)
- On the demand-side, as national grids developed, geography 'disappeared'; the 'grid state' is an 'isotropic' plane; across the national territory there is access to electricity of the same quality, at the same time & at the same price.
- The new grid is becoming more geographical (and temporal) - because of renewable supply AND because of changes in consumption & storage

Towards a new energy system: the future is (green) electric!

- Huge number of **small, distributed, intermittent power stations** (PV panels, micro hydro, wind energy, geo-thermal, tidal energy, [wave energy])
 - Geographically spread; wind, solar, wave
 - More local & predictable; tidal, hydro, geo-thermal
 - Storable; biomass energy
- **Electrification of other energy sectors:**
 - Electric mobility
 - Synfuels made from renewables (hydrogen, ammonia) – for use in hard-to-decarbonise sectors, e.g. steel & cement making; long distance flights
 - Electric heating (cooling was always electric)
- **Investments & innovations in storage** (batteries; pumped-hydro; geological)
- **Off-setting, carbon capture & storage (CCS)**
- **Demand-side measures** (reducing or shifting consumption)

Supply & demand

- Old electricity system is 'predict & provide'; production (supply) follows consumption (demand)
- The new electricity system has variable production, and in order to make the most of 'free' renewable energy, consumption should follow production.
- Climate change affects energy demand (e.g. cooling demand during heat waves)
- Climate change affects energy supply (e.g. wind speeds; damage to infrastructure, agricultural yields)



Coo
Doel
*The supply chain
Of nuclear power 'system'*
Arlit (Niger)





Belgium is an 'oasis of light'
(ESA-astronaut Thomas Pesquet, ISS, 2017)

En Belgique, les autoroutes sont éclairées toute la nuit. La Wallonie vient d'entreprendre un chantier titanesque pour remplacer les vieilles ampoules par des LED, beaucoup moins gourmandes en électricité.

Francetvinfo, 26/04/2021

Retro-fitting smarter solutions

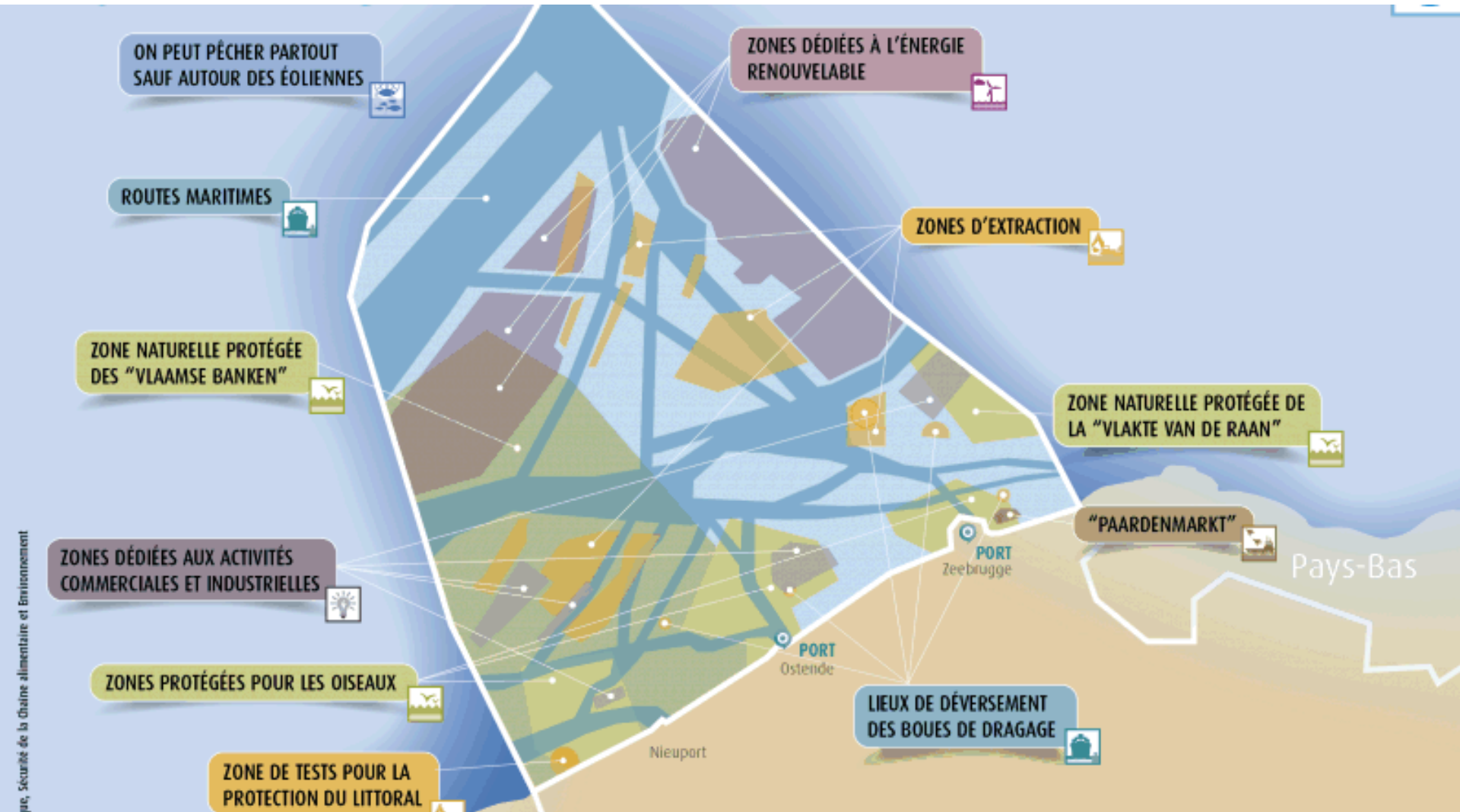
L'éclairage adaptatif en temps réel sur les autoroutes wallonnes pourrait réduire de 32% la facture énergétique actuelle

RTBF, 27 Oct, 2020

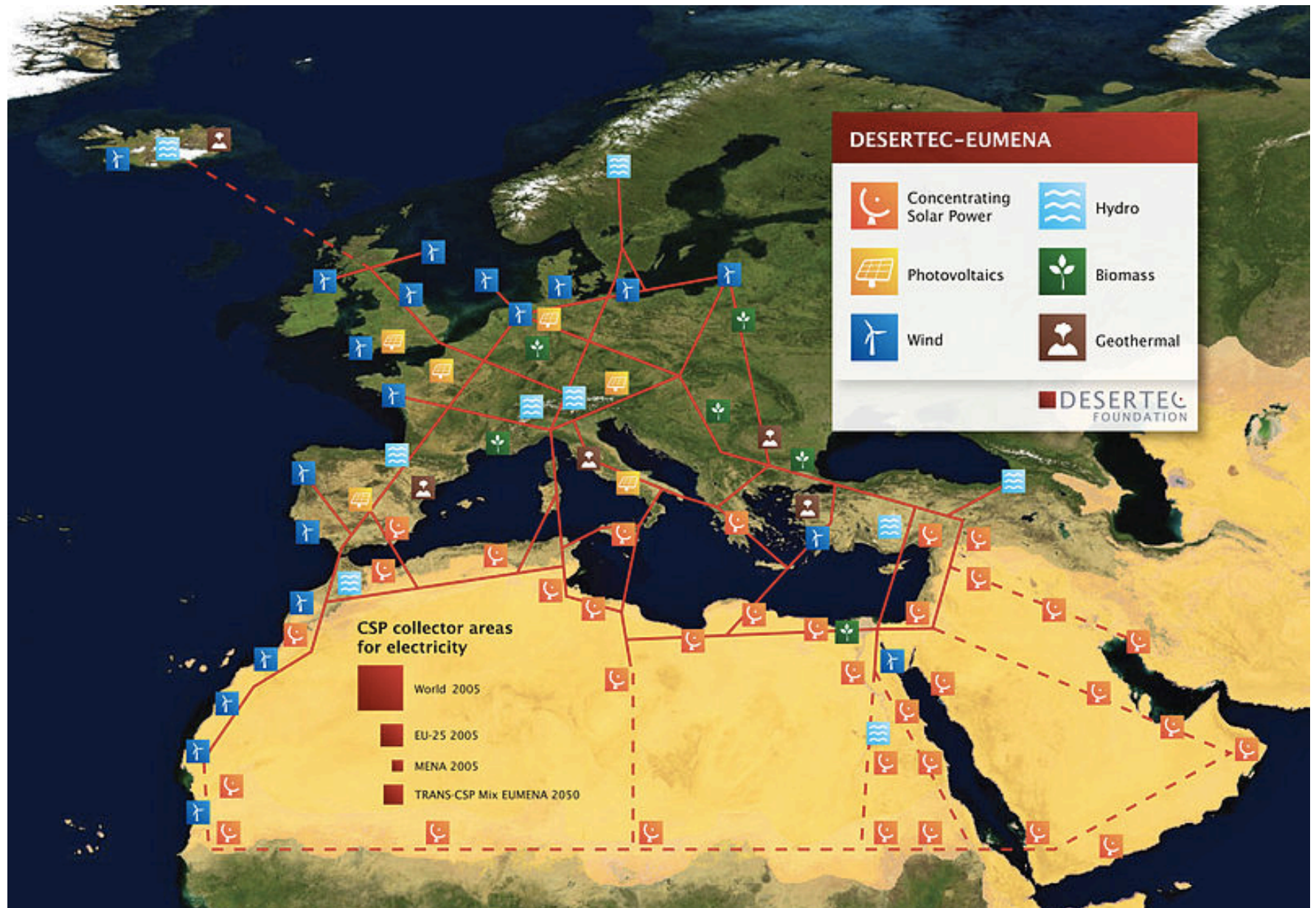


Space is scarce; even the sea is getting crowded!

Marine Spatial Plan 2020-2026



Future techno dreams; renewable **mega** grid

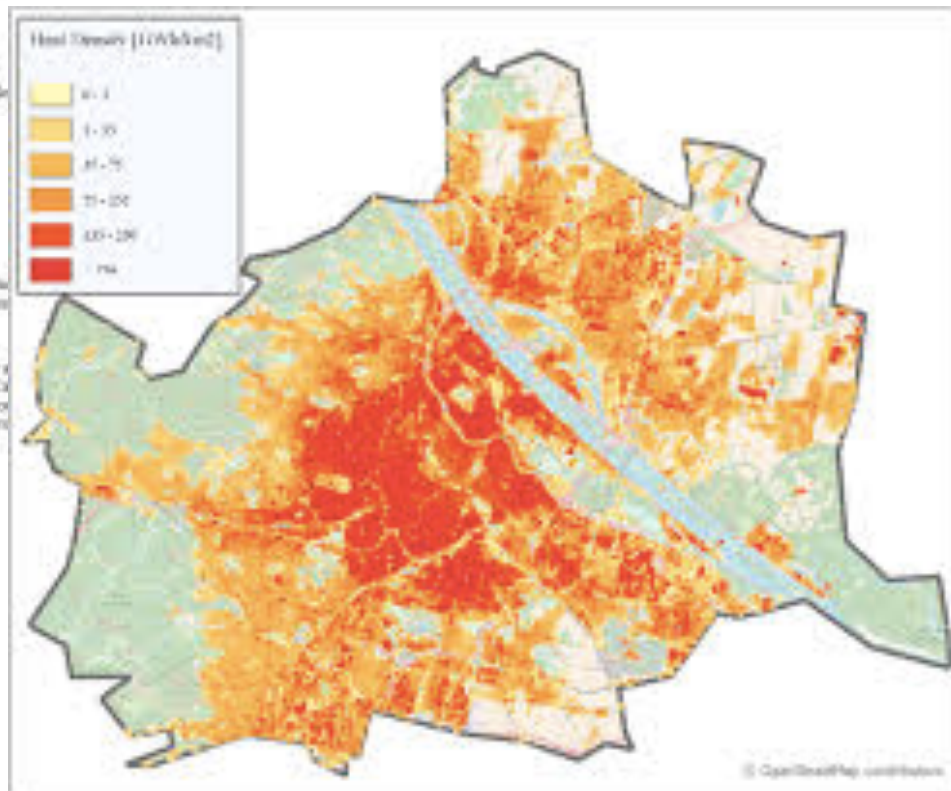




Micro dream: Eco-homes / living off-grid (retro/futuristic; rural/urban)



Beyond individual homes;
Collective heating approaches
are cheaper & more efficient.
This means retrofitting whole
streets or neighbourhoods
(state planning versus neo-
liberal 'individual choice').



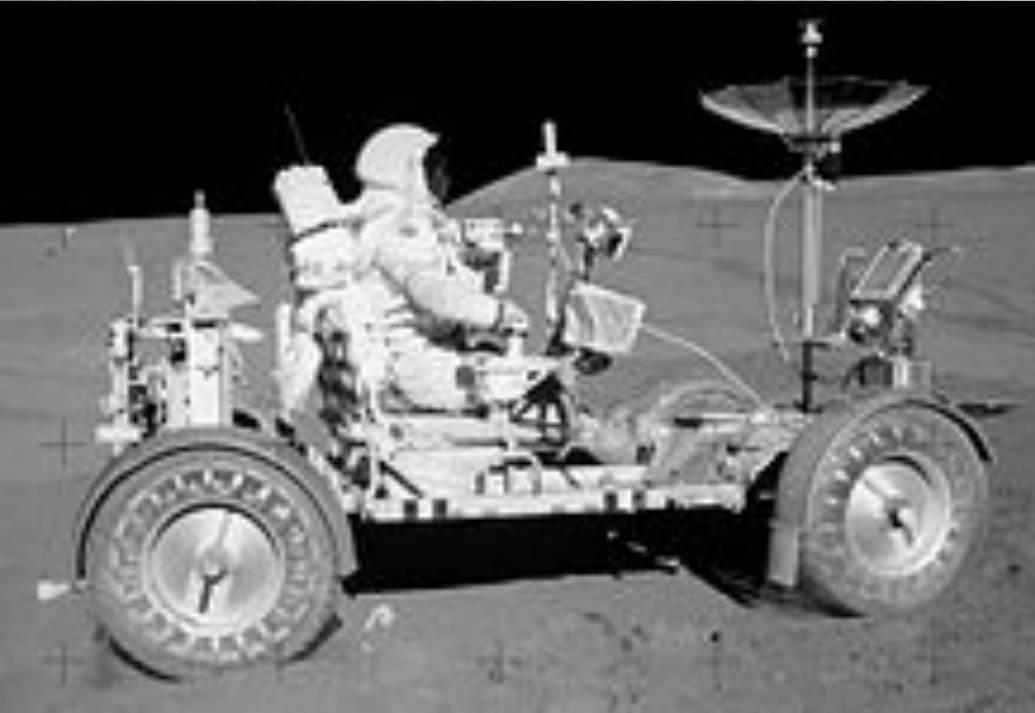
Retrofitting our streets

Private cars (= noise, air pollution, collision danger, big foot print [$\approx 10\text{m}^2$]) versus street commons: scarce street space must be reclaimed for pedestrians, cyclists, public transport.





Electric vehicles;
New trends, despite old technology (left, 1900).
Space age; not for combustion engines (bottom; moon & mars)



Old 'niche':

electric door-to-door delivery of fresh milk (picture from Gent, 2008; still exists in the UK; not waking up the customers!)



New law;



New laws:

Electric golf carts are popular in the US; illegal to drive on the road until local laws were changed (to save money & reduce air pollution)

In summary; challenges are socio-political, but many solutions are 'smart' and local

- Just transitions: Climate policy was about inter-generational equity (future generations) but now intra-generational equity has become a huge challenge.
- We already have the technologies for 'net zero'; but we must deploy those technologies at MUCH bigger scale & MUCH faster.
- Requires huge financial investments, but studies show that it pays off; some measures save money now & 'doing nothing' is even more expensive.
- Unavoidable (but politically difficult): must change market & society
- Policy change; serious carbon tax (polluter-pays); health & wellbeing as key policy drivers (not economic proxy indicators, like GDP)
- Retrofitting existing homes, streets and cities is our biggest challenge in Europe (in comparison, new-build is 'easy'). BE & UK; buildings very old!
- Social and local (spatial) innovations needed. (history as inspiration?)
- New business models: selling services, not goods; sharing economy; creating 'shared value'; product take-back & rights to repair.
- New/bigger role for local/regional authorities (need new powers, expertise).